TEXTBOOK OF FOOTWEAR MANUFACTURE

EDITED
BY
J.H. THORNTON

Compiler's Notes

THE FOLLOWING is a faithful digitalization of the *TEXTBOOK OF FOOTWEAR MANUFACTURE* as edited by J.H. Thornton.

I have taken the liberty of using this originally blank page to comment on the material within. Insofar as I was able, I have endeavoured to preserve the appearance, formatting, kerning, spacing, etc,. of the original work. Sometimes, however, this was simply not possible. The typefaces used in the original text are not precisely duplicated in any of the font sets to which I have access. Then too, the spacing between chapter, paragraph, and graphic elements is often inconsistent within the original text. Sometimes a chapter heading will be set an inch and a quarter below the edge of the page, sometime an inch and a half. Sometimes, using a given set of paragraph styles, a page would format almost to the exact word at the bottom margin...and then the next page would run over or come up substantially short. Nevertheless, I have preserved page numbers and the contents of those pages to fairly close extent.

Additionally, there are some illustrations that I have "re-drawn," so to speak. This process involved "tracing" the original (as faithfully as is humanly possible) in order to clarify a drawing, or areas of a drawing which, because of "shading" or other "textures," would not have displayed or printed well. I had some initial qualms about this but, in the end, felt that the result was no different than substituting a contemporary typeface for one that was no longer available. Presenting the information in a clear forme is the whole point, after all.

I have also taken the liberty to superimpose the title of Thornton's book on the digital cover. In the version I used, the title was confined to the spine of the book.

Beyond that, nothing has been added or subtracted from the text as it is contained in the original volumes in my possession. It is my fervent hope that this work will help to preserve the Trade and make this invaluable resource more accessible to those students seeking to learn from the past masters.

DWFII—15 March 2009

TEXTBOOK OF FOOTWEAR MANUFACTURE

Textbook of Footwear Manufacture
Textbook of Footwear Materials
Editor: J. H.Thornton

The above-named textbooks were originally published by the National Trade Press (UK) in 1953 and 1955 respectively. The final edition of the "Textbook of Footwear Manufacture" (there were three editions in total) was published in 1964, but I am unaware whether there was more than one edition of the "Textbook of Footwear Materials". The editor of both books, John H. Thornton - my late father - died in 1983. Both volumes are long out of print.

The National Trade Press apparently no longer exists, and my enquiries suggest their likely successor publisher is Elsevier. However in response to my approach to them, Elsevier have informed me that they can find no record of the books, and that in all probability the copyright has reverted to my father's heirs. Since my two brothers have predeceased me, I therefore believe that the copyright now rests with me, his daughter Judith E. Doherty. It should be stressed that I have not sought an independent legal opinion on this matter and that the following permission to use the materials within these books is granted solely on the basis of my own judgment as a retired attorney (without specific experience in the area of copyright law).

I have received a request from the Honourable Cordwainers' Company, a registered charity, for permission to digitize the "Textbook of Footwear Manufacture". The HCC membership is composed of practising boot and shoemakers; historical shoemaking interpreters, museum animators and docents; researchers as well as traditional leather workers from USA, UK and other countries worldwide. The work of making the textbook available on line would be carried out on a volunteer basis by members of the HCC, whose website is www.thehcc.org, and the material would be freely and generally available as an important reference source.

It gives me great pleasure to know that the work of my father and his colleagues will be accessible again after all these years. Sadly my father did not live to experience the internet age, which I am sure he would have thoroughly enjoyed. I think he would have been delighted to hear about the HCC's plans. I am very happy to give the Company authority to proceed.

Although I have not specifically been asked for permission to reproduce the "Textbook of Footwear Materials", I have no objection whatsoever to the use of this book for similar purposes. Both volumes are, I think, still excellent reference tools today, and they should both be available.

Judith E. Doherty
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TEXTBOOK OF FOOTWEAR MANUFACTURE

Editor

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FOREWORD

By Geoffrey N. Barrett, B.E.M., F.B.S.I.,
Chairman of the Council of the British Boot and Shoe institution

TODAY HAS BEEN CALLED the Age of Technology, and it has certainly become more and more apparent that the competition of modern life compels all energetic and far-seeing students to make an intensive study of the trade or profession which they have chosen as their life's work.

The old craft trades, of which boot and shoe manufacture is one, are, to a large extent, being revolutionised by the application of better machines and a more scientific and mechanical approach to all problems, and no training can be done without adequate textbooks.

We, in boot and shoe manufacture, have felt the need, for some years, of modern textbooks, and the matter has often been raised at the Council meetings of the British Boot and Shoe Institution.

It is, therefore, with very great pleasure, that we welcome this new book, a tribute to the knowledge and perseverence of Mr. J. H. Thornton and his fellow authors. It is also a tribute, of course, to the late Mr. E. J. C. Swaysland that his textbook of Boot and Shoe Manufacture published in 1905 should still be quoted, but it is also a reflection on the shoe trade for having produced since that time so few adequate and more modern books.

The *Journal of the British Boot and Shoe Institution* has endeavoured to spread the knowledge of modern techniques, but it was not conceived as, and could never take the place of, a textbook. The authors of this book, however, have been able to make use of much of the matter contained in articles of the *Journal*. The inclusion of a section on slipper making is also particularly welcome, as it makes this the first book to cover the whole range of footwear manufacture.

May I congratulate Mr. Thornton on the production of this book, and also thank his extremely competent team of contributors on their work for the benefit of all students of the Boot and Shoe Industry.

GEOFFREY N. BARRETT

GENERAL INTRODUCTION

THE SCOPE OF THIS book is defined by its title and in this respect it differs from several earlier works. Although last making, leather manufacture, weaving and the anatomy and measurement of the foot are all most interesting topics, they are not a part of footwear manufacture within the factory but ancillary to it. Therefore, although there are many references to them, as will be seen from the index, they are not dealt with in any great detail.

Except for a section on area measurement in the clicking room, costing has also been omitted in view of the fact that there is in the course of preparation by the Federated Associations of Boot and Shoe Manufacturers a very detailed and authoritative work on this subject. On the other hand, the background of the trade has been established in the first part of the book dealing with the origin and development of shoe design.

It is very difficult to study boot and shoe manufacture away from a recognised trade centre, but to assist pattern cutting students to practise at home several of the last manufacturers whose advertisements appear in this book have agreed to supply, at a nominal cost, lasts suitable for this purpose.

I would like to thank the following people for the great help they have given during the preparation of the book: Mr. J. Barnet, Mr. R. W. Brown, F.L.A. (Curator, Northampton Museums), Messrs. G. A. Kirby, H. J. Stafford and C. M. Strudwicke (The British United Shoe Machinery Co., Ltd.), Mr. E. H. Lusty (Messrs. Phipps and Son, Ltd.), Mr. R. P. Swain (The Standard Engineering Co., Ltd.), and the authors of the various articles appearing in the *Journal of the British Boot and Shoe Institution*, the titles of which are given in the Bibliography, which articles have been freely consulted.

In addition, very welcome practical assistance in the form of information, illustrations or blocks, some specially prepared, has been given by the following: the B.B. Chemical Co., Ltd. (Figures 239, 240); the British Boot, Shoe and Allied Trades Research Association (Figures 234, 241); The British United Shoe Machinery Co., Ltd. (Figures 4-15, 129, 134, 142, 157, 184, 186, 187, 189, 228*c*, 238); Northampton libraries Committee (Figures 23, 24); the Pedoscope Co., Ltd. (Figure 21); the Singer Sewing Machine Co., Ltd. (Figures 78-80, 82-9); the Standard Engineering Co., Ltd. (Figures 124, 126, 128, 131, 133, 135, 137, 139, 141, 144, 149, 150,

152, 154, 155, 158, 159, 160, 167, 169, 173, 174, 176, 179, 181, 185, 188, 194-200, 203*b*, 204*a*, 205-9, 226, 227, 228*a*, *b*, 229, 230, 235-7 and the chart on p. 254; Vantona News (Figure 57); the Victoria and Albert Museum (Figure 18).

J. H. THORNTON

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PART I

SHOE DESIGN: ITS BASIS AND DEVELOPMENT

J. H. THORNTON

INTRODUCTION

IT MUST BE STATED at the outset that the purpose of this first section on the basis and development of shoe design is not to try and teach anyone how to design shoes. In the first place, in spite of the thousands of words which have been written about shoe design (or, rather, shoe fashion), particularly during the past few years, it is still very doubtful whether it is a subject which can be taught by a textbook; in the second place it appears to be quite impossible to differentiate between what is basic design, fundamental and unchanging, and what is transitory fashion. Each generation produces new articles such as shoes, furniture, vehicles, domestic equipment and so on, different in appearance from what has gone before, and each is advertised as the best ever to be designed. Yet fifteen or twenty years later these articles are 'old-fashioned' and once again we are shown the 'best ever'. Furthermore, reasons, apparently sound, are given on each occasion that a new design is produced staling why it is so much better than the old—but these reasons have a habit of becoming unsound with the passage of time.

This apparent anomaly is partly due to the indiscriminate use of the very much overworked term 'design' instead of 'style'. Designing shoes* is something more than drawing a pleasing upper, a fact sometimes overlooked when the designer has received his, or her, training in art and has not acquired the necessary knowledge of shoe function and construction. On the other hand, the technician who becomes a designer often lacks the necessary appreciation of the basic ideas of line, form and colour and may tend to use ornament and decoration indiscriminately without relation to the whole design. A shoe designer, in the correct sense of the title, is both an artist and a technician; a shoe stylist is more likely to belong to the first category.

It would appear to be a logical assumption that if a design is fundamentally sound then its life should be at least as long as that of the conditions it was first intended to meet, always allowing, of course, for alterations and improvements with increasing knowledge. This brings us up against the commercial considerations, however, and the need to alter a design, not because it improves it in any way but because it makes it different from someone else's product; it is then the duty of the advertising department to think up for the benefit of the consumer some reasons why the new design is so superior to the old. The customary practice of producing seasonal 'models' fosters this practice and basic design is often subordinated to commercial fashion or novelty.

* The term ' shoe ' is used throughout Part I as the generic name for all types of footwear, including boots.

Shoe design, in common with the design of all articles of clothing, particularly women's, is much more susceptible to the vagaries of fashion than the design of any other manufactured articles. At the same time, however, shoes are among the oldest of our man-made commodities and it is possible to trace through the centuries certain fundamental characteristics of them which we may properly call 'basic design'. It is these characteristics which will be dealt with in this section, together with a brief summary of modern methods of shoe construction so that, if taken in conjunction with the later sections on shoe manufacture, the student will have at least an indication of how to prepare himself to be a shoe designer.

THE BASIS OF DESIGN

A properly designed article, whether it be a shoe or a rabbit-hutch, may be compared with a three-legged stool of which the seat forms the design resting firmly on the three legs of purpose,material and method.

The **purpose**, or what the article is made for, must be clearly understood and constantly kept in mind by the designer. Every other consideration should be subordinate to this; none must in any way interfere with the fulfilment of the design when the article is eventually used for its intended purpose.

The **material**, or what the article is made of, is primarily controlled by the purpose for which the design is intended and secondarily by the availability of it. Having been chosen, it then itself controls to a considerable extent the method of construction, the third leg.

The **method**, or how the article is to be made, both influences the design and is influenced by-it; the designer, therefore, should have a thorough knowledge of the actual manufacturing processes through which his design will have to pass on its way from paper to reality.

The three-legged stool of design so described would stand firmly if it were not for the fact that a fourth interchangeable leg, that of **fashion**, has so often to be inserted, especially where clothing is concerned, and more often than not the stool wobbles. The perfect design, like the perfect stool, remains steady on the four legs of purpose, material, method and fashion, but such a design is as rare as a non-wobbling four-legged stool.

Let us now consider how these legs' of purpose, material, method and fashion have influenced shoe design in time and space—from time immemorial and in the most remote parts of the world—and will presumably go on doing so.

1

THE PURPOSE OF SHOES

THE SHOE HAS TWO primary functions to perform and has acquired through the years other lesser ones. The primary functions are:

(1) To protect the sole of the foot from the heat, cold, dampness, dirt or roughness of the ground in walking and standing. In its simplest form this is achieved in the primitive *sandal* (see p. 20) which is nothing more nor less than a piece of leather, wood or other material, fixed under the foot by a strap or other means.

(2) To protect the upper part of the foot, and, if required, the leg, from the cold, rain, thorns and insect or other bites. In its simplest form this is a bag of leather or material wrapped round the foot and is here given the generic name of *moccasin* (see p. 22).

Lesser functions are:

(3) To assist the foot to perform some abnormal task. This includes the various sports such as football, cricket, hockey, running, fishing, riding, mountaineering, dancing, etc., all of which today have their own special footwear. So, also, have many trades, such as mining, deep-sea diving, munitions manufacture and fire-fighting, and the armed services. It should be noted here that more primitive peoples with much stronger and tougher feet can tackle many of these sports, pastimes or occupations without special shoes, or, in fact, without shoes of any kind.

(4) To overcome abnormalities in the. foot itself, the surgical boot being the extreme example of this, while many shoes incorporate corrective devices, some more corrective in name than in fact.

(5) To complete a costume. This is particularly important today when costume designing includes not only the dress but also the hat, shoes, gloves and handbag. In fact, the main purpose of the shoe may be to complete or enhance the remainder of the costume, the primary functions of foot-covering and sole- protection being subordinate to this.

Shoes for ceremonial occasions, such as a man's court shoe, also come under this heading.

(6) To indicate rank or office. This is not applicable in western civilisations, unless we include the notorious 'jackboot' in this category, but formerly it was important, certain types of shoe being restricted to certain classes; there is obviously a very close link here with the purpose stated in (5) above.

If the shoe designer had to cater for only one of the above purposes then, of course, his task would be comparatively simple, but except, perhaps, for the most primitive sandal, this is never the case and he is faced with the problem of combining several of them. Whatever may be the main purpose or purposes, however, one primary fact remains—the shoe is intended to be worn on the foot and the foot is a living, mobile part of the human body.

In natural walking the foot bends, and so the shoe must normally bend too, and at the same places as the foot (there are exceptions to this principle which are dealt with on p. 11 under the heading 'Flexibility'). Furthermore, the foot is asymmetrical both in its construction and its movements and so this bending does not take place as it would do if the foot were a divided block of wood with a simple transverse hinge joining the front and back parts; foot bending is an extremely complicated action with many bone joints coming into play. The foot also turns at the ankle through two ball joints—the lower one being on the outside and the higher one on the inside; these joints influence the height of shoe quarters (the rear portions of the shoe upper) and are mentioned again in Part II (p. 87).

The upper portion of the foot is soft, yields easily to pressure and quickly shows the results of it; the toes in particular grow 'corns' where the shoe continually presses against them, and a bunion on the big toe joints is caused by pointed-toe shoes constantly forcing the big toes away from their natural straight-forward position towards an imaginary centre line down each foot. The shoe designer is in no small measure responsible for these effects; the last (the block of wood on which the shoe is made, see p. 26) may be the wrong shape or have insufficient width or depth or both, and his upper design may introduce seams or double thicknesses of material, and consequently unyielding stiffness, at the very places where comfort demands softness. One frequently sees multi-strap sandals worn without stockings and so designed that one or more of the toes finds its way between the straps, or the edge of a strap rubs against the tender little toe. The currently fashionable 'peep-toe' shoe usually has its 'peep-hole' placed centrally so that the big toe tends to be turned from its normal, alignment and pokes through the hole, especially when the addition of a high heel to the shoe causes the foot to slide forward into the wedge-shaped forepart.

A shoe designer, then, should have a working knowledge of the foot in action and should be in a position to examine after wear both the shoes he has designed and the feet which have worn them. Only then will he appreciate the practical faults in his design and be able to rectify them in future ones; in this task, he must have, of course, the full co-operation of the foot fitter—he can hardly be blamed for the ill-effects of incorrect fitting if he never has an opportunity of inspecting his design when it is fulfilling its intended purpose on the foot.

Special Purpose Shoes

Perhaps the greatest difference between the wardrobe of the woman (and to a lesser extent, the man) of today and her ancestors is that whereas the latter had the same pattern of clothes, including shoes, varied only by ornament, for every purpose, today every occasion, occupation, sport, even time of day, has its own costume specially designed for it. A woman may change her complete outfit several times during the day.

On the other hand, the former distinction between the clothes of the rich and those of the poor has gone, at least, as far as pattern is concerned; the quality of them is still determined by pocket but superficially they look alike. Gone also has the clothes-difference of the town-dweller and the rustic.

The change has been brought about by the cinema, the fashion magazines, the increased urbanisation of the country by industry and improved transport, a general class-levelling due to improved education and two world wars, and the mass production of clothing copied from 'exclusive models' and brought within the price-reach of the now highly fashion-conscious and better paid working population. Today, almost any young woman in paid employment will have at least six pairs of shoes in use: the pair she goes to work in, the pair she wears on Sundays and for 'dressy' occasions, a pair for dancing, holiday or beach sandals, winter bootees (or overboots) and her bedroom slippers. If she plays tennis, or some other sport, then a further pair may be required.

Occasionally, however, a shoe designer is called upon to produce a shoe for a special purpose in which fashion or custom plays no part; he then joins the ranks of the scientists and the engineers and his product can be compared with theirs. Examples are the R.A.F. 'Escape' boot produced in 1944, the 'Jungle' boot for the war in Burma in 1945 and the 'Korean' boot of 1951. Each of these was designed to meet the peculiar circumstances in which each was to be used. The 'Escape' boot, for example, was primarily a flying boot fleece-lined for warmth, but in addition it had a shrapnel-proof leg lining consisting of loose layers of silk and a leg which could be cut off with a knife (enclosed in a pocket in one of the boots) leaving a normal Oxford shoe (see p. 69) and so enabling the baled-out airman to escape more easily from enemy territory without recognition. The 'Jungle' and 'Korean' boots have both developed from the normal Army boot but include materials and components (leather, metal, thread, *etc.*) specially treated or made to withstand or insulate against extremes of heat, cold and damp.

In a more peaceful direction we have the miner's boot with its steel toe-case, and the British Boot, Shoe and Allied Trades Research Association has spent considerable time in developing 'occupational footwear' for different trades, an idea suggested by James Dowie in 1861 in his *The Foot and its Covering*. It is curious, however, that the shoe trade has never yet produced a shoe specially designed for its own workers, the majority of whom are standing all day at the bench or the machine. Most of these workers keep an old pair at the factory with pieces cut out here and there to give them the maximum comfort and freedom to control the machine pedals and it would seem that the shoe designer might begin by setting his own house in order.

2
SHOE MATERIALS

THERE CAN BE FEW solid materials in the world which at some time or other have not been used for shoes— leather, cloth, wood, brass, glass and grass. The two controlling factors have always been and always will be, availability and suitability.

The wooden clogs of Western Europe, the Middle East, India and Japan, the straw slippers and sandals of Korea, Egypt and Finland, the delicate fabric shoes of China and the universal leather foot-covering have all been made where the particular material happens to be available and suitable for local conditions. One may compare them with the stone houses of the limestone districts, the wooden structures of the timber covered Scandinavian countries, the grass and mud huts of the jungles or the granite buildings of Aberdeen. Only with improved transport does an otherwise local material become universal and even then its use may be restricted by unsuitability for changed conditions.

From time immemorial, leather has been the pre-eminent shoe material and it is essential that a shoe designer should understand why it has achieved and maintained this position by virtue of its unique physical properties if he (or she) is to produce a design suitable for the intended purpose and at the same time practicable from the manufacturing standpoint. This does not imply that the shoe designer *must* choose leather, but it is true to say that any other material which has proved to be suitable for shoes invariably has one or more of the properties of leather as detailed below.

There has been much speculation as to how and when leather, or, rather, rawhide, first came to be used but there seems to be little doubt that the real reason was availability followed by suitability. Some primitive man found that the hide of the animal he had killed in self-defence or for food, although in itself unsuitable for eating, proved to be an excellent protective covering for his home, his bed, his body and his feet. He learned to soften it with oils and fats from the animal itself, a primitive method of tanning (or more correctly 'dressing') which still survives for wash-leathers. Later, either by accident or by design in early attempts at dyeing, he found that infusions of vegetable materials such as oak-bark, chestnut, sumach and many others would convert the raw hide into a non-putrefying substance—leather. This 'vegetable tanning' process with many improvements and refinements is still the method by which the bulk of our sole and insole leather is made.

Within the last hundred years, the chemist, without reference to primitive man or traditional methods, has given us 'chrome tanned' leather, now universally used for shoe uppers.

Our predecessors, right down to recent years, probably never tried to analyse the reasons why leather was so suitable for shoemaking and foot comfort—they knew that it was and took it for granted. Today we are beginning to understand some of these reasons; we can describe and explain many of its economic and physical properties even if we cannot yet control them all. A description of these properties now follows and although it does not pretend to be complete it is hoped that the student may realise from it what are the desirable properties for any shoe material, quite apart from leather, always bearing in mind the primary function of suitability for purpose.

(1) **Availability**

As long as meat is eaten, hides and skins (see p. 108)will be available. There appears to be no inhabited place in the world where animals cannot also live and, in many cases, be domesticated and bred. The commercial and economic aspects of hide supply are outside the scope of this book but obviously they may considerably influence a shoe designer at some particular time. Many examples of this were shown during the war periods, the shortage of leather for civilian purposes making it necessary for designers to try all sorts of materials instead—likely and unlikely. During the occupation period of the Second World War for example, Norway made a shoe with an upper of woven paper and fish-skin and a sole of birch-bark.

At the other end of the scale, a designer working in the very high-class trade can afford to specify materials such as crocodile, antelope, gold kid and so on which would be quite impossible in the lower price ranges.

(2) **Area**

A point not often stressed in discussing leather and its virtues is that it can have the largest area of any natural flexible material. Large cattle hides as used for the upholstery trade average about 58 sq. ft. in area but have been known to reach 120 sq. ft.; only such man-made materials as woven, knitted or felted fabrics, or milled paper-board, rubber and plastic can equal or exceed this.

This area has very important practical aspects in the actual cutting economy which are dealt with in some detail in Part III (p. 134). There is, however, a very important difference between a large area of leather and a similar area of fabricated sheet. The latter is approximately constant in its properties all over and also does not differ materially from another sheet of the same batch. On the other hand, leather varies considerably from hide to hide and from point to point in the hide (see p. 122). These variations are generally a hindrance to mass production methods but as far as foot comfort and wear are concerned they may be made to coincide with the different requirements of the various sections of the shoe. Part of the art of shoemaking is the correct matching of these variables with the demands of the foot in action.

(3) **Elasticity and Plasticity**

These are two properties often discussed loosely under the heading of stretch, give or flexibility; they have, however, precise meanings and a thorough understanding of them is extremely valuable in shoe designing and manufacture.

An *elastic* material is one which after distortion (stretch, compression, twist or shear) and release will completely recover its original shape.

A *plastic* material is one which after distortion and release will retain the new shape produced by the distortion.

Good examples of the first are rubber and steel; of the second, putty, dough and, at some stage other than the final one in their manufacture, the ever-growing family of synthetic 'plastics'.

As will be described in the section on 'Making' (p. 255), almost all the methods of shoe manufacture involve moulding a flat material to the curved surface of a last. If this moulding is to be permanent, even after the last is removed, then the material must be plastic. On the other hand when a shoe is being worn it is continually being flexed, but is expected to recover its original shape when it is removed from the foot. Since all bending of any material entails the stretching of the layers on the outside of the bend and the compression of those on the inside, the shoe material must, therefore, be elastic, otherwise the shoe will rapidly lose its shape.

We are thus faced with the problem of finding a material which is plastic during part of its processing and then becomes, or remains, mainly elastic. The answer is leather, but there are also other materials possessing this dual property to a lesser extent, fabric for example.

During the lasting process (see p. 256) the 'stretch' is taken out of the leather, in other words, the laster makes use of the plasticity of leather to mould it to the curves of the last by stretching it, twisting it, compressing it and possibly by subjecting it to heat and moisture. The elasticity of the leather ensures a tight fit of the upper on the last during manufacture and subsequent shape retention in wear. The plasticity, however, is not entirely removed so that in wear the shoe gradually adjusts itself to the shape of the foot and either increases in comfort or finally becomes comfortable thus carrying out the shop assistant's promise that it will 'give'. (The effect of this 'breaking-in' process on the foot itself is often painfully obvious on bathing beaches!)

The properties of elasticity and plasticity are important not only for shoe upper materials but also for soles and insoles. These are normally made from vegetable tanned leather which becomes soft and plastic when wetted (see p. 235). In this state, soles and insoles can be moulded to the bottom of the shoe or last but on drying out they resume their normal elasticity and so help the whole shoe to retain its shape in wear. For heels, many people prefer an elastic material such as rubber which helps to soften the blow of putting the foot to the ground in walking on a hard surface and also makes less noise as a result of this cushioning. Rubber and synthetic soles have a similar effect but they also possess disadvantages which are dealt with below.

(4) Strength and Stretch

Present methods of shoe manufacture, other than for rubber footwear and some strip sandals and slippers, require the upper material to be subjected to considerable tension in order to achieve the moulding described in (3) above. The material must therefore stretch adequately before the breaking point is reached if it is to be properly lasted. This emphasises a point not always appreciated—namely, that stretch is frequently more important than strength. No upper material at present in use is as strong as the machines used to process it but if it has adequate stretch it will yield without breaking. Similar considerations also apply to the threads used for making the upper seams.

Leather can have both a very high tensile strength and adequate stretch before it breaks depending upon the type of hide or skin it came from, its method of tanning and finishing and its thickness ('substance').

It is obvious that the designer should know whether his chosen material will stand up to manufacturing processes with or without reinforcement; in the former case he may be able to incorporate such reinforcement in the design itself.

Another factor to which less attention is paid than should be is how the shoe stands up to tension and stretch in wear, particularly at the seams. The very act of putting on the shoe forms a severe test for certain parts of it, for example the back-seam, and unless the designer realises this and similar facts, the inevitable result will be burst seams or material. Again, it is only by a study of shoes which have been worn and returned with complaints that the designer can realise why his choice of material and method of using it in his design is at fault.

(5) Flexibility

This property is somewhat akin to elasticity and plasticity; it means the ease with which the material may be bent. This depends not only on the nature of the material but also on its thickness and is an important property of both upper and bottom materials. Leather varies considerably from the highly flexible kidskins used for delicate shoe uppers to the stiff heavy cattle hides required for army boot soles, and the actual tanning itself can be adjusted to vary the property within limits. Whether or not the upper of the shoe needs to be flexible, however, depends upon the ultimate purpose of the shoe, the thickness of the sole and the method of walking.

If the shod foot is to bend naturally in walking as it would do if bare then either both the upper and the sole must be flexible, or else the upper must be so reduced in quantity that the rear part of the foot can leave the sole entirely as is the practice for many Eastern sandals and ‘mules’; this also occurs with modern open-back (or ‘sling-back’) women’s shoes. In the latter cases, the sole may be quite inflexible, especially if it takes the form of a thick ‘platform’.

On the other hand, boots designed for the greatest amount of walking, such as the army boot, are very inflexible, this being due both to the very stout soles (this includes here all the bottoming components) and the correspondingly heavy uppers. Walking in them is accomplished by a rolling action from heel to toe, the bottom of the boot being deliberately curved upwards at the toe end (increased ‘toe spring’, see p. 61) for this purpose. The reduction of the actual flexing of the foot itself causes less fatigue in excessive walking.

Wooden shoes which cover the greater part of the foot, such as the ‘sabots’ of France, the ‘klompen’ of the Netherlands and the ‘traesko’ of Denmark are completely inflexible but they are walked in comfortably by many of the inhabitants of these countries partly because of the bottom curvature and partly because the foot can easily lift out at the heel as with the sandals mentioned above. This heel lifting is not possible, however, with Lancashire clogs and some of the wooden-soled boots and shoes produced during the Second World War; here, walking has to be accomplished by the heel-toe rolling action, assisted by the pronounced ‘toe spring’ and sometimes by a similar but less pronounced curving of the heel bottom.

There is no point in putting a very flexible upper on an inflexible sole unless the upper extends above the ankle joint, in which case, of course, it must be able to bend with the ankle in walking, and also permit entry of the foot. Also, an inflexible upper will prevent a flexible sole from bending; the balance, therefore, between upper and bottom flexibility should always be borne in mind by the designer.

(6) **Permeability**

The ability of a shoe material to pass air, water and water-vapour is one of the most important factors contributory to foot comfort. The shoe designer has here a constant problem which the majority of other designers do not have to face; the article he is designing has its interior in intimate contact with a mobile, warm and perspiring part of the human body while its exterior may be subjected to heat, cold, rain, wet grass, snow or very dry air. At the same time it may be carrying the whole weight of the body, frequently for long periods.

Ability to perspire and the subsequent removal of the perspiration by evaporation or absorption is essential to body comfort. The foot is usually much more tightly enclosed than are other parts of the body and so special steps must be taken to assist this essential waste-elimination process. If the perspiration is not to be trapped, as it is in a rubber boot, it must be allowed to penetrate the shoe materials and subsequently to evaporate into the air, such evaporation taking place either when the shoe is removed, or directly through the material, or both.

Leather is permeable both to water and water-vapour, the former being a particularly important property of vegetable tanned insole leather, the latter of chrome tanned upper leather. The desirability of an absorbent insole is well known and in recent years, absorbent 'socks' (loose insoles) of synthetic materials have appeared which can be removed from the shoe, washed and replaced.

The phrase leather breathes' has long been a common one when extolling the virtues of leather. It is, however, rather misleading as it suggests that the leather has some internal mechanism which enables it to inhale and exhale air like lungs; all that is meant is that it will permit air to pass through it when there is a difference of pressure between the opposite sides to cause such a flow.

Recent research has tended to show that this property of passing air, or air permeability, is not as important as formerly believed and certainly not as important as the ability to pass water-vapour, or water-vapour permeability, an essential property if perspiration is to escape. Rubber and synthetic plastic materials, such as polyvinyl chloride (P.V.C.) sheet, are normally quite impermeable to air, water and water-vapour. This reduces their suitability for shoe uppers which cover a large part of the foot, such as an ordinary man's shoe upper, particularly when the shoe may be worn for long periods without rest. The perspiration cannot escape and the foot becomes either hot or cold, clammy and most uncomfortable.

Although, as stated above, leather is free from these disadvantages, this freedom can be destroyed either by covering the surface with an impermeable layer such as the enamel of a patent leather or a synthetic plastic finish, or by sealing the under side with an impermeable adhesive fabric 'backer' (for added strength and support), such a backer being coated with gutta percha and wax and commonly used on suede leathers. Patent shoes and suede shoes frequently make the foot uncomfortably hot because of this imposed impermeability.

If impermeable materials are to be used, however, and with leather supplies uncertain and the number of plastics increasing, they certainly will be used more and more, then the designer should aim at open-work types of shoes and sandals, or shoes with ventilated uppers, where so much of the foot is exposed to the air that the intimate contact of the upper with the foot in a few places does not seriously affect foot comfort.

The permeability of shoe materials to liquid water is also very important. As mentioned above, insoles require to be water- (and, therefore, perspiration-) absorbent; on the other hand, soles and uppers should be waterproof, or, at least, water-resisting. Again, leather seems to provide the best answer, bearing in mind other factors. It can be made waterproof (by waxes) for soles, and water-absorbent for insoles; upper leather can be made water-repellent on its surface but at the same time permeable to air and water-vapour in a manner similar to tent canvas.

Lastly, there is one effect which, although easier to measure in the laboratory than in wear, may help to make the foot more comfortable. On a hot day when the foot perspiration escapes by evaporation from the surface of the upper leather, the leather is actually cooled down in the process; the effect is similar to that of cooling milk or butter by covering them with a damp earthenware cover. On a damp winter day, however, the reverse effect may take place; the leather, absorbing moisture from the air, becomes slightly warmer and so helps to prevent loss of foot heat (see (7) below).

(7) **Thermal Conductivity**

The ease with which a shoe material transmits heat is yet another important factor in foot comfort. Heat will only travel from a substance at a higher temperature to one at a lower temperature and so it depends on the temperature of the air or floor in contact with the shoe as compared with the foot temperature whether heat will escape from the foot or pass into it from outside.

Rubber has a higher thermal conductivity than leather and so in winter conditions the heat can escape from the foot through a rubber boot or a rubber sole more easily than it can do through leather of the same thickness; consequently the foot feels cold. Similarly, in the summer, when outside temperatures may be hotter than the foot temperature, heat may get into the shoe from outside more easily if it is encased in rubber rather than leather, and so the foot may become uncomfortably hot. The personal element, however, cannot be ignored, as some people can wear rubber soles continually, apparently without discomfort.

In designing shoes for hot or cold conditions, therefore, the designer must consider both the nature of the material and the extent to which the foot is to be covered by it. The sandal, which has been worn from time immemorial (see p. 20), is the answer to hot desert conditions where the foot requires as little covering as possible but still wants protection from the heat and roughness of the ground.

For cold conditions, the designer invariably turns to the natural heat insulation of animals—fur, hair and wool. All these, and many other fibrous cellular materials such as leather itself, enclose immobile air between the fibres, and air which cannot move (and so produce convection currents) is one of the best, and certainly the most widespread, forms of heat insulation. (Witness the bird puffing up its feathers at night or the straw wrapped round the parish pump in winter.)

Thus we have sheepskin linings for boots and wool felt for house slippers. Incidentally the first provides us with another example of the principle of availability and suitability. The flood of shearling-lined bootees for women since the end of the second world war has been partly due to the availability of sheepskins formerly required for flying boots.

(8) **Abrasion Resistance**

As the parents of schoolboys (and schoolgirls) know to their (literal) cost, the ability of shoe materials, both upper and bottom, to withstand abrasion is one of their most important desirable properties. Leather does not show up as well here as do rubber, both crepe and vulcanised, and the more recently introduced plastic soling materials known as the resin-rubbers.

The abrasive wear of shoe soles is the first cause of their wanting repairing and for years this wear has been countered by the thrifty by such devices as metal studs or 'stuck-on' rubber half-soles. The similar wear which occurs on uppers, however, although very common, seems to be taken for granted, both by the designer and the wearer, and far more attention should be paid to it than hitherto. There are at present available, for example, several well-known brands of children's shoes, the shape and fit of which (when properly ascertained in the shop) are based on a great amount of research and the measurement of literally thousands of feet. Yet the first time one of these shoes is worn by a normal healthy child the grain is 'scuffed' from the toe-cap because he has kicked a ball or crawled on the ground.

The increasing use of resin-rubber soles is helping to solve the sole-wear problem and it would seem that the replacement of leather by a plastic in the more vulnerable parts of the upper would also be desirable. During the second world war, boys' boots with P.V.C. caps were produced experimentally and after four months wear, these caps were still almost free from scratches. It should not be impossible to produce a child's shoe which lasts without repair or undue signs of wear for the same length of time as its particular size is required by the child; no longer, in the interests of correct fitting, and no less, for the sake of economy.

An alternative method open to the designer who wishes to counter abrasion of the upper is to hide the scratches instead of preventing their being made. This can be accomplished by choosing a material which already has a rough or teazed surface, such as a reversed leather, or coarse suede. It is said that 'thornproof uppers were first introduced by a manufacturer who had a considerable quantity of leather on hand with a very poor and damaged grain surface—he simply reversed it!

(9) **Surface Characteristics**

These include *colour*, *smoothness*, and *pattern*. Leather can be made in any colour, it can be highly polished or given a suede nap surface, it can have an unlimited variety of natural patterns typical of the animal, bird, fish or reptile from which it came, or artificial ones, either in imitation of the natural, or original creations of the designer. It is possibly a tribute to the universal appeal of leather but a negation of good design that rubber and synthetic upper, bag and upholstery materials are frequently made to resemble leather as closely as possible. New materials should be used by the designer to exploit to the full their own individual characteristics.

(10) **Ease of Working**

As already mentioned all methods of making shoes, other than certain types of sandal, slippers and rubber footwear, involve the conforming of a flat material to the curved surface of the last. In addition the upper has to be joined on to the bottom (except for simple moccasins, see p. 22). It is necessary, therefore, that the material should be capable of being easily cut and rejoined in a different position or to a different material by a thread seam, thong, metallic attachment, cement or weld.

With the exception at present of welding, leather can be joined to itself or to other materials by any of these methods. On the other hand, some of the new. synthetics present difficulties such as failure to hold stitches or adhesives of the normal type. Here the designer is faced with the problem that most shoe factories are laid out to deal with shoes made from traditional materials by traditional methods and that he cannot possibly, for economic reasons, ignore this fact. The special methods of handling required by the new materials may require special equipment and until such equipment is available he cannot have full scope in the use of these materials.

Here then is a very close link between materials and methods of construction; this will be dealt with in the next chapter but it is immediately obvious that the designer must be fully aware of this link.

(11) **Maintenance**

The attitude of a person towards the maintenance and repair of any possession which may deteriorate through wear and tear depends upon a number of factors. These include nationality, personal pride, financial position, thrift and immediate necessity. The Englishman, for example, expects that a cheap alarm clock should last indefinitely without maintenance, keep time accurately and, if the worst comes to the worst, be repairable; on the other hand the American view is that when the clock stops through sheer wear it should be thrown away and a new one bought.

A similar state of affairs applies to shoes—the Englishman (and Englishwoman) expects shoes to be easily maintained and several times repairable. Anyone who has been ‘behind the scenes’ in a shoe repair shop or factory must have been amazed at some of the aged remnants of shoes which the customer expects the repairer to restore to something like their original form and appearance. The operation may involve new soles, heels, linings and other parts and the eventual cost will not be far short of the price of a new pair; the repaired shoes will still contain, however, parts which have not been replaced but which are nearing the end of their useful life. Unless new shoes are quite unobtainable it would seem that the whole business of 'rebuilding' shoes is a waste of materials and man-power.

Leather, unfortunately perhaps from some aspects, lends itself to repair better than most other shoe materials, its fibrous structure enabling it to go on receiving new stitches and tacks long after its original appearance and suitability for purpose have gone.

The method of shoe construction also has a vital bearing on ease of repair, some methods lending themselves to repair much more than others. This is dealt with in more detail in the next chapter but the designer should remember that although the repair of high-fashion special-occasion shoes may not be important, most people expect everyday general purpose shoes to be repaired at hast once or even several times.

The ease of maintenance of a shoe for the immediate purpose of appearance and the eventual effect of longer life is of considerable importance and not always appreciated by shoe stylists. Leather has to be maintained if it is to retain several of the desirable properties already listed above, and if the shoe is given proper daily attention with rest periods some of these properties will actually be improved. Good quality wax polish, for example, will increase the shoes' water resistance, flexibility and life; they will also gradually acquire the prized 'antique' appearance which only leather has (and which today is sometimes deliberately applied to new shoes in the factory).

On the other hand, synthetics such as P.V.C. and rubber require only washing to remove dirt and as they are self-coloured and extremely resistant to abrasion, their original appearance remains indefinitley.

Suede-finished leathers and fabrics are the most difficult to maintain and therefore far less adaptable to varying conditions of wear.

Upper designs specifying two colours of leather are currently popular and yet shoes of this type are among the most awkward to keep clean, particularly when one of the leathers used is white suede and the other a polished dark leather. Uppers with perforated overlays are similarly difficult to clean as the perforations become filled with dirt and polish. White or yellow sole stitching showing round the edge of the shoe (or on the upper itself) is only effective during the early life of the shoe; dirt, and attempts to remove it, eventually effectively camouflage the thread.

(12) **Slippiness**

The importance of non-slip soles is something we frequently overlook until we overbalance. With the one exception of the soles of shoes for ballroom dancing, soling materials are required to be non-slippy. If we were only concerned with one type of ground surface the problem would be comparatively easy to solve but unfortunately we are not; wearing conditions today include concrete and stone pavements, asphalt, metal platforms and steps, wooden floors, linoleum and other surfaces, and these may in many cases be dry, wet, or, worst of all, wet and muddy. Such floors and their condition may be beyond our control but there is one type which we can abolish—the abominable polished floor, whether it be wood, tile or linoleum. No shoe designer can cope with or cater for the fetish of house-pride running contrary to common sense and safety.

The property of slippiness, or ‘coefficient of friction’ is assessable in the laboratory and new synthetic materials are subjected to a routine test by the British Boot, Shoe and Allied Trades Research Association to measure this property under wet and dry conditions on different surfaces.

Leather gives a reasonable grip on most surfaces and is probably least effective on dry grass. On wet surfaces, a certain suction effect is apparent, giving added grip; this effect may be nullified by the presence of mud, the particles of dirt then acting rather like ball-bearings. For dancing shoes, the polished wood floor (plus a dry lubricant such as French chalk) and smooth leather make an ideal slipping combination.

The grip of leather on soft wet surfaces can be considerably increased by the use of studs (leather or metal) or spikes, and sports shoes, such as those for football, cricket or running, incorporate these devices.

Patterned rubber and synthetic soles again give a good grip on most surfaces, especially when dry but smooth soles of the same materials approximate to leather. Crepe has the highest coefficient of friction on dry concrete or wood; when wet it may slide suddenly.

The heel is probably more important than the sole in considering slippiness as there is such a small area of heel material in contact with the ground (and none of the sole) when the weight of the body is transferred to the forward leg in walking. In this respect there is no doubt that under dry conditions at any rate, a rubber top-piece on the heel is considerably safer than a leather one, particularly if the latter is metal studded.

(13) **Chemical Constitution and Reaction with the Foot**

The long-term effect of the shoe materials on the foot and of the foot on the shoe materials can only be assessed by prolonged testing and customers’ complaints—the object of the former being to prevent the latter. The human factor is so variable however, that it is impossible to cater for every contingency.

One of the main causes of material failure is the foot perspiration. This varies so much in composition and quantity from one person to another that it is extremely difficult to cope with it completely. In one case the perspiration may have no ill-effect on the shoe whereas in another the thread seams will rot and the leather discolour and crack in a few months.

The reverse effect, that of the materials on the foot is usually less pronounced, the materials in common use being normally harmless. Cases of dermatitis are occasionally reported but here again the personal allergy is the usual reason.

Nevertheless, in specifying new materials, the interaction with the foot cannot be ignored and they should certainly be tested for this.

It may be thought that in the above account of desirable properties for shoe materials undue stress has been placed on the virtues of leather. It is probably true to say that if just one or two of these properties were required then it would not be difficult to find a material better than leather. For example, steel is stronger and more perfectly elastic, rubber is more resilient and water-resistant, a sponge is more absorbent, and so on. The virtue of leather is that it possesses so many more useful properties than does any other material yet discovered, these properties being due to its unique fibrous structure which it is impossible to reproduce artificially.

It has achieved and maintained its pre-eminent position through the centuries on sheer merit, and modern research has confirmed and explained what the craftsman and his customers have discovered by trial and error during these years.

3

METHODS OF SHOE CONSTRUCTION

THE SANDAL

THE TWO BASIC TYPES of footwear—the sandal and the moccasin—in their simplest forms require little constructional skill. The sandal, which is merely a protection for the sole of the foot, is a flat piece of rawhide, leather, wood, metal, plaited straw, or other material, cut or formed to the shape of the foot sole. This sandal sole has then to be held on to the foot in some way, and the various methods which have been adopted in various parts of the world at different times still appear in modern shoe designs for the very sound reason that all the possible methods appear to have been discovered, and therefore, new designs must incorporate them.

In Figure I all the known devices are shown and they will now be described.

(1) **Toe-peg**

A turned or carved wooden peg with a knob on top and fixed to the sole is held between the great and second toe. The specimen shown in Figure 1*a*, which has a wooden sole, came from India recently and the type is still commonly used in the East. The peg has also appeared on sandals produced in this country in recent years.

(2) **Toe-band**

A band of leather, fabric, rubber or other material, usually broad, is fixed over the forepart of the sole and the toes inserted under it. The specimen shown in Figure 1*b* has a piece of tyre inner tube nailed to a wooden sole and came from Sarawak about 1938.

A variation of this method found in many sandals in conjunction with other straps further back is a single loop over the big toe.

(3) **V-strap**

In some ways this is a cross between (1) and (2), the point of the V passing between the toes to the sole while the ends of the two arms are fixed to the sole on either side of the foot. The type is very common in Japan, which is the source of the specimen shown in Figure 1*c*, but flat rawhide sandals with a similar fastening are found in many parts of the world.

An interesting variation of the method is shown on the foot of a Roman statue of the second century, exhibited in the Victoria and Albert Museum; here the V is reversed, the point or junction of the two arms being at an ankle-strap while the arms themselves diverge forwards and join the sole on either side of the toes.

(4) **Instep-band**

This is similar to the toe-band but further back on the foot (Figure 1*d*). There is usually in addition a toe-loop or a strap passing forward from the instep-band to a point on the sole between the toes to anchor the forepart of the foot. A common variation of the method is to include also a strap passing round the back of the heel, this type having been found in Egyptian tombs and on wall paintings. These specimens and paintings show that in some cases, 'ears' were left on the sides of the soles in cutting so that, when subsequently turned up by the sides of the foot, a thong could join them together over the instep; here we have the prototype of the latchet shoe of later centuries (see p. 52).

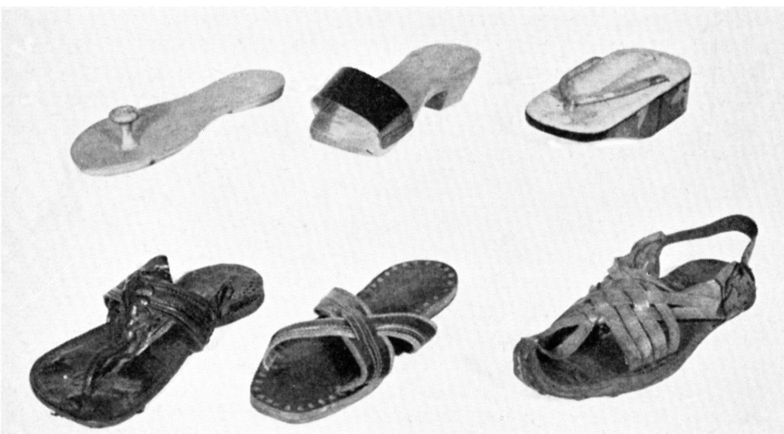


Figure 1. Sandal fastenings: *Top row—a* toe-peg; *b* toe-band; *c* V-strap; *Bottom row—d* instep-band; *e* crossed bands; *f* multi-strap (Author's collection).

(5) **Crossed Bands**

Two bands cross over each other and the toes from either side of the toe end of the sole to the opposite sides further back (Figure 1*e*). The well-known, and much copied, Indian 'chupplie' is a version of this method, as also are many modern interlaced sandals.

(6) **Multi-strap**

The number of straps or bands passing over the foot from one side of the sandal sole to the other may be increased in number (Figure 1*f*); they may be widened, interlaced, taken round the ankle and up the leg to give an infinite variety of patterns and increasing coverage of the foot until eventually a complete upper is produced and the footwear can no longer be termed a sandal. It may also become necessary to have some sort of fastening (see p. 50) which may be undone to allow the sandal to be put on or taken off.

Attachment of Straps to Sole

There is a variety of methods by which the straps or bands may be fastened to the sandal-sole depending to some extent upon the material from which this sole is made. For a wooden sole, as shown in Figure 1*b*, nails are adequate and universally used, the straps being attached to the edges of the sole. With leather and plaited or woven materials, the ends of the straps are frequently enclosed between the sole and an insole placed on top, the two being fixed together by stitching, thonging, nailing or sticking; the straps themselves may pass over the edge of the insole or pass through slots near the edge of it. Another variation is to stitch, thong or nail the ends of the straps directly on to the sole surface.

A variant which was very popular in the 1930's was the so-called 'Sahara' sandal which had a moulded leather sole with an upturned margin perforated to take the straps of the plaited upper. This same type of moulded sole is also found in Cyprus but in this case a complete upper is seamed on to it.

THE MOCCASIN

As previously described (p. 5) the moccasin is essentially a bag of leather or other material wrapped round the foot in order to protect it from the weather, thorns, etc. It must be emphasised that the basic type has no separate sole, the leather on which the foot rests being drawn up and over the foot. Having drawn it up in this manner the problem of closing it up and fastening it arises as it is the widest outer portion of an originally roughly oval and flat piece of material which now has to be reduced in area down the front of the foot and the back of the heel in order to complete the closure and fit the foot.

The three methods of accomplishing this are (1) to cut the material away and make a seam, (2) to gather it up in folds, and (3) to combine (1) and (2). An example of method (1) is shown in Figure 2*a*, this specimen having a thong running through holes to gather up the leather. Method (2) is shown in Figure 2*b*, where the material, in this case raw goatskin, has been thoroughly wetted, drawn over a wooden last and moulded to it, cut down the centre of the instep nearly to the toe and also down the back of the heel and then seamed with a thong of the same material at both these places. The plastic nature of the wet raw skin has enabled all the wrinkles and fold to be removed and the shape of the last to be assumed and retained.

This process of stretching and removing wrinkles is the basis of lasting', a fundamental process in most methods of modern shoe manufacture. It is dealt with in detail in Chapter 18 in Part VI of this book and the admirable way in which leather lends itself to the process has already been described on p. 10.

The specimens illustrated in Figure 2 are all demonstration models made by the author but moccasins of this type appear to have been used by primitive man and still are in some remote places according to some writers. In Iceland today sheepskin slippers of a very similar type are made and before being worn for the first time are soaked in water to soften them so that the foot lasts' them to its own shape (see Figure 2*c*).

The North-American moccasin, which gives its name to the family, combines methods (1) and (2) by having wrinkles round the toe where the skin is drawn over but then the bigger folds are cut away and an 'apron' is overlaid and stitched in position as shown in Figure 2*d* (a decorative apron, shown in Figure 1*e*, overlays the first apron).

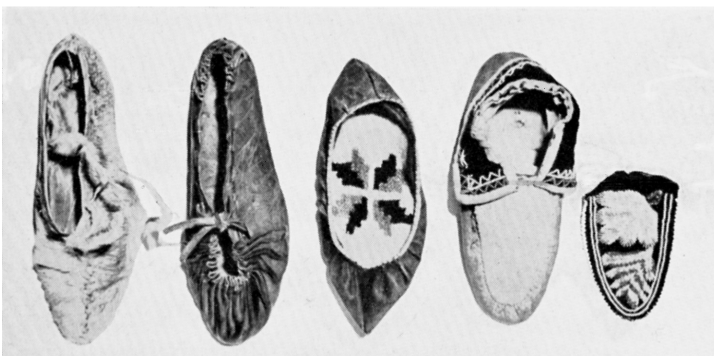


Figure 2. Types of moccasin: *left to right*; *a* cut and thonged; *b* pleated; *c* cut and sewn; *d* apron front; *e* apron from *d* (Author's collection)

Modern bedroom slippers are often made on the same principle (see p. 523) but with the addition of an extra sole; the folds round the toe form one of the distinctive and attractive 'design' features of this type of slipper. Infants' boots and shoes sometimes follow a similar pattern, particularly in U.S.A.

It is also possible by expert lasting to remove the wrinkles completely round the toe even when the leather is very much heavier than that used for slippers and infants' shoes, and this method is occasionally used for apron-fronted men's (see Figure 8) and women's sports shoes; an extra sole is, of course, added in such cases, but even then the resulting shoes are extremely flexible when compared with those made by more orthodox methods.

The lasting process for a moccasin is only necessary where the chosen material, such as rawhide or leather, is flat in the first place and has to be made to conform to the curves of the last or foot. With some other materials, however, the effect can be achieved in other ways. For example, the wooden shoes of Western Europe (see p. 12) are nothing more nor less than wooden moccasins carved into the required shape from the solid block; similarly, the straw slippers from Russia, Korea, and China shown in Figure 3*a*, *b*, and *c* have been woven into their moccasin form by the same technique as that used in basket making.

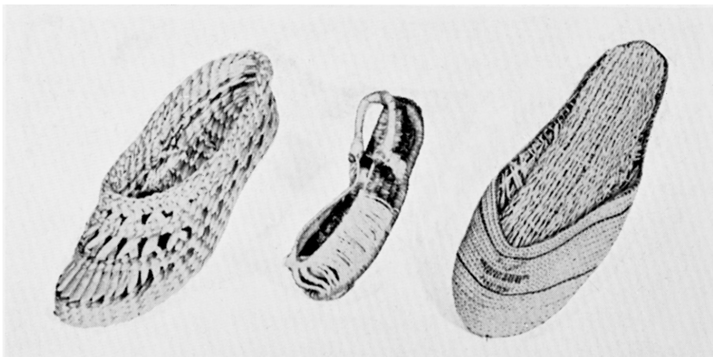


Figure 3. Woven straw slippers: *Left to right—a* Russia: *b* Korea: *c* China (Author's collection).

Wool, too, can be either knitted or felted into the foot shape, the former method being commonly adopted for domestic slipper making while the latter reaches its peak of perfection in the Russian 'valenki' boot, a complete foot and leg covering of compressed wool felt designed especially for use on dry snow. Many such boots were made in Lancashire during the second world war and a somewhat similar type is used in Canada as a lining for rubber Wellington boots.

THE SHOE

It has been suggested earlier in this section that in hot climates the foot requires a sandal and in cold climates a moccasin. Climate, however, not only varies from one part of the world to another—it also changes within a country particularly where the country has considerable variations in heights above sea level. Thus in mountainous regions, the moccasin is found while nearer the sea the sandal may predominate. The inevitable mixing of the people, both nationally and internationally, results in a mixing of footwear types and so many countries can show a complete range starting from the sandal and passing through transitional types with an increasing number of straps over the foot until a completely closed upper is reached and we have a shoe. Or, starting from the other end, the moccasin, with increasing care and craftsmanship in the preparation and construction of the 'foot bag' and the addition of an extra sole, produces the same result.

The shoe, then, appears to be the logical outcome of the marrying of the sandal and the moccasin. It is possible that the shoe of Western Europe is the result of the mingling of the sandal worn by the conquering Roman legions and the crude moccasins of the tribes they fought.

The union of sandal sole and moccasin upper, or, in modern trade terms, the attaching of the bottom to the upper of a shoe is another fundamental process of shoemaking as it has been known for hundreds of years and the whole of Part VI of this book is devoted entirely to it. In this present section, however, it is intended only to indicate the general principles involved and to summarise the modern methods so that the would-be designer will be aware of the problems which arise.

The Seam

The seam, by which one piece of material can be joined to another is probably one of the most important discoveries of mankind ranking with the wheel and the lever. In shoemaking it is not only required to join together the various parts of the upper but also to unite the upper and the bottom.

No doubt the earliest method was that already described in which a thong of the same material, or an animal ligament, was threaded through holes in the two sections. It must soon have been discovered that it was necessary to have some method of leading the thong or ligament through the holes and the answer was the needle, prehistoric bone ones having been found.

The next step was the discovery of spinning—the twisting together of animal hairs or vegetable fibres to form a thread very much finer than thongs or ligaments and capable of being made into any length. This enabled a far neater seam to be made than hitherto and it must also have been found out at an early date that an exceptionally strong and easily led thread could be built up by waxing and twisting together several strands of an otherwise light yarn and at the same time tapering each end and working in a pig's bristle to act as a needle. The method has survived to this day for handsewn work, the only innovation being the substitution of a nylon 'bristle' for the natural one (see p. 265). The introduction of steel needles and the nineteenth-century invention of the sewing machine did not alter the basic method of shoe construction— they just speeded up the process.

The increasing use of metals, however, following the Industrial Revolution, introduced a different type of seam—that employing metallic fastenings such as nails, rivets, screws and staples. Such methods lend themselves particularly well to power machinery and the necessity of supplying large quantities of heavy boots to the armies during the Napoleonic wars led to the invention of the riveting machine and the riveted boot which still survives (see p. 340).

Not very dissimilar to nailing and probably older is the use of wooden pegs to hold the bottom on—a method of especial value where water-resistance is required since the pegs swell in water, or where metal might cause dangerous sparks on hard ground in explosives factories.

The latest method of upper and bottom union is by sticking with an adhesive, usually a synthetic cement, and present trends seem to suggest that this will be the most important method of the future (see p. 348).

The Last

In order that a shoe may be made the required shape it is necessary to build it up gradually on a mould, this mould being called a last. Today, lasts are usually made of wood (maple) or, for the rubber boot trade, aluminium, but formerly iron was used as well as wood. It is not known when lasts came into use; the earliest picture of one known to the writer is dated 1688 but they must have been known centuries before then as there are references to them in literature before this date.

As mentioned on p. 23, some moccasins, after being wetted, are actually lasted on the foot itself and it is also on record that the South-American Indians used to dip their feet into rubber latex and deposit rubber boots on them; a method similar to the latter is now employed, but with aluminium lasts, for making Wellington boots.

The shape of the finished shoe is (or should be if it is correctly made) the shape of the last on which it has been built and therefore the designer must always have the last before him and should, in fact, have had a considerable hand in the design of the last itself. It cannot be emphasised too strongly that a design starts with a last and finishes on the foot; it is not correct designing to produce an upper and bottom pattern for an unsatisfactory last and to have no idea what happens to the final shoe in wear. The transfer or adaptation of a particular pattern from one last to another may completely upset the design but such a practice is very common.

The fashion aspects of last shape (and therefore shoe shape) are dealt with in the next chapter and will not be discussed further here; there are, however, a number of functional considerations of which the designer should be aware.

It is sometimes assumed by those interested in foot comfort but with no knowledge of shoemaking that the last should be the same shape as the foot but possibly a little larger. This is not so; it might be true if the shoe were intended as a foot covering only, like a bedsock, but since most shoes have to be walked in, quite apart from manufacturing considerations, deviations from foot shape have to be made at various places. There must, for example, be an extension at the toes to allow for a slight moving forward during walking; nothing is more uncomfortable than a shoe fitted too short in length. Also, if the shoe is too large, the movement of the foot inside will cause chafing and blisters, particularly at the heel where the foot tries to lift out in walking; a tight shoe may even be more comfortable as it is more likely to become an integral part of the foot and move with it.

In designing lasts for court shoes (see p. 75) which rely solely on their own fit in order to stop on the foot and have no form of fastening, the design of the last becomes of even greater importance as no latitude is permissible; the last is either right or wrong and errors in design (or, of course, foot fitting) cannot be overcome by tighter lacing or other fastening as is possible with ordinary walking shoes.

As will be seen in the next chapter, it is mainly the foreparts of lasts which alter with fashion; the rear portions, which also correspond to the least mobile part of the foot, need not vary and the modern factory practice is to standardise the back parts for any particular heel height (see p. 93).

Manufacturing requirements also cause differences between last and foot shape—simple examples of this are the sharp bottom edge of the last and the higher and narrower instep or 'cone'.

Lasts are dealt with in several places in this book and the reader is advised to refer to the index for further information concerning them; the use of them in shoemaking, however, introduces problems of a practical character which have influenced the methods of shoe construction and their development, and these will now be considered.

In Chapter 2 (p. 10) it was pointed out that the ideal shoe material should be plastic so that it would mould itself to the curved surface of the last. It is also true to say that the longer the material can be left in tight contact with the last the longer it is likely to retain the imposed shape after the last has been removed, in other words, in storage and wear.

This prolonged retention of the last within the shoe during the lasting operations, however, brings in a problem—the inside of the shoe (or, rather, the lasted upper) is inaccessible and so any form of sole and heel attaching has to be done from the outside only.

This is a straightforward enough matter when a metallic attachment is used; rivets, for example, can be driven through the sole, upper and insole and clenched on a metal plate covering the bottom of the last (see p. 32). Similarly, modern methods of adhesive attachment (see p. 348) with cellulose or other cements do not require the inside of the shoe to be accessible. Thread seams, however, can only be made when both the entrance and exit for the thread are accessible either to the hands or machine parts (note: it is not necessary to see both sides) and a description of the ways in which this difficulty has been met now follows.

Figures 4-15, with their captions, illustrate modern methods of shoe construction, all of which will be dealt with in detail in subsequent sections. It will be noted that some combine several methods so as to include the desirable features of each.

Thread Attachments

The simplest method of thread attachment of sole and upper is found in the VELDTSCHOEN (Dutch: field shoe) (Figure 14) where the edges of the upper are turned outwards away from the last on which the shoe is being made and then stitched on to the edge of the sole. The origin of the method is lost in antiquity, many of the mediaeval specimens in the various museum shoe collections being variations of it. It is still used for children's and adults' sandals (see p. 361).

An extension of the veldtschoen method is found in the TURNSHOE (Figure 13) where the upper is lasted inside out and stitched on to the sole, also reversed. The actual position of the seam appears to have been very variable; in some specimens the thread has passed through the upper and then the actual vertical edge of the sole and out through the exposed face; in others, as in the modern turnshoe, the upper has been brought over the edge of the reversed sole and sewn through a channel on the face of the sole.

After the sole and upper have been united, the last is withdrawn and the shoe turned inside out so that the seam is now inside; the last is then replaced to 're-last' the shoe (see pp. 368-72).

Both the veldtschoen and the turnshoe are examples of what is called a 'direct attachment'—the direct union of sole and upper without any intermediate sections or seams. The turnshoe, with its flat internal seam, has a very neat appearance and great flexibility and has long been popular as a high-grade construction where cost is of secondary consideration. It survives today in the slipper (see p. 503) and women's dress shoe trades but in the latter case it is being replaced by the cemented ('stuck-on') method of attachment (see p. 348).

During the seventeenth century the soft turnshoe types began to give way to the thick-soled heavy leather riding boots, at least, for men. The Civil War—the first since the disappearance of armour (other than breast-plates and helmets) now rendered ineffective by gunpowder—may have been the reason for this. Such boots could not be 'turned' and so the WELTED method was developed (the writer has found some evidence that it was used before this period).

Welting, the modern version of which is shown in Figure 4 and described in detail on pp. 289-324, is the most important method of construction at present in use. It is an extension of the tumshoe method but with several important differences. The upper is not reversed but is lasted in its final position and sewn on to an insole tacked on to the last instead of a reversed sole as in the tumshoe method. As before, the thread passes through the margin of the upper and a channel cut in the surface of (in this case) the insole and close to its edge; it also takes in, however, a long narrow strip of flexible leather, the 'welt, which eventually projects outwards from the upper (see Figure 4) not unlike the flange of a veldtschoen. In some cases, this welt may go completely round the shoe; in others it stops short at the heel on each side.

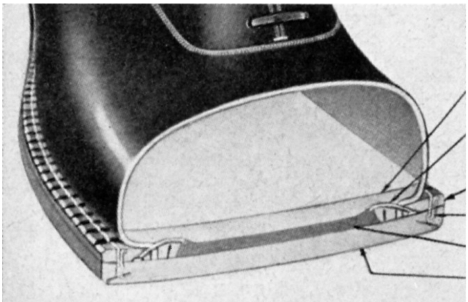


Figure 4. Welted. *Features:* The upper and insole are sewn to the welt, which in turn is stitched to the sole. No seam visible inside; a flexible method for men's and women's shoes. See pp. 289-324.

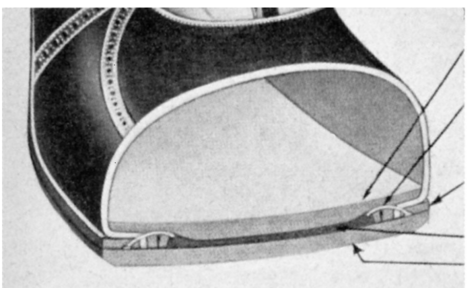


Figure 5. Silhouwelt. *Features:* Similar to welted but the outsole is stuck on to the welt which can be very much narrower and lighter. A flexible method for women;s shoes. See pp. 359-60.

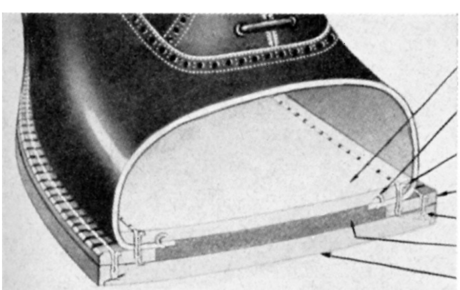


Figure 6. Lock-stitch through-sewn welt. *Features:* The welt and upper are joined to the insole by a vertical seam passing right through it. Sole stitched to welt as in welted method. Simpler and cheaper than the orthodox welted method but not so flexible and seam shows inside. See pp. 374-5

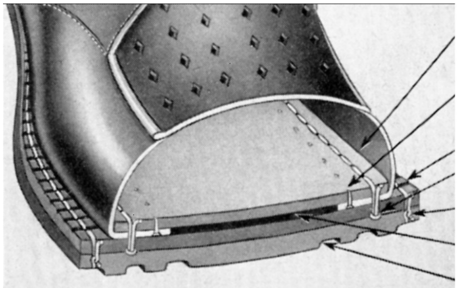


Figure 7. Fairstitched. *Features:* The insole, upper and middlesole are sewn together. The sole is then stitched to the projecting edge of the middlesole (the 'fairstitching'). See pp. 337-8.

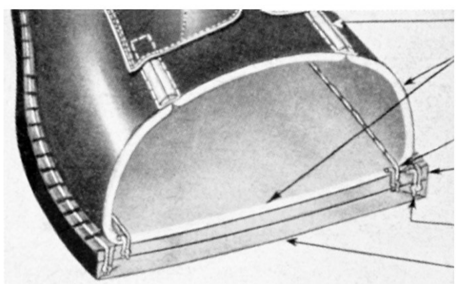


Figure 8. Moccasin. *Features:* The upper passes right under the foot. A middlesole is stitched on to the upper and the sole stitched on to the middlesole edge. A very flexible and waterproof construction for sport shoes. A variation of the method used for slippers. See pp. 523-34

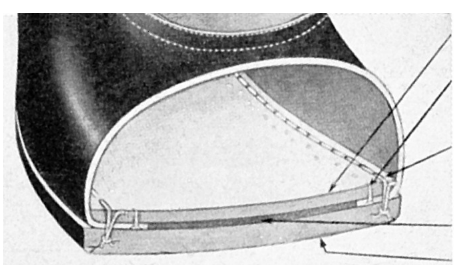


Figure 9. Machine-sewn (Blake or McKay). *Features:* Sole, upper and insole are united by a single chain-stitch seam. Used for medium grade women's shoes. Variations of the method include the use of 'Littleway' lasting staples (which do not show on the insole) and a lock-stitch in place of the chain-stitch, giving added flexibility. See pp. 325-39.

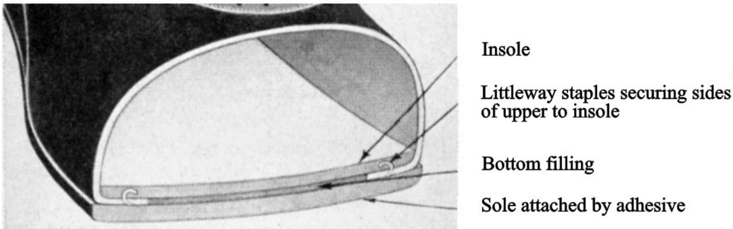


Figure 10. Cemented. *Features:* The upper is secured to the insole by 'Little-way' staples and then the sole is attached by cellulose or similar cement. A large proportion of women's shoes, children's shoes and some men's light-weight shoes are made cemented. See pp. 348-60. The method can be made to look heavier by extending the sole and stitching a 'rand' or false welt round the edge.

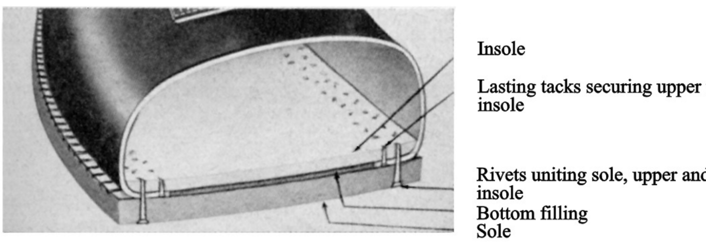


Figure 11. Riveted. *Features:* The sole is riveted through the upper on to the insole. Used for football boots and cheap boys' boots and shoes, being a rigid method of construction. See pp. 340-41

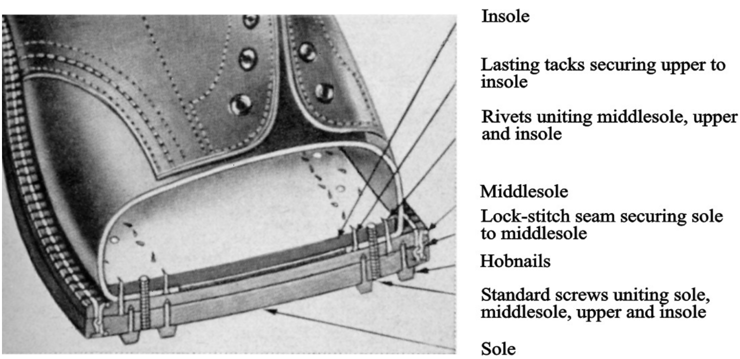


Figure 12. Riveted, screwed and stitched. *Features:* Uses three methods of attachment: (1) the middlesole is riveted through the upper to the insole as in previous method, (2) the sole is stitched to the projecting edge of the middlesole, (3) the sole, middlesole, upper and insole are united by screwing. The method can be varied by omitting one of the attachments. Widely used for army and other heavy-duty boots. See pp. 342-5.

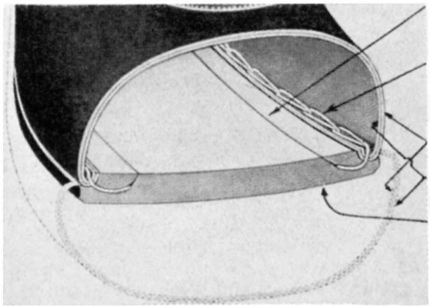


Figure 13. Turnshoe. *Features:* A single-sole shoe of exceptional flexibility and with only a very light sole edge showing. The upper and sole are sewn together and the shoe then 'turned'. Used for high-grade women's shoes, and slippers. See pp. 368-72

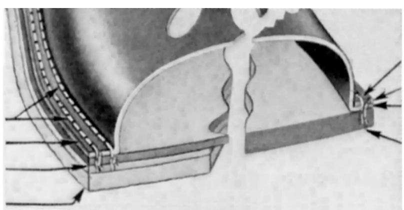


Figure 14. Veldtschoen. *Features:* the upper is turned outwards and stitched to the sole (as at 'A'). A variation is to stitch a crepe rubber middle (or a crepe-faced leather middle) on to the flange, and then to stick a crepe sole on to this (as at 'B'). See pp. 361-8.

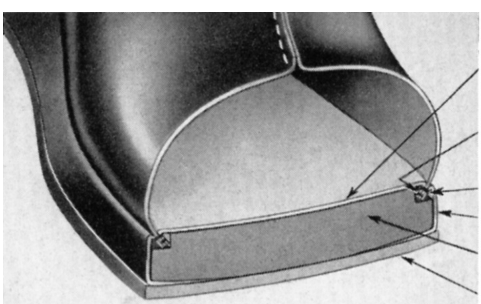


Figure 15. Slip-lasted (Californian or force-lasted). *Features:* The upper is stitched on to a sock lining and a platform cover. A last is forced into the upper to give it its shape, the platform (and wedge heel) are stuck in position and their edges covered. Finally, the sole is stuck on. A cheap method of construction for women's sandals, light fashion shoes and slippers. See pp. 496-502.

On to this welt, after it has been beaten out flat, the sole is stitched by a second, vertical seam. Since by this process the upper is not united directly to the sole but has an intermediate section, the welt, the method is called an '*indirect attachment*'. It must be emphasised that the last has remained in position inside the shoe during the operations described and there is eventually no seam showing inside.

Machine welt-sewing arrived at the end of the nineteenth century, the machine being originally invented for machine turnshoe sewing, but handsewn shoes survive for high-class bespoke work because of their flexibility, strength and comfort. An account of handsewing is given on pp. 260-69.

If the last is removed after lasting (on to an insole) then a direct thread attachment can be made, a single seam taking in sole, upper margin and insole. This method, which has the seam showing on the inside, is known as BLAKE, McKAY (after the inventors of the machine) or MACHINE-SEWN and is shown in Figure 9 and described on pp. 325-39. It is extensively used for women's and children's shoes.

The SLIP-LASTED or FORCE-LASTED construction (Figure 15) is of fairly recent origin but based on older methods. The upper is stitched on to a soft sock instead of a firm insole or sole. The last is then forced into it and a proper sole stuck on to the bottom. It is a cheap method of construction which lends itself to short-lived fashion shoes and summer sandals of light materials but has not sufficient strength in the seam for heavier duty footwear. A description of the method will be found on pp. 496-502.

4
FASHION

WE NOW COME TO the fourth leg of our stool of Design—the unstable, unpredictable leg of Fashion. A designer could produce a shoe which fulfilled the essential purpose of foot-covering, which used the material best suited for the intended purpose, and which used the best possible method having regard for both the purpose and the chosen material—and yet nobody would buy it because it was not fashionable!

When an object designed for sale has fulfilled the requirements of purpose, material and method, it must still satisfy one more condition—it must be acceptable to the public, or, rather, to the wholesale buyer, since the public does not know of the existence of it until it appears in the shop window or is nationally advertised on a large scale. To achieve this end and make a shoe acceptable, the shoe designer becomes a shoe stylist who has to take into account many influences such as general trends in costume as a whole, national characteristics and current events; above all, his product must be different from that of his competitors and yet preserve certain points of similarity. This last requirement is illustrated by such features as toe shape and heel shape; if pointed toes are 'in', then he may alter his upper style but must still have a pointed toe.

The fashion element or 'difference' is present even in the primitive sandals and moccasins already described. Whatever method and

Figure 16. Fashion development of the toe-peg sandal (Author's collection).

Figure 17. Specimens from the Middle and Far East showing fashion development of the toe-band sandal. Some have a marked resemblance to the pattens of Western Europe (Author's collection).

material is chosen there always appears to be a similar development from the plain functional type to the elaborately ornamented 'fashion' version. Figure 16 illustrates this development for a wooden peg sandal, the last one being inlaid with mother-o'-pearl and having an intricately turned peg. The sole shape also departs from the natural foot form to resemble something like a fish. Figure 17 shows a similar sequence of events for the toe-band sandal.

No matter what article we consider we always find that fashion follows function and frequently survives long after the function has disappeared (diamond-paned windows in modern houses, for example). It also appears to be true to say that every craftsman has a natural desire to ornament his work (witness the carvings on church benches) but it must not be forgotten that ornament without craft is vulgarity.

In order to see how 'fashion difference' may be achieved in modern shoe design, let us analyse a shoe into its variable, visible components, variable, that is, from a fashion standpoint. These variables as they have been exploited through the ages are:

(1) *Upper appearance*—amount, pattern, material, decoration, colour

(2) *Sole shape*

(3) *Sole height*

(4) *Heel height* (and, to a lesser extent, *shape*)

(5) *Fastening*

They will now be considered in detail.

UPPER APPEARANCE

(*a*) **The Amount of the Upper**

The upper may vary from a single strap to a knee- or thigh-length boot. Obviously the question of purpose is important here since primarily a boot is intended to give added protection to the ankle and leg. This function, however, is frequently forgotten in the interests of fashion both by the designer and the wearer and so we get ankle boots intended for evening dress wear and even a boot with a peep-toe! On the other hand, strap sandals are frequently seen in conjunction with a fur coat on a winter's day.

As far as can be ascertained from museum specimens, fashionable women appear to have worn low shoes for several hundred years prior to the Victorian era when the side-laced or elastic-gusset leather or cloth ankle boots came into fashion round about the middle of the century. The boot increased in height and, with the moving of the lace to the front of the instep, or the replacement of the lace by buttons, became the popular high boot of Edwardian and early Georgian times.

After the first world war, the so-called 'Russian' boot appeared, a plain leather knee-high boot similar to the man's Wellington. These were displaced by the rubber overboots but have now turned up again as fleece-lined boots, or lower-cut 'bootees' for cold weather wear. Rubber Wellingtons in all heights and colours have also to a large extent filled the need for a really waterproof boot for both men and women.

The covering of the leg, or part of it, from a fashion angle has its roots in antiquity. Grecian and Roman sandals frequently had their securing straps going well up the leg, probably for the express purpose of drawing attention to the leg itself. In the 1920's women often wore 'tango' shoes with multi-straps round the ankle, probably for the same purpose.

The wearing of boots by men has always been much more common due to the requirements of riding, hunting and fighting. The long-toed 'poulaines', mentioned below (p. 40) were sometimes made as ankle boots. As mentioned on p. 28, the disappearance of steel armour led to the making of heavy welted leather riding boots in the seventeenth century and, once again, fashion took a hand.

A study of the contemporary paintings of the Stuart royalty and nobility by Van Dyck and others will reveal the elaborate ornamentation and extravagance of the fashionable boots of the time; the tops, wide, turned down and filled with lace are particularly notable.

The boot moved from the field of sport or battle to the town, and by the Regency period in the early nineteenth century every well-dressed 'buck' wore them, the 'Hessian' with its curved top and tassel being very popular. Famous generals such as Wellington, Napoleon and Blucher all gave their names to the boots they favoured and, as usual, the utility article became a fashion and the 'dress Wellington' of the 1870's has remained in various forms ever since, particularly as a uniform or ceremonial boot.

In general, however, the legs gradually shortened for men's wear and about 1860 the elastic-gusset ankle boot, or 'spring-sided Jemima' became the fashionable boot not only for women, as described above, but also for men. Again, as for women, laces and buttons replaced the gusset and whereas women's boots reached the knee, men's boots consolidated into the laced 'Balmoral' made popular by Edward VII and the open-front Blucher or Derby boot for heavy duty. Shoes for men and women gradually increased in numbers and styles and, since 1920, the man's boot has moved to the functional away from the fashionable so that today, except for the older generation or where there is some ankle weakness, the majority of men wear shoes for all everyday occasions. Boots are still essential, of course, for certain industries, occupations, and sports.

In discussing the amount of upper, it should not be forgotten that the actual joining of the hose and shoe has also occurred from time to time. Contemporary paintings show that during the fourteenth century men (and women) often wore, especially for ceremonial occasions, a one-piece leg and foot covering, sometimes called a 'buskin'. Shoes with 'stocking tops' also appeared about 1830, there being a very fine specimen in Northampton Museum. Currently popular in the U.S.A. is the knitted stocking or sock with a leather slipper sole fastened either permanently or detachably (with a zip fastener) so that the sock may be washed. A somewhat similar child's shoe is found in Switzerland.

(*b*) **The Pattern of the Upper**

This, of course, is closely allied to the amount of the upper which has just been discussed, but the pattern may be altered in an infinite number of ways even if the overall area of the upper remains the same. Some shoe designers (so-called) seem to think that alteration of upper pattern is the beginning and end of design.

The use of sectionalised upper patterns probably arose, as usual, through necessity and appears to be an outcome of the nineteenth century mechanisation of shoemaking and the arrival of mass-production methods. Specimens before about 1830 generally have few sections; three is quite common—the front (or vamp) and the two quarters (the sides of the back), the fronts of the quarters being extended to form fastening straps over the instep. As mentioned on p. 10, in order to make flat leather (or other material) conform to the curved surface of a last it must be stretched in some places and compressed in others; even then it may be necessary to pleat it, fold it or cut it away at the most prominent curves, as for example, with the moccasin. If, however, the material is first cut into sections and these are then stitched together in a new position, a certain amount of solid shape can be given to the whole so making the subsequent lasting operation easier. This operation of upper making is known as ‘closing’ and is the subject of Part IV of this book.

Another advantage of the sectionalised upper is that the different parts of it can be cut from material specially suited to the particular needs of the shoe and foot at the place covered by the particular section. These considerations are dealt with in detail in Part III of the book, from which it will also be seen that economy in cutting out the upper is also an important factor in determining the number, shape and area of the sections into which it is divided.

Yet a third advantage of the sectionalised upper is that it permits both contrasting materials and section outlines to be used as fashion points. Examples of the former are the currently popular two-colour shoes for women and the use of suede and smooth-faced leather of the same colour in one shoe. An older example of the second is the brogue shoe which is characterised by its multi-sectioned upper and serrated edges (see p. 195). There are in both men’s and women’s shoes, however, certain basic sectional outlines and these are dealt with in Part II.

(*c*) **The Material of the Upper**

Today more than ever before, the designer has an enormous range of materials from which to specify his upper. As explained in Chapter 2 on ‘Materials’, availability is one of the main controlling factors in this choice and, in the past, shoes were of necessity limited to very few locally-obtainable materials. Modern industrial research, manufacture and transport have removed the obstacles, other than the economic ones, so that today the upper may consist of two or more quite different materials combined together, such as leather, rubber, synthetic plastics, or textiles in a wide range of colours and surface textures. In choosing his materials, however, the designer should bear in mind the desirable characteristics they should possess for ease of manufacture and foot comfort as set out in Chapter 2.

(*d*) **The Decoration of the Upper**

Here again there is an infinite variety of possibilities. One of the oldest forms of decoration, used in ancient civilisations and still popular, is the “cut-out’. Holes in an upper—circles, triangles, rectangles, squares, intricate patterns—seem to exert a fascination on designers. In some cases these holes serve a useful ventilating purpose as, for example, on summer shoes; in others the only possible reason is ornament. It has been suggested that the perforations in a brogue shoe, which do not today completely penetrate the upper, are a survival of the day when they formed drains for the water taken in when crossing the mountain streams; presumably they also formed inlets! Incidentally, some R.A.F. overboot waders do have perforations in the waist for drainage.

Additive decoration (a phrase which has no absolute meaning but varies with the current fashion) of the upper may consist of ornamental but non-functional rows of stitching, sometimes with a contrasting thread, overlays or ‘appliques’ of other materials, piping, interlacing, metallic threads, beads, etc. All these pass in and out of fashion and presumably will go on doing so.

The embossing of leather uppers by heated tools has not been exploited in the shoe trade in this country to the same extent as it has in other branches of leather work and in other countries, but the cowboy boots, perhaps because of their link with the Red Indian crafts, often use this form of ornamentation. Such embossing can be done on the multi-purpose presses described in Part IV and so may increase in extent.

The *fastening* of the upper on the foot is dealt with later in this chapter but it may be noted here that it is frequently more of an upper decoration than a method of securing and releasing the foot within the shoe.

(*e*) **Colour**

Although it seems that the ancient Greeks, Romans, Hebrews and others wore brightly-coloured footwear, museum specimens, which in general are only fragmentary remains of anything earlier than Tudor times, are rather drab as far as men are concerned; black and tan have always been the predominant colours and remain so to this day, but white (again see Stuart paintings) was worn for full dress occasions. The women’s shoes, on the contrary, were, as now, very much brighter, red morocco leather, coloured silks and heavily embroidered damasks being very popular right down to the black or white slippers, and later, boots, of the nineteenth century.

Today, any colour is acceptable providing it is fashionable, which implies a link-up with the current trends in general costume design. In an attempt to co-ordinate such trends, the British Colour Council issues lists of costume and accessory colours each season. As indicated earlier, current events and national feeling may influence shoe design and perhaps colour is one of the design elements most susceptible to these influences. It also appears to be influenced by climate, sunshine and bright colours going together.

SOLE SHAPE

Perhaps of all the variable elements in a shoe, the characteristic which ‘dates’ it most is its sole shape, or, to be more precise, its foe shape. Again judging from museum specimens, the shape of the back portion of the sole has not appreciably altered in centuries and has always followed, more or less, the shape of the heel of the foot. The central portion or ‘waist’ has sometimes been much narrower than the foot and sometimes as wide as the thickest part of the ankle. The foot has an arch on the inside of the waist, the body weight being carried along the outer edge from the heel to the forepart, and so the main function of the sole waist is to join together the front and back portions. As the heel (shoe) increases in weight, less weight is borne by the waist and so it becomes narrower.

Modern high-heeled shoes have a strong steel 'shank' (see p. 300) to reinforce this narrow bridge between front and back, otherwise the shoe would collapse with the heel pointing backwards. As will be described inthe paragraph below on 'Heels' (p. 46), the older shoes had heels with very much broader seats and extending much further down the waist towards the forepart so that shanks were not necessary.

It is from the waist forwards that the most variation in sole shape becomes apparent as we examine shoes from all ages in our museums, particularly the width across the forepart and the length and shape of the toe. Toes have lengthened and shortened again, have become pointed and rounded or sometimes square. The 'poulaines' of the fourteenth century,

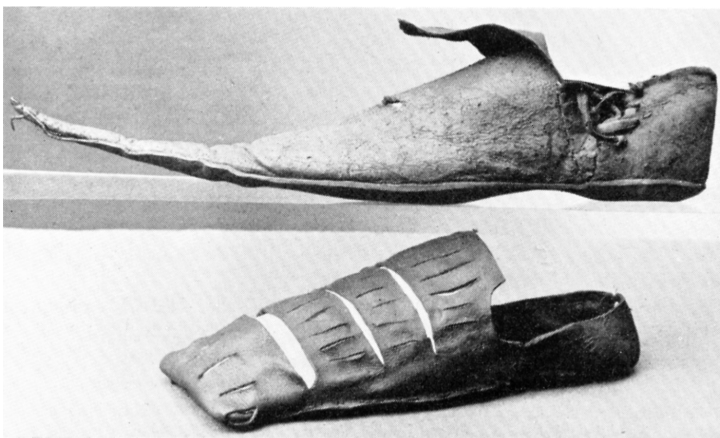


Figure 18. *a Top* Fourteenth-century poulaine; *b Bottom* fifteenth-century broad shoe (Victoria and Albert Museum, Crown copyright reserved).

shown in Figure 18*a*, were stuffed with moss or hay and reached such a length that they had to be fastened to the leg below the knee with a chain and were eventually restricted by law in 1420 to those whose income exceeded £40 per annum! A somewhat similar style is (or was) shown in the Cluny Museum in Paris, where the toe has a fish-tail shape and is curved right back and joined to the instep of the shoe itself. An English shoe of about 1905 and an Indian slipper, both with pointed toes, are shown in Figure 19.

A Papal 'bull' against long pointed shoes in 1468 was followed by an increase in width instead of length and once again the fashion reached extreme limits. The wide stubby shoes we always associate with Henry VIII (see Figure 18*b*) and shown in his portraits were typical of the Tudor period. Except for periodic outbursts of 'nature-form' shoes, however, the vogue for wide shoes has never returned to fashionable circles; on the other hand, points are always passing in and out of fashion although never to their mediaeval extravagance. In fact, except for occasional intervals of 'duck-bill' toes in early Stuart and late Victorian times, women's shoes have usually been pointed, sometimes sharply, sometimes more rounded, as an examination of museum specimens will reveal.

The fascination of the pointed toe is hard to explain; it gives the foot a long, tapering and consequently slender appearance but that is not an

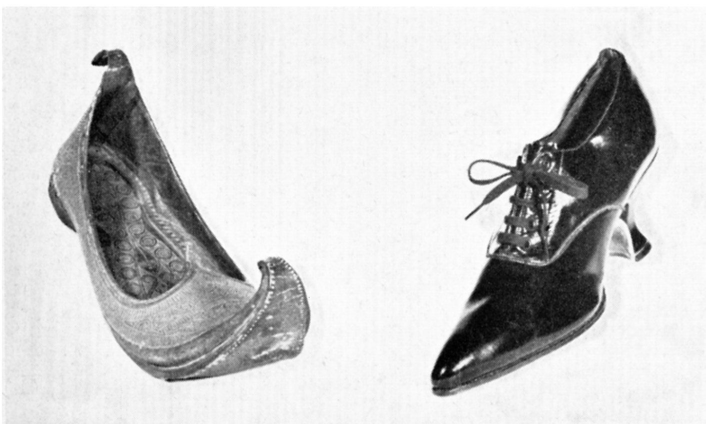


Figure 19. Pointed toes; *a Left* India *b Right* England, about 1905 (Author's collection).

explanation, it is merely a description of an effect. When the long pointed poulaine was at the height (or should it be length) of its popularity, women often wore tall pointed conical hats —they were, in fact, pointed at both ends, but again the question arises, why? It is possible that the reason for both hat and shoe is the same perverse one as that suggested below for high heels—namely, difficulty of wear and consequently, inability to work and enhanced social status. It has been suggested that the fashion came from the East via the Crusaders and certainly turned-up pointed toes are a feature of oriental sandals (see Figure 19*a*). Another possible source is the 'buskin', or combined shoe and hose, already described, a pointed end being the easiest and least clumsy way of finishing off the long seam which these had to have.

One consequence of either lengthening the toe or widening it to extremes is the masking of the essential asymmetry of the foot, in other words, the fact that we have a left foot and a right foot and that one is (or should be) the 'mirror image' of the other. Shoe designers throughout the ages have seemed determined to mask this essential fact and the majority of shoes still have their uppers designed as though a foot were symmetrical about a central line from the big toe to the centre of the back

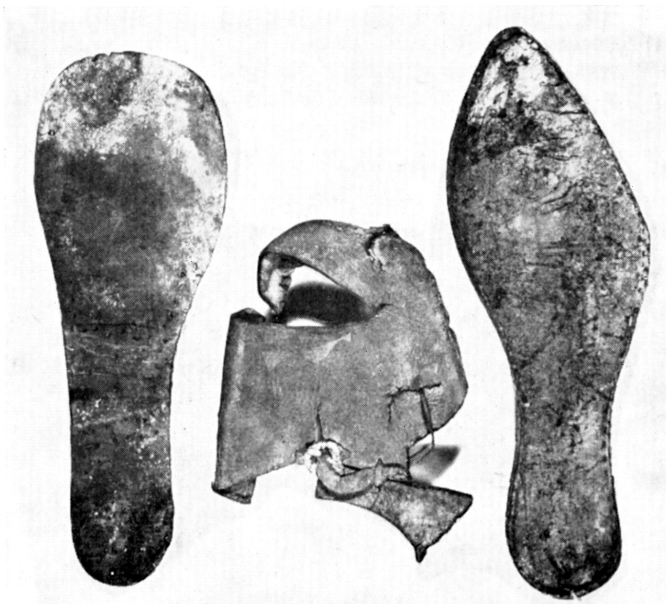


Figure 20. Mediæval shoe soles and a portion of upper from City of London excavations (Author's collection).

of the heel instead of being one half of a pair of opposites; the only concession they have made is to put the fastening on the outside (if it is not in the middle) of each shoe, e.g. buckles or buttons on strap shoes and this has been done to prevent the fastening of one shoe from rubbing on the other foot.

This objection to foot asymmetry has also extended, although to a lesser extent, to the last and sole shape. The mediaeval shoe soles shown in Figure 20 are definitely left or right, whereas the Stuart and Georgian women's shoes were 'straights' and appear to have been interchangeable. In Victorian times, both lefts and rights' and 'straights' were made as, indeed, they still are in the slipper and sandal trades.

There has been a trend towards asymmetry in upper patterns for some time now in the women's Fashion trade but men's shoes still remain in general, solidly symmetrical as far as their uppers are concerned.

Another noticeable feature of shoes in museums is the general narrowness of the sole and the small volume of upper, and one often wonders how it was ever possible to insert the foot at all, quite apart from walking in them. It must be remembered, however, that such specimens have usually been the property of the upper classes (which is why they have not been worn to destruction) and were probably only on the foot for short periods during which elegance was more important than comfort. What the working classes wore can only be assessed from contemporary paintings and drawings and it seems probable from such evidence that

Figure 21. X-ray photograph of toes distorted by pointed shoes fitted too short.

their boots and shoes were ample in size if clumsy and heavy in construction, and that they walked far more comfortably than did their 'betters'.

Before leaving the question of sole shape and pointed toes, the effect on the toes themselves must be mentioned. Figure 21 is an x-ray photograph of a foot inside a pointed shoe showing how the big toe has been turned in to the others and has developed a bunion joint in consequence of wearing shorter and possibly more pointed shoes. The effect is considerably increased in a high-heeled pointed-toe shoe since the foot then tends to slide down the sloping waist of the shoe and the toes are bunched together in the toe end. Modern 'peep-toe' shoes again aggravate the distortion since they normally have the 'peep-hole' in the centre and there is no extension of the sole beyond the toes to allow for the tapering effect.

If pointed toes must be introduced, then the tapering should not start until the foot has finished; there should be adequate toe-extension of the last, but this is all too rarely the case. Even today (1952) there appears to be a return to pointed symmetrical toes on women's shoes without adequate extension; it is to be hoped that the fashion will die a natural death before it permanently distorts young feet.

SOLE HEIGHT

The actual separation of the foot from the ground by the sole has utilitarian origins as already described in the first chapter. The ground may be unpleasantly rough, damp, muddy, cold or hot and so an insulating layer or sole is introduced. The thickness of this sole will obviously depend in the first instance upon the degree to which any of the conditions mentioned exists. The inevitable fashion element, however,

Figure 22. Examples of sole elevation: *Top—a* Africa; *b* China: *Bottom—c* Middle East, *d* China; *e* Great Britain. 1948 (Author's collection).

begins to creep in and so the thickness of the sole or its height above the ground increases to the usual extravagant limits. In the absence of any sound utilitarian reasons for this height it is only possible to suggest such perverse reasons as giving added stature to the wearer and therefore superiority in the presence of the less fortunate who are more down to earth (literally), or feminine physical instability in the presence of the opposite sex. A thick 'platform' for the forepart only of a shoe enables a much higher heel to be worn without a corresponding increase in discomfort and, as is discussed below, this is a very important fashion point.

Figure 22 shows five examples of extreme sole height or thickness. *a* is an African sandal with a $1\frac{1}{2}$ to $2\frac{1}{2}$ in. thick laminated rawhide sole, *b* a Chinese slipper with a $1\frac{1}{2}$ in. laminated leather sole, c a Chinese slipper with a central pedestal 2 in. high, *d* a. Middle East clog 8 in. high, *e* a 1948 woman's 'platform' shoe. The first, and possibly the second, of these is probably utilitarian but it is difficult to explain the others except on the grounds of fashion mentioned above.

In the sixteenth century, fantastic heights were achieved by giving the shoe, a mule type, a pedestal similar to Figure lie but higher; it was called a 'chopine' and the fashion spread from Venice to England and there are several references to it in contemporary literature (*Hamlet*, Act ii, scene 2; *John Evelyn's Diary*, June 1645).

Men's military boots have, of necessity, always had thicker soles than those for town and dress wear but, after the short-lived 'chopine' period,

Figure 23. Shoes with broad heels and pattens (Northampton Central Museum).

the shoes of upper-class women were made with soles as thin as possible right down to the 1940's when the 'platform' soles migrated from the bathing beaches to the town and became a feature of many fashion shoes. The cause for this was probably the shortage of materials during the second world war, particularly on the Continent, and the necessity for replacing sole leather by wood or cork, both of which are available in much greater thicknesses than is leather and lend themselves to carving.

One result of the use of thin leather soles, particularly on delicate fabric uppers, was the introduction of the 'patten', or overshoe, to protect them. They were used with poulaines in the Middle Ages and resembled the toe-band clogs shown in Figure 17. In Stuart times they were curved to fit under the heel as shown in Figure 23 and by Victorian times, they were commonly worn by all classes to protect their boots from the mud and consisted of a wooden sole on an iron hoop placed centrally. Today, they have been replaced by the rubber overshoe and golosh and some manufacturers of these commodities have been admitted to the old Pattenmakers' Company—one of the ancient London livery companies.

HEEL HEIGHT AND SHAPE

Heel height is closely allied with sole height but its exaggeration presents additional problems to the student of fashion, costume and human behaviour. The first question to be answered is 'Why does a shoe need a heel at all?'. The writer has never yet heard of a convincing anatomical reason why the foot should require any elevation at the heel to assist either in walking or in standing; presumably, if such elevation were required, the human foot would by now have acquired it through a process of natural evolution. An argument frequently advanced is that if we wear perfectly flat shoes for long periods our legs and ankles become very tired. This is probably true but it ignores the rather obvious fact that we normally wear shoes which have heels and that the muscles and ligaments of our legs and feet become accustomed to the resulting position caused by this elevation; this is particularly true in the case of women who normally wear high-heeled shoes and then change to flat ones, such as tennis shoes, or vice-versa. If we never wear heeled shoes at all, however, then there appears to be no reason why the lack of a heel should cause fatigue; millions of primitive peoples in the world wear no shoes at all, or at most, a flat sandal, and they walk, run, carry loads, and perform other arduous tasks without, apparently, feeling the need for a heel.

Apart from anatomy, however, there is a variety of reasons for a shoe acquiring a heel; these are:

(*a*) **Utility**

This is usually the first reason for any development and it holds good for shoe heels as for many other things. In walking, whether in a flat shoe or one with a heel, it is the back of the heel end which strikes the ground first and wears away quickest. In a flat-soled heelless shoe, therefore, it would be economical to cover this worn portion with another piece of leather—and the heel is born. The piece so added could either be replaced in due course or covered with yet another section, in which case the heel grows in height.

In either case, the idea of a replaceable part of the sole at the place which receives the most wear is a sensible one and today, shoes otherwise flat-soled have a single lift' heel for this very purpose. Incidentally, mediaeval shoe soles in our museums frequently show signs that there was this additional piece of leather attached at the heel end of the sole although contemporary illustrations do not reveal a heel of any sort.

(*b*) **Stirrups**

A heel prevents the shoe from slipping either way in the stirrup in riding, cowboy boots having heels especially high for this purpose. Shoes with heels of noticeable height, however, did not appear in this country until late Tudor times (latter half of sixteenth century) and people certainly rode horses before then. Northampton Museum has a photograph of a mediaeval heel-less poulaine with a spur attached and modern riding boots do not carry an exceptionally high heel.

(*c*) **Height**

As in the case of high platform soles, heels increase the overall height of the wearer and some small women certainly wear extremely high ones for this purpose. Popular legend has it that the high heel was introduced by Louis XIV of France because he was of short stature, and then rapidly became a court fashion; the name 'Louis' has certainly survived for a type of heel much curved and with the front or 'breast' covered by the sole curving downwards. As usual, the legend is suspect as this type of heel appears to have been worn before Louis became king in 1643.

(*d*) **Instability**

No one pretends that walking in high-heeled shoes is easier than in low ones if the foot has been accustomed to the latter but this may be the very reason why for the last 400 years except for an occasional 'flat' period they have always been fashionable. Until the twentieth century with its two class-levelling world wars and world economic crises, the costume of the aristocracy was notable for its extravagance and unsuitability for wear for any sort of manual work; it was, in fact, a 'badge of office'. Long-toed poulaines, high chopines, high heels, neck ruffs, wasp-waist corsets, hobble skirts and, to seek an example from abroad, the bound feet of Chinese women, all restricted the movements of their wearers—and were, therefore, desirable. Servants were required to fetch and carry and, in the case of the high chopine, to support the elevated lady who was literally above work. These considerations have applied at various times equally as much to men as to women. With women, instability and its sister, fragility, have the added attraction of enlisting the sympathy of the opposite sex.

Thomas Wright in his The Romance of the Shoe sums up this perverse state of affairs in describing the sandals of the ancient Egyptians:

'As to men, while the favoured aristocrats indulged in a long and often inconveniently curved sandal, the down-trodden peasant, who was unable to go to the expense of making himself miserable, had to put up with a really comfortable shoe that approximated to the shape of his foot.'

(*e*) **Appearance**

The wearing of high-heeled shoes accentuates the curvature of the instep and arch of the foot, makes the foot look smaller, shortens the step and generally draws attention to the foot and leg. This undeniably has attractions both for the wearer and for the beholder, particularly if the latter is of the male sex and the shoe is worn by a woman.

For the above reasons, and perhaps others, the high-heeled shoe is an established article of a fashionable woman's apparel, and, as stated above, has been so with occasional lapses since Tudor times.

The earliest heel in the Northampton Museum collection occurs on the white leather shoe shown in Figure 24.

Its date is uncertain but judging from contemporary pictures, it is probably late sixteenth or early seventeenth century. It has a long 'duck-bill' toe and a high heel very similar in shape to the 'cuban' type popular today. Its chief peculiarity is that the rear portion of the sole from

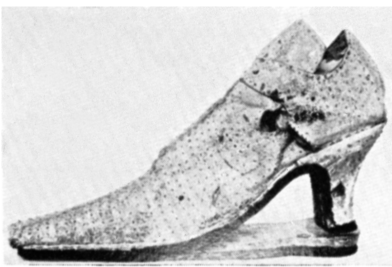


Figure 24

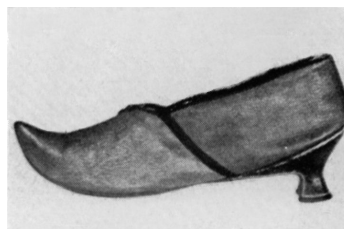


Figure 25

Figure 24. Late sixteenth- or early seventeenth-century shoe with extended sole (Northampton Central Museum).

Figure 25. Shoe with turned-up pointed toe and 'hour-glass heel', eighteenth century (Author's collection).

the tread backwards divides, one part going upwards in the usual manner to form the waist arch and then turning down to become the heel breast and under the heel to form the 'top-piece'; the other, lower portion of the sole is carried straight backwards to form a platform on which the heel stands loosely. This unique construction, which appears to have been fashionable on the Continent at this time, has never had a serious revival, although there has appeared in recent years a somewhat similar shoe having a high 'wedge' heel from which the central portion has been removed leaving a kind of bridge.

The seventeenth and first quarter of the eighteenth centuries were the era of the heavy brocade shoes for women, with high broad heels and pointed toes as shown in Figure 23. Towards the middle of the eighteenth century, the heels became much more delicate and assumed the hour-glass shape as in Figure 25.

The dawn of the nineteenth century saw the almost total disappearance of the heel and although it reappeared in a modified form and shape on some Victorian shoes, it seems to have little fashion significance till the end of the century when it came back again in its full ‘Louis’ form as one of the most exaggerated and fashionable features of the high buttoned or laced boots of the London society lady (see Figure 26) and remained so throughout the Edwardian period.

The boot gradually went out of fashion but the heel remained, the Louis form now acquiring rivals in the ‘Spanish’ and ‘Cuban’ types, straighter, narrower and with a smaller bearing surface, or top-piece. ‘Built’ heels, consisting of several layers of leather or board, also increased in height and decreased in cross-sectional area, the layered effect, not possible with the covered ‘one-piece’ wooden type which has been used for centuries, being one of their main attractions.

The re-introduction of the platform sole has permitted even higher heels to be worn without increasing the slope and consequent discomfort of the foot but has not added to its stability (see Figure 22*e*).

Another re-introduction has been that of the wedge heel (see Figure 213) which fills up the whole of the space under the waist arch and appears to have its origin in a type of slipper worn round about 1750-1820. When carried to extremes in conjunction with a platform sole, one is forcibly reminded of a surgical boot worn to correct unevenness in leg length and the shoe can hardly be regarded as delicate or feminine. Such a large mass of material below the foot heel, however, gives scope to the designer and these wedge heels are grooved, turned, carved and otherwise decorated, in rather the same way as eighteenth-century heels were sometimes painted with landscapes or flowers by fashionable artists. Other forms of heel decoration such as studding with real or imitation precious stones have also gone in and out of fashion and the Northampton Museum has a very fine collection of such heels.

More recently, experimental heels have been made of plastic (opaque and transparent) and tubular steel; in fact there appears to be no limit to the ingenuity of the designer, or stylist, in finding fresh ways of making shoes different via the heel. The high heel persists as one of the most important fashion and selling features of a woman’s shoe; it is an integral part of shoe styling which survives all the attacks of the medical profession and common sense.

Heel Position

Before leaving the question of heels, some mention must be made of their position relative to the back of the shoe and the leg. Obviously when the heel is broad as in the seventeenth- and eighteenth-century types (Figure 23), and has a large area in contact with the ground, the precise position on the shoe is not critical. As the heel becomes narrower and the top-piece smaller, however, it would be expected that the exact position would influence considerably the stability of the wearer. In spite of this the placing has varied considerably from time to time, as Figures 24, 25 and 26 show. In some eighteenth-century specimens it is about halfway along the sole while in others it is put right at the very back. The nineteenth-century Louis heel (see Figure 26) was considerably curved so that the top-piece came well forward.

The actual height of the heel, of course, decides to some extent the position of the top-piece relative to the forepart of the sole; some extreme examples of high heels (about 7 in.) in the Northampton Museum, for example, have the arch so much curved that there is hardly any space between the forepart and the heel and top-piece, and the body weight must be carried almost entirely on the toes.

Since the heel strikes the ground first in normal walking, there is, presumably, an argument for putting the heel and its top-piece in the same vertical line as the leg, rather like the single stilts of the 'chopines' described earlier; this still gives considerable latitude in placing since the leg is not a single narrow line but has thickness. Precisely whereabouts under the leg the top-piece of the heel should be placed still seems to be a variable factor, with fashion playing a bigger part in the decision than does knowledge of the anatomy and weight-bearing mechanism of the foot in standing and walking.

FASTENING

Some types of boot and shoe may 'give' sufficiently to allow them to be put on or taken off the foot without the necessity for any form of fastening which can be undone; for example, the Wellington boot and the court shoe. When actually being worn there is either sufficient coverage of the foot, ankle or leg, or a tight enough fit to prevent their slipping off accidentally. Neither of these conditions makes for comfort, however, and so, since sandals, moccasins and shoes were first made, means of opening the upper and closing it again for insertion and removal of the foot have been provided. These have all become fashion features and will now be considered in detail.

Laces

A knotted thong or string is undoubtedly the simplest and oldest method; it may either be one of the actual sandal thongs or straps as already described in Chapter 3, or it may be a separate string or lace threaded through holes (or attached loops) in the upper as is the common practice today.

Roman and Grecian sandals were often laced and some fifteenth-century poulaines had side-lacing (Figure 18*a*), a fashion which reappeared in the first half of the nineteenth century with the advent of the ankle boot. The opening and consequently the lacing then moved round from the side to the instep where it has, in general, remained ever since for the majority of shoes, particularly men's.

The number of holes, which by the end of the nineteenth century had acquired eyelets, increased with the height of the boot and the lacing became a definite fashion feature (Figure 26). The lacing also extended further towards the toe than was necessary for utilitarian purposes. The time taken to lace so many eyelets led to the introduction of the boot-hook with its much quicker fastening; this often replaces the eyelet down to the level below which it is only necessary to loosen the lace rather than to remove it completely for foot insertion and withdrawal.

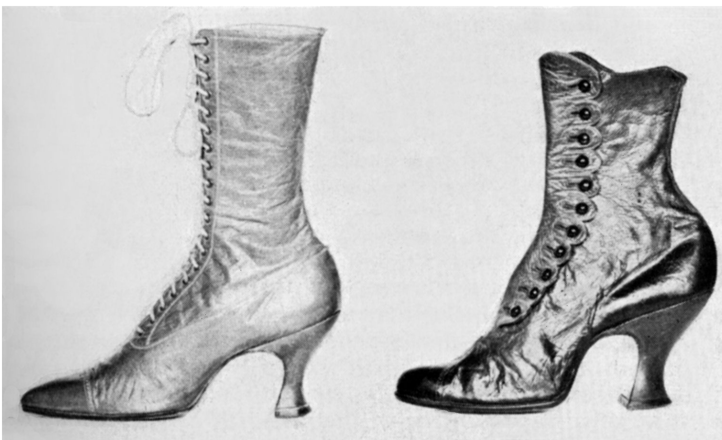


Figure 26. Laced and buttoned boots, about 1900 (Author's collection)

The knotting of a thong or lace into a bow made the bow itself a fashion feature, especially when the lace took the form of a wide ribbon and so, as always, even when the lace was no longer required, the bow survived in all sizes, shapes and colours as a decoration, not only at the place where it was originally required but at any point where fashion decreed it should be. The simple bow is now made in an infinite variety of forms which could not actually be tied at all in a lace—pleats, folds, rolls, rosettes, etc., combined with metals, wood and other materials—and there is now no firm boundary between the bow and the button.

Buckles

The woman's shoe which remained popular throughout the seventeenth and eighteenth centuries had a very simple upper pattern although the materials used varied considerably in texture and appearance—a policy which might with advantage be carried out today. Most of them were as shown in Figure 23 and simply had a vamp with extended tongue and two quarters, each with the front end narrowed into a strap either nearly meeting, or overlapping over the instep. In the former case, the two straps each had a single hole and were tied together with a string or ribbon, the ‘latchet’; in the latter, they were fastened together with a buckle. Both methods were also used for men’s shoes and soon, for both sexes, the buckle became perhaps the most important badge of rank and fashion. Made of silver and steel and inlaid with real or artificial gemstones, they grew in size and brilliance until they dominated the shoe. By the end of the eighteenth century the fashion had passed except for ceremonial dress. Few museum shoe specimens show them because they were not an integral part of the shoe but were transferred from one shoe to another and kept in a case when not in use.

Today, mass production methods have enabled buckles of every conceivable colour, size and shape to be made, some being purely decorative and others functional; their position on the shoe is as variable as that of the bow with the difference that their shiny metallic appearance calls more immediate attention to the shoe and foot. It is interesting to note that the vamp of the mediaeval shoe shown in Figure 20 has a buckle.

Buttons

Although buttons have been used on garments for many years, buttoned boots do not appear until towards the end of the nineteenth century, buttoned shoes following shortly afterwards; both men and women wore them then but today they are only seen on women’s and children’s shoes. The ‘one-bar’, i.e., single-strap, women’s shoe with button was the standard shoe of the early 1920’s and retained its popularity till the 1930’s when it began to give pride of place to the buckle. As for a buckle, however, there is no limit to the size, shape and colour of the button when it leaves the functional for the fashionable; if it is really required to be used as a button in a buttonhole, then it is usually small and well rounded.

Gussets

Although hardly fastenings in the true sense of the word, elastic gussets or inserts at some portion of the upper to permit the entry and withdrawal of the foot must be mentioned here. The development of the rubber trade in the first half of the nineteenth century led to the manufacture of elastic cloth and, as already described, the ‘spring-sided Jemima’ of the 1860’s had an enormous popularity, coinciding as it did with the advent of factory methods of shoemaking.

Gussets, however, are not usually regarded with much favour and when they are introduced into an upper design they are often covered with a bow or tongue of other material. One remarkable shoe of about 1905 in the Northampton Museum has laces (through eyelets), buttons and a gusset!

Elasticised leathers, which were invented by James Dowie and described by him in his *The Foot and its Covering* in 1861, are being used to an increasing extent in shoes today and might be regarded as the modern equivalent of the gusset, although this still remains.

Other Fastenings

There are, of course, other ways of fastening shoes such as hooks and eyes, press-studs, interlaced loops and zip-fasteners, all of which are capable of utility or fashion development. Their drawback generally is that they have no latitude, that is to say they can only be fixed in a predetermined position and cannot be adapted easily for different size feet; buttons suffer from the same defect. Laces and buckles, therefore, retain their popularity for sound utilitarian reasons just as screw-down water taps and simple wooden lever latches on gates survive in spite of numerous ‘improved’ inventions intended to replace them.

We have now seen the various factors which have influenced shoe design, consciously or unconsciously, throughout the ages and which will go on doing so in the years to come—purpose, material, method and fashion. In the following parts of this book, modern methods of shoe manufacture are dealt with in considerable detail and it is hoped that the study of them will convince the would-be shoe designer that it is not sufficient just to paint or draw a pretty upper pattern in order to create a new shoe; the shoe has still to be manufactured by one of the methods described from available materials, and when it has been manufactured, it will still have to be worn for one of the purposes listed in Chapter 1.

If the student can produce a four-legged stool design which does not rock unsteadily but is evenly balanced on its four legs of purpose, material, method and fashion, then he can call himself a shoe designer.

PART II

PATTERN CUTTING

A. V. GOODFELLOW

5
LASTS
SIZES AND FITTINGS

Length Scales

The orthodox size scale in use in this country has three sizes to the inch and commences with size 0 which is 4 in. long. The scale continues with intervals of $\frac{1}{3}$ in. up to size 13 which is $8\frac{1}{3}$ in. Long. The numbering breaks off at this size, recommencing with size 1 which is $8\frac{2}{3}$ in. long and continuing to include the largest sizes. The English size scale is thus divided into two, a children's scale ranging from 0 to 13 (4 to $8\frac{1}{3}$ in.) and an adults' scale ranging from 1 to 12 ($8\frac{2}{3}$ to $12\frac{1}{3}$ in.). Half sizes ($\frac{1}{6}$ in. difference) are usually made.

The scale is further divided according to the type of shoe to be made. The characteristics of the foot vary while growth is taking place, consequently lasts for different age groups must be modelled differently. The following ranges are typical but should not be regarded as unalterable. There is some overlapping between ranges particularly in the older groups.

Infants'	..	0 to 6	Youths' and Maids'		3 to 6
Children's	..	7 to 11	Women's	..	3 to 9
Boys' and Girls'		12 to 2	Men's	..	5 to 12

Girth Scales

Between each length size there is a difference of $\frac{1}{3}$ in. The larger size will also have a greater girth measurement and the orthodox increase is $\frac{1}{4}$ in. Thus if size 7 has a joint girth of 9 in., size 8 will have a joint girth of $9\frac{1}{4}$ in. The actual measurements will vary according to the type of shoe to be made. A shoe made from heavy materials will have a greater girth than one made from light materials since this is necessary in order to compensate for the loss of flexibility and the greater thickness of the upper.

Fitting Scales

Lasts are made not only with different girths for different lengths but also with different girths for the same length. This practice gives several sets of lasts covering the same length scale but with different girth measurements, enabling a greater number of feet to be efficiently fitted, although the objection to the extension of this custom in all cases lies in the fact that by increasing the variety of the product we reduce the quantity that can be produced and increase its cost.

The difference between these fittings as they are called is not fixed, but the most widely used grade is $\frac{1}{4}$ in. This is usually distributed with

$\frac{1}{12}$ in. across the width of the last and $\frac{1}{6}$ in. on the top, the measurement being taken across the joints, i.e. corresponding to the widest part of the foot.

As indicated, the number of fittings will vary according to the type of shoe being made. Each fitting is identified either by a number or a letter. If D is taken as an average fitting the number corresponding would be 4 and the range of fittings made would be as follows: 3 =C; 4=D; 5=E. This does not refer to the ranges of shoes made in what are called multi-fittings.

Taking the girth measurement of 9 in. already given for a size 7 and now adding the fact that it refers to a D fitting, Table 1 shows the joint girth measurements for a limited fitting range.

Table 1. Girth Measurements for Various Sizes and Fittings

Fitting	Girth (in). for sizes					
	6	7	8	9	10	11
C	$8\frac{1}{2}$	$8\frac{3}{4}$	9	$9\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{3}{4}$
D	$8\frac{3}{4}$	9	$9\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{3}{4}$	10
E	9	$9\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{3}{4}$	10	$10\frac{1}{4}$

Multi-fittings

Usually associated with the manufacture of women's shoes, this method may involve as many as ten or eleven different fittings, ranging from 4A (AAAA) to 4E (EEEE). The orthodox grade of $\frac{1}{4}$ in.

Table 2. Length and Girth for Multi-fittings, Size 5

Fitting	Length (in.)		Girth (in.)	
AAAA	$9\frac{19}{24}$	$\frac{1}{24}$ Reduction	$7\frac{5}{16}$	$\frac{3}{16}$ Grade
AAA	$9\frac{20}{24}$		$7\frac{8}{16}$	
AA	$9\frac{21}{24}$		$7\frac{11}{16}$	
A	$9\frac{22}{24}$		$7\frac{14}{16}$	
B	$9\frac{23}{24}$		$8\frac{1}{16}$	
C	10	No alteration	$8\frac{4}{16}$	$\frac{1}{4}$ Grade
D	10		$8\frac{8}{16}$	
E	10		$8\frac{12}{16}$	
EE	$10\frac{1}{24}$	$\frac{1}{24}$ Increase	$8\frac{15}{16}$	$\frac{3}{16}$ Grade
EEE	$10\frac{2}{24}$		$9\frac{2}{16}$	
EEEE	$10\frac{3}{24}$		$9\frac{5}{16}$	

is not satisfactory for such a wide range and it is a general practice for this to be reduced to $\frac{3}{16}$ in. between the larger and smaller fittings. The increase of $\frac{1}{4}$ in. makes the larger fittings too large for good foot fitting and the smaller fittings become too small. A further complication is introduced by the practice of lengthening the lasts by $\frac{1}{24}$ in. between each of the larger fittings and making a similar reduction between each of the smaller fittings. Table 2 illustrates this grade.

Precision Grade

It was pointed out above that the orthodox girth increase of 8 in. has had to be modified for multi-fittings and this has become standard practice. A large-scale investigation into the actual size and shape of women's feet, carried out by the British Boot, Shoe and Allied Trades Research Association has led to the introduction of a new scale of girth increases known as precision grading. Investigations showed that where single fitting lines of shoes were made with a $\frac{1}{4}$ in. girth increase between each size there was a tendency for shoe fitters to fit the larger feet 'short' in order to get the correct joint fitting; also the smaller feet were fitted long' because the correct size was too small across the joints.

The use of multi-fittings overcame this difficulty, but the fact that the scale was wrong received further emphasis when an analysis of sales figures showed that in the wider fittings there was a demand for smaller sizes and in the narrower fittings the demand was for larger sizes.

The measurements taken by the Research Association showed that the correct girth increase between sizes should be, not $\frac{1}{4}$ in., but $\frac{3}{20}$, in. This reduction means a large reduction in volume and it was felt that half sizes could be left out. The difference between fittings does not derive from foot characteristics but may vary according to the accuracy of the fitting properties required in the shoes to be made. The Research Association have suggested that as the precision grade is adjusted to the actual girth increases of feet, the difference between fittings may safely be increased to $\frac{7}{20}$ in. The recommended scale for precision graded lasts is, then, as follows:

Length increase between sizes $\frac{1}{3}$ in.
Joint girth increase between sizes $\frac{3}{20}$ in.
Joint girth increase between fittings $\frac{7}{20}$ in.

New Developments

In an endeavour to find a more satisfactory length size scale than the one in general use experiments are being made using 1 in. as the size unit. Three proposals have been made:

(1) 'The size marked on a shoe shall be the length of the foot which the shoe properly fits when the foot is correctly measured on the "standard" length scale'.

(2) 'The "standard" length shall be in divisions of twelfths of an inch and, to avoid three figure numbers at the larger sizes, the scale

shall start with zero at 4 in., the $\frac{1}{12}$ in. divisions being then numbered consecutively.'

(3) 'The Research Association shall produce a foot-measuring instrument embodying the above proposals and including in it the corresponding heel/ball scale.'

The purpose of the $\frac{1}{12}$ in. interval is to permit the use of $\frac{1}{3}$ in., $\frac{1}{6}$ in., or $\frac{1}{4}$ in., size intervals, all on the same basic scale. The appropriate size interval can be selected for the type and price of shoe.

American Size Scale

The length size scale is exactly the same as the orthodox scale in use in this country, with the exception that the American begins with size 0=$3\frac{11}{12}$ in. Each size is therefore $\frac{1}{12}$ in. shorter than its English equivalent. The method of numbering and the size interval of $\frac{1}{3}$ in. are the same.

Unfortunately the matter is complicated by the American practice of stamping shoes $1\frac{1}{2}$ sizes up; thus size 4 is marked size $5\frac{1}{2}$. In addition the fittings are marked two down thus D fitting becomes B.

Paris Points

Length Scale—On the Continent the size unit is the Paris point which equals $\frac{2}{3}$ cm. (centimetre). The size scale begins at 0 cm. and continues without a break up to the largest sizes. Half sizes are made.

To convert English sizes into Paris points the following calculations should be made:

(1) Convert English size into inches.
(2) Convert inches into centimetres (1 in. = 2·54 cm.).
(3) Convert centimetres into Paris points (multiply by $\frac{3}{2}$).

Example 1—Convert size 8 adults' into Paris points.
(1) Size 8 has a length of 11 in.
(2) $11 \times 2{\cdot}54 = 27{\cdot}94$ cm.
(3) $27{\cdot}94 \times \frac{3}{2} = 42$ Paris points (nearest size).

Example 2—Convert 36 Paris points into English sizes.
(1) $36 \times \frac{2}{3} = 24$ cm.
(2) $24/2{\cdot}54 = 9{\cdot}45$ in.
(3) 9·45 in.= size 3 (nearest size).

An easy method of conversion is suggested by the fact that size 5 adults (10 in.) is practically the same as 38 Paris points. English inches may be converted into Paris points thus:

$$\text{Paris points} = \frac{\text{Inches} \times 38}{10}$$

Girth Scale—The girth scale has the following dimensions:
5 mm. (millimetres) between sizes;
$1\frac{2}{3}$ mm. across the tread.

Centimetre

Length Scale—This is another scale in use on the Continent with one size equal to 1 cm.

Girth Scale—The girth scale has the following dimensions:
$7\frac{1}{2}$ mm. between sizes; $2\frac{1}{2}$ mm. across the tread.

LAST SPECIFICATION

Several of the points mentioned are obtained by measuring a certain proportion of the standard length. This practice is continued in Chapter 6 and has the advantage that the instructions hold good, regardless of the size of the model. The standard length is the length in inches of any given English size and may be found by referring to p. 57. It is important to avoid confusion here because the actual length of a last may vary according to the shape of the toe, whereas the standard length is fixed for a particular size regardless of the length of any individual last.

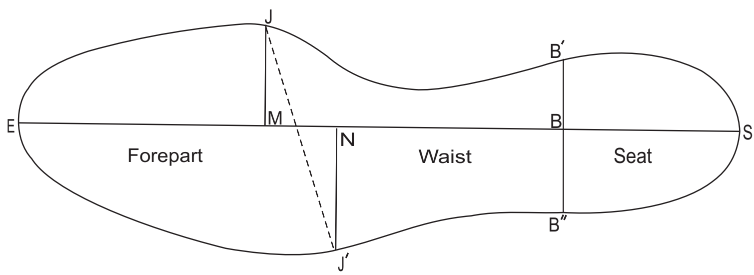


Figure 27. The bottom of the last. E = centre of the toe shape; S = centre of the heel shape. (The positions of E and S are difficult to define , but can be located easily on the last); SB = $\frac{1}{4}$ *SL* (standard length); B′B″ = breast of heel; SM = $\frac{2}{3}$ *SL*; MN = $\frac{1}{10}$ *SL*; SNJ′ = 90° (outside joint position); SMJ = 90° (inside joint position)

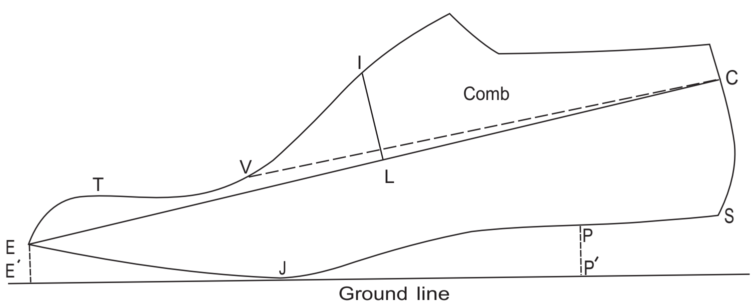


Figure 28 The profile of the last: J = point of contact or tread, PP′ = heel height or pitch; EE′ = toe spring; S = seat position; E = end of toes; C = counterpoint; SC = $\frac{1}{5}$ *SL*; V = vamp position; CV = $\frac{7}{10}$ *SL*; I = instep; CLI = 90°; L is $\frac{1}{2}$ *SL* from C; T = top of toes (highest point over toes).

Pitch

All lasts are made to carry a definite height of heel and the most satisfactory way of finding the heel height for a last is to consult the last manufacturer. If this is not convenient the following points should be observed:

(1) The heel height should be measured $\frac{3}{8}$ in. behind the breast of heel.

(2) The last should be placed on a level surface and for a 1 in. heel, the seat should be parallel to the ground. For heel heights above 1 in. the seat should be raised until the last seems to be well balanced, i.e. the amount of the toe spring and pitch look right. The amount of toe spring varies but a man's medium walking shoe should have about $\frac{3}{8}$ in. spring and a woman's light-weight shoe with a high heel about $\frac{1}{4}$ in. It will be seen from this that on normal types of shoes the variation in toe spring is not great.

(3) High heels are measured from the centre of the top-piece at right-angles to the ground.

(4) The general practice is for built and wood heels to be measured in $\frac{1}{8}$ in., e.g. a 22/8 heel is $2\frac{3}{4}$ in. high.

Toe Spring

As already pointed out the amount of toe spring varies with the type of shoe. As one of the objects of toe spring is to compensate for the loss of flexibility caused by encasing the foot, it follows that the more rigid the shoe the more will be the amount of toe spring required. Also in shoes with high heels the foot is already flexed and little toe spring is needed because the action of walking is stilted rather than heel and toe.

Secondary advantages of toe spring are:

(1) As the shoe is already partly flexed the amount of creasing across the vamp is reduced.

(2) On court, slipper and some casual styles the downward pressure of the toes helps to tighten the top line of the shoe.

6
PRACTICAL INSTRUCTION

THE INSTRUCTIONS GIVEN ARE framed in such a way as to enable any student to follow them and to produce his own patterns even if he is without previous experience. It is hoped that students will make the attempt, regarding these notes as exercises that are meant to give a clearer understanding of what is involved in pattern cutting. Certain practices, desirable in themselves, have been omitted for the sake of simplicity since these notes are not intended to form a set of complete pattern-cutting instructions.

TOOLS

Fortunately very few tools are needed, although there are many 'extras' that prove useful.

Cutting Surface

Although the factory pattern cutter usually has a clicking board it is not essential. Sheet zinc or plate glass will give excellent results.

Knife

Any of the various types of clicking knives are suitable, but the shape of the blade must be suited to cutting paper, i.e. it should be straight and not curved, and should be rigid enough to give perfect control. Students may like to experiment with the type of knife used on the Continent which is held like a pencil instead of being gripped in the hand. The knives sold for the use of model aeroplane makers are of this type and can be used.

Steel Rule

This is one of the essential tools; a 12 in. or 18 in. rule is best. It is necessary because of the need for accurate measurement and because straight lines in patterns should be cut to the rule.

Dividers

A pair of 4 in. dividers will be found easy to handle and is needed for the many parallel lines that have to be drawn.

Scriber

This tool is far better than the clicker's awl since it is used primarily for marking lines and not for stabbing. All lines should be traced with the scriber and a pencil only used for sketching in curves.

Tape Measure

The shoemaker's tape measure is graduated in $\frac{1}{8}$ in. and $\frac{1}{16}$ in. and has the English size scale marked on the reverse side. It is essential for checking last measurements when forme cutting.

French Curves

Many beginners experience difficulty in obtaining satisfactory curves, but if these are lightly sketched in first and then connected with a French curve the results will be much better. They are made in sets of celluloid shapes with various curves.

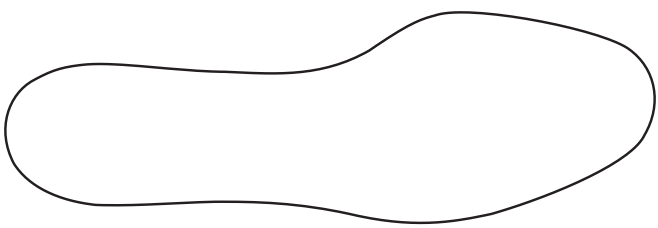
MARKING THE LAST

For convenience in transferring the shape of the last (Figures 30 and 31) on to a flat piece of paper, lines are drawn dividing the last into three parts, the bottom or insole shape and the inside and outside top sections. The lines must be drawn in before any pattern is cut and since the waist curves are primarily intended to give the insole shape it is logical to begin with that.

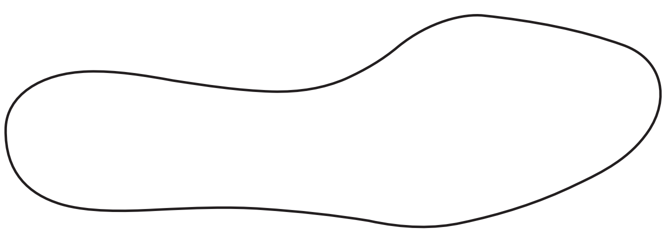
Insole Shape

The majority of lasts are designed with a clearly-defined forepart and seat and this edge is used. The waist curves connecting forepart and seat must be shaped to blend with the lines of the last and some experience is necessary before really good results are obtained.

Outside Waist—This is always fairly straight and can be drawn in without difficulty.



a



b

Figure 29. Typical insole waist shapes: *a* heavy shoe (low heel); *b* light shoe (high heel).

Inside Waist—This varies with the type of shoe and the contours of the last. A light shoe will have a narrow waist and a heavy shoe a wide waist. A shoe with a high heel carries a narrower waist than one with a low heel. Figures 29*a* and *b* show typical insole waist shapes.

Centre Line—Draw a straight line connecting E and S. The student is advised to compare inside shapes, noting the differences between them. Made up shoes can be used for this purpose.

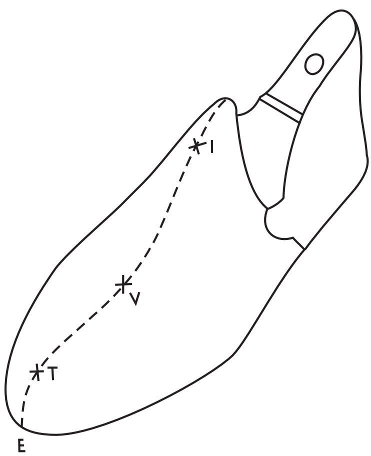


Figure 30. The centre line.

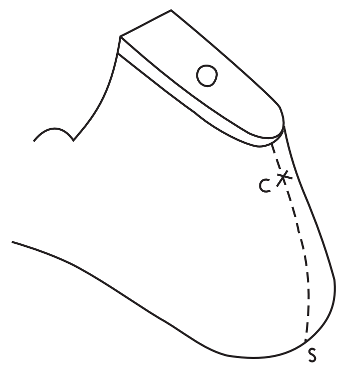


Figure 31. The back line.

Top Sections

The inside and outside sections are divided by means of a line drawn down the front of the last and one down the back.

Centre Line (Figure 30)—The line is drawn by connecting E the centre of the toe shape, T the top of toes, I the instep, and V the vamp position. It is not necessary for I to be located exactly, but it should be in the centre of the top of the comb. E and T can also be located easily.

The vamp position should be located by holding the last level with the eyes and with the inside joint uppermost, dropping a perpendicular from the most prominent point across the front of the last. Now hold the last with the toe pointing towards you and mark a point on the perpendicular which appears to be on a straight line between I and T.

Back Line (Figure 31)—Connect C and S. Follow the centre of the back curve.

THE INSOLE PATTERN

Use paper that can be moulded easily to the last without tearing. Rough out a rectangle large enough for the purpose.

Draw a line on the paper corresponding to the line ES (Figure 27) on the last. On the line cut three ‘windows’ approximately 1 in. × $\frac{3}{8}$ in., positioned at the toe, the seat and in the waist. Fasten strips of $\frac{5}{8}$ in. transparent adhesive tape over the windows. Stick the paper to the last so that the line ES on the last corresponds with the line on the paper.

Mark round the forepart and seat outline with a sharp pencil. Cut slots in the waist until the paper can be pressed gently on to the wood. Transfer the waist curves to the paper. Remove the paper and cut around the outline thus marked. Replace the insole pattern on the last and check at all points.

A working insole pattern is then made by reducing behind the inside joint by $\frac{1}{64}$ in. and increasing the length at the seat by $\frac{1}{12}$ in. for trimming.

THE SOLE PATTERN

Mark round the original insole pattern and add the following allowances :

Upper substance	Obviously this varies but $\frac{1}{8}$ in. may be used as an average.
Stiffener substance and Toe-puff substance	An allowance of $\frac{1}{8}$ in. should be made in and length and continued round the side, tapering off where the components are skived away.
Welt	Again this must vary according to the width of sole required. For a man’s welted shoe an allowance of $\frac{1}{4}$ in. should be made, tapered off to $\frac{1}{8}$ in. at the seat.
Finishing	An allowance of $\frac{1}{16}$ in. may be made.

The making of sole caster patterns is described on p. 94.

THE SLOTTED FORME

Draw a straight line along the side of the last from the counterpoint to I in. away from the centre of the toe shape

Lay the last on its side and with a long pencil mark out the profile—it will be necessary to mark first the back, and then to tip the last so that the forepart is down to the paper, before completing the marking.

Remove the last and cut round the pencilled outline leaving on a margin of about 1 in. Draw a line on the paper to correspond with the one just drawn on the last.

Cut three 1 in. × $\frac{3}{8}$ in. windows on the line as indicated in Figure 32. Reverse the paper and stick strips of cellulose tape over the win-

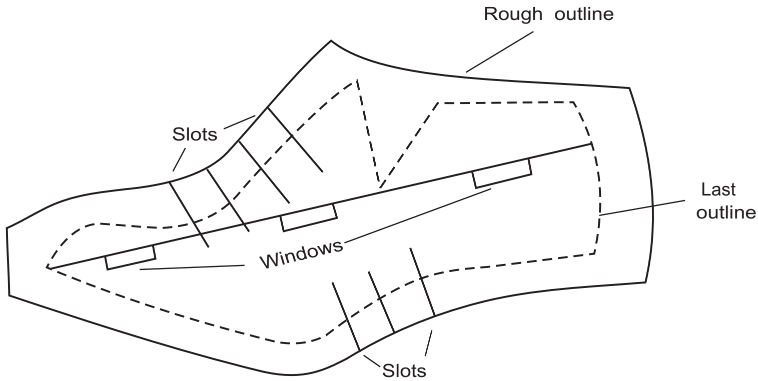


Figure 32. The slotted forme.

dows. Fasten the paper to the last so that the paper and wood lines agree (the wood line can be seen through the windows).

Where the paper stands away from the last, cut slots deep enough to enable the paper to be pressed down. The aim should be to make the slots as few and short as possible to avoid distortion later.

Transfer the lines on the last to the paper taking particular care at the toe and seat. When marking the back curve a short line should be made showing the position of the bottom line. When marking the front line a mark should be made showing the length.

Remove the forme from the last and cut along the lines marked. The forme should now be replaced on the last (the tape facilitates this) and its accuracy checked. Additional checks should be made by measuring the length of the last with the tape measure and comparing with the forme length.

Repeat the procedure on the other side of the last.

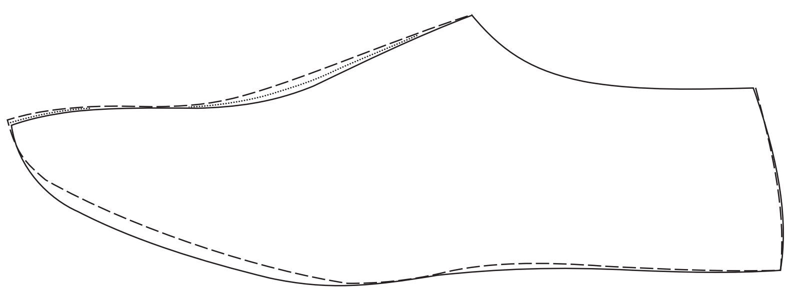


Figure 33. Mean forme. (——— outside forme – – – inside forme . . . mean forme.)

Mean Forme

When formes have been cut for both inside and outside the two should be compared to see if a mean or average forme can be made or if special inside and outside patterns must be cut. In most cases it is possible to cut a mean forme as follows:

Mark round the outside forme, indicating the counterpoint. Place the inside forme on the outline with the two counterpoints together. Pivot the inside forme until the two front lines are brought together at the top of toe position.

The difference between the two formes should be divided to obtain the mean forme line, except along the bottom where the lower line should always be followed (Figure 33).

MEN'S SHOE STANDARDS AND SECTIONS

Standard Construction

The abbreviation *SL* refers to the standard length and the following instructions may be used for any size of men's shoes.

Trace the mean forme, showing both inside and outside forepart lines. Mark in the following reference points (Figure 34):

SC	$= \frac{1}{5}\ SL$	C	= Counterpoint.
CQ	$= \frac{1}{2}$ in.	Q	= Top of quarter at the back.
CV	$= \frac{7}{10}\ SL$	V	= Vamp point.
VT	$= \frac{1}{4}\ SL + \frac{1}{4}$ in.	T	= Top of facing.
SB	$= \frac{1}{4}\ SL$	B	= Breast of heel.
$\widehat{SBA}$	$= 90°$	A	= Outside of ankle bone.
BA	$= \frac{1}{5}\ SL$		

Connect QA and extend to meet a perpendicular dropped from T. Design the quarter curve from T through A to Q. Add a stiffener allowance from $\frac{3}{16}$ in. at S to nothing at C. Continue the line to $\frac{1}{16}$ in. inside Q to give added tension to the top line of the upper which will

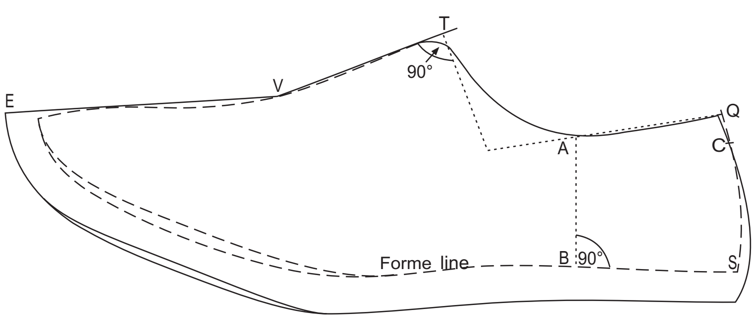


Figure 34. Men's shoe standard construction.

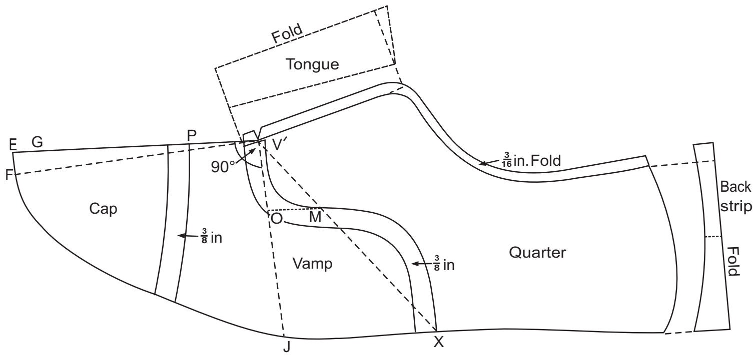


Figure 35. Oxford shoe standard, showing vamp, cap, quarter, back-strip, and tongue

eventually be cut from this pattern. Add a lasting allowance of $\frac{5}{8}$ in. to the bottom edge reduced to $\frac{1}{2}$ in. at toe and seat.

Repeat following the inside forme line.

Note: On men's shoes the line from the joint to the seat may be cut straight.

Oxford Shoe Sections

Vamp—(Figure 35). Take a piece of paper about 9 in. x 8 in. and fold lengthways. Place EV of the shoe standard on the fold and mark the bottom line of the standard and as much of the quarter curve as possible. Prick V. Make EF = $\frac{1}{2}$ in.; $\widehat{FVJ}$=90°; VO = $\frac{1}{3}$VJ + $\frac{1}{16}$ in.; OM = 1 in. parallel to the fold.

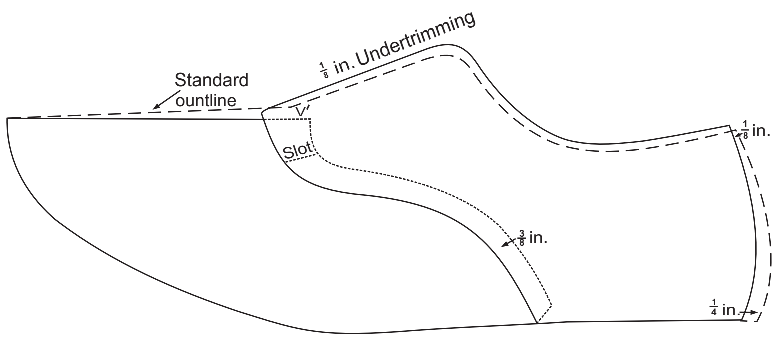
Connect VM and extend to the edge of the standard (X). Design the vamp curve from V′ ($\frac{1}{8}$ in. above V) through M to X. The throat curve should not be too full and the distance between vamp and quarter curve should be about $\frac{1}{7}$ SL. This will vary according to the style of vamp preferred.

Cap (Figure 35)—Describe an arc with a radius of 12 in. Cut along the line thus drawn and fold the paper with two halves of the arc coinciding. Find the cap depth by making EG = $\frac{1}{2}$ in. V′P = $\frac{1}{3}$ GV′. Place EP on the fold with P on the arc and mark the bottom line. Allow $\frac{3}{16}$ in. for folding ('beading') on the curve if this edge treatment is required.

Quarter (Figure 35)—Trace round the back of the shoe standard from V to X. Remove standard and fill in the vamp curve. Allow $\frac{3}{8}$ in. underlay for the vamp. Allow $\frac{3}{16}$ in. for folding ('beading') up the facing and along the quarter curve.

Quarter Lining (Figure 36)—Trace round the standard from V to X; fill in the vamp curve. Extend the facing line $\frac{1}{2}$ in. below V′. Design the lining curve as shown in Figure 36 taking care to clear the vamp curve as this would cause undesirable bulk. Different curves can be used according to the degree of economy wanted, bearing in mind that it is normal practice to cut quarter linings from leather and vamp linings from the cheaper cloth. Those cut nearer to the seat will cut from a smaller area. The curve should be one that will interlock easily. Add $\frac{1}{8}$ in. undertrimming allowance along the facing and top of quarter. Reduce the back of the lining for stiffener pocket by $\frac{1}{8}$ in. at the top and $\frac{1}{4}$ in. at the bottom.

Vamp Lining (Figure 36)—Fold a piece of paper as for the vamp. Mark the quarter lining curve on the standard. Place the standard on the fold and mark the bottom. Prick through the lining curve. Remove the standard and fill in the lining curve. Add $\frac{3}{8}$ in. underlay to the vamp lining increased to $\frac{1}{2}$ in. in the throat.



Outside Strip (*or Back-strap*) (Figure 35)—Fold a piece of paper and cut a strip to the following measurements:

Length	= Back of quarter + $\frac{3}{8}$ in.	
Width	= $\frac{3}{8}$ in. at the top $\frac{5}{16}$ in. in the centre $\frac{5}{8}$ in. at the bottom	Measured on the fold.

Tongue (Figure 35)—Fold a piece of paper and cut a tongue to the following measurements:

Length	= Length of folded quarter facing	
Width	= 1 $\frac{1}{8}$ in. at the top $\frac{3}{4}$ in. at the bottom	Measured on the fold.

The top of the tongue may be shaped as preferred.

Note: These sections are obtained by tracing round the standard, filling in the curves afterwards. Other methods are described on p.87.

The practice of cutting patterns to a folded edge is an extremely useful one since, for example, the two halves of a vamp curve are cut together and are identical. The crease made must be sharp.

Reference to a 'net' pattern means one without any addition for edge treatment. Lasting and underlay allowances are not referred to.

Derby Shoe Sections

*Finding the Tab Poin*t (Figure 37)—Draw the line VJ on the shoe standard. Mark J′ (the intersection of VJ and the forme).

VO = $\frac{1}{2}$ VJ′ − $\frac{1}{16}$ in.

Derby Quarter (Figure 37)—Trace the back of the standard. Mark V, C, O. Make X about $\frac{2}{5}$ SL from the back. Connect OV and OC. Make VW= $\frac{1}{8}$ in. Connect WO. Design the side curve from O to X keeping below the line OC.

Reduce the facing by $\frac{1}{8}$ in. Round off the corners.

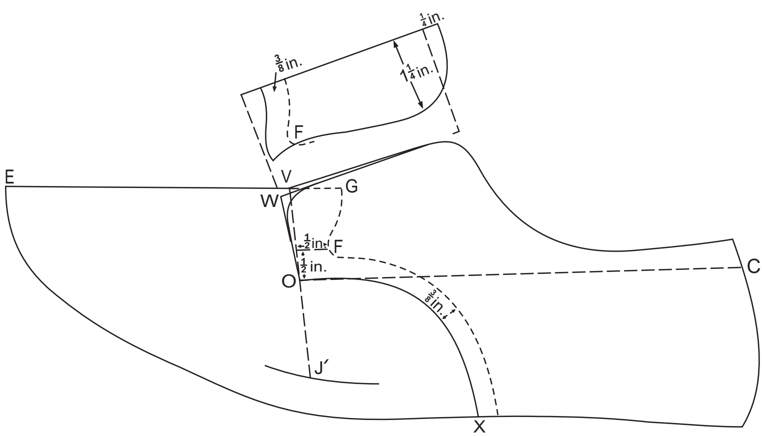


Figure 37. Derby shoe standard, showing location of the tab point, quarter, vamp and tongue.

Derby Vamp (Figure 37)—Transfer the curve OX to the standard. Place EV on a folded edge, trace the bottom line and mark VOX. Remove the standard and fill in the side curve with the quarter pattern. Connect VO. Make VG = $\frac{7}{8}$ in. Add $\frac{3}{8}$ in. underlay from O to W. To find the *fitting point* (F) measure $\frac{1}{2}$ in. from O along OV and $\frac{1}{2}$ in. from that point parallel to OW. Design the throat from G through F to blend with OW, remembering that the curve through F must be wide enough to cut round easily.

Derby Cap—Construction is as for the Oxford except that the radius is reduced to 10 in. as the vamp tends to pull forward in the centre when lasted.

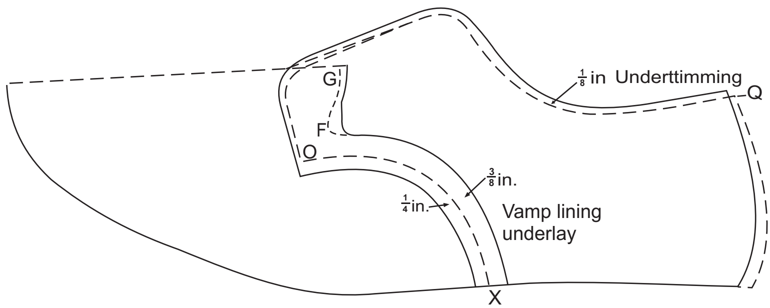


Figure 38. Derby quarter lining and vamp lining.

Quarter Lining (Figure 38)—Mark round the net quarter. Add $\frac{1}{8}$ in. undertrimming allowance from O to Q. Add $\frac{1}{4}$ in. trimming allowance from O to X. Reduce for the stiffener pocket $\frac{1}{8}$ in. to $\frac{1}{4}$ in. Slot the quarter from F through O.

Vamp Lining (Figure 38)—Follow the vamp pattern except in the throat where an allowance of $\frac{1}{8}$ in. at G and $\frac{3}{8}$ in. at F should be added.

Tongue (Figure 37)—Place the vamp on a folded edge and mark the throat and side curve; prick through O and F. Place net quarter on O with the facing parallel to the fold, add $\frac{1}{4}$ in. to the length for top of tongue. Design the tongue to be $1\frac{1}{4}$ in. wide at the top; follow the side curve, passing through F to $\frac{3}{16}$ in. above O. Allow $\frac{3}{8}$ in. underlay below G.

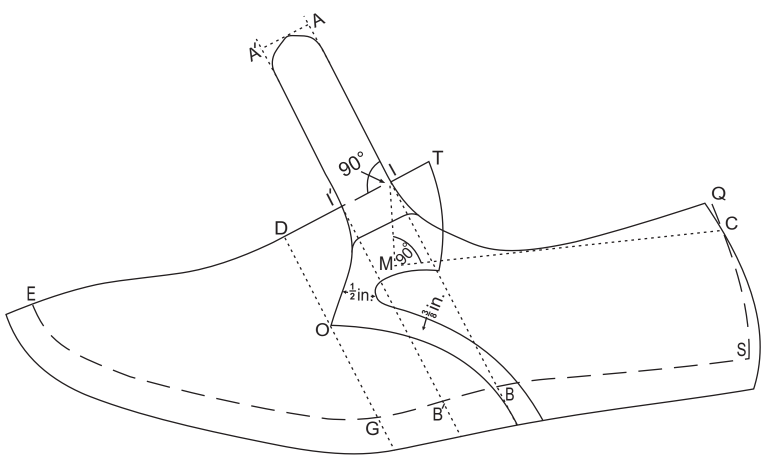


Figure 39. Monk shoe standard.

Monk Shoe Standard and Sections

Standard (Figure 39)—Trace round the mean forme. Find the instep by connecting CE, making CM = $\frac{1}{2}$ SL and erecting a perpendicular from M. Draw a line (AB) through I at right-angles to the instep line. Make A′B′ parallel to AB and $\frac{7}{8}$ in. below. Make DG parallel to A′B′ and $\frac{7}{8}$ in. below. Make DO = OG. Make CQ = $\frac{1}{2}$ in. Length of strap IA from instep = 3 in. Design the top curve from Q to I touching CM and blending with the straight strap line. Make top of tongue (T) $\frac{3}{4}$ in. above I. Add stiffener and lasting allowances.

Quarter (*Inside*)—Trace the back of the standard from D to G. Mark O and B. Design the front curve from I′ to O without a break at I′. Design the side curve from O to B.

Quarter (*Outside*)—This is as for the inside quarter except that it is reduced $\frac{5}{8}$ in. below and parallel to instep line.

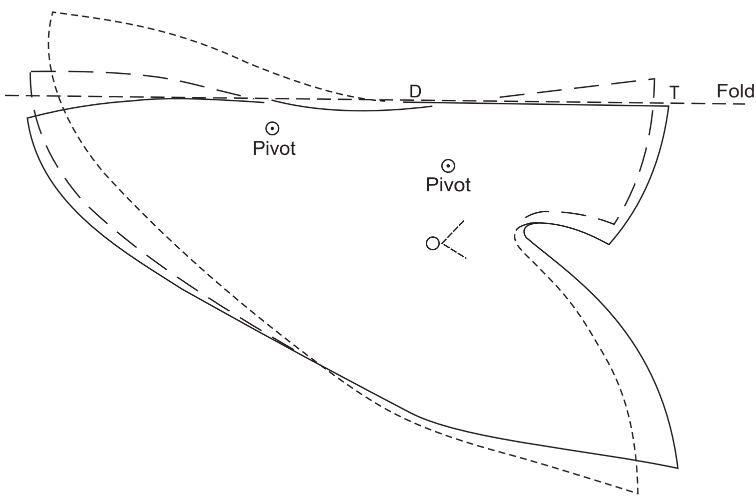


Figure 40. Monk vamp.

Vamp (Figure 40)—Cut a vamp to the front of the standard following, where indicated, the tongue line. Place the line TD on a folded edge and mark in the tongue. Pivot between D and O until the lowest point of the front curve is on the fold, mark the side curve and to the joint. Pivot $\frac{1}{2}$ in. below this fresh position until the ‘top of toe’ point is on the fold and complete marking.

Linings—The quarter linings may be cut in the same way as for the Derby shoe. In many cases the same pattern is used for both inside and outside linings, a separate bar piece being joined with a lap seam to the inside quarter. If the vamp lining is leather the outside pattern can be used. If, however, a fabric lining is wanted a separate leather tongue lining is cut, joined to the fabric with a lap seam.

Chukka Boot Standard and Sections

Standard (Figure 41)—XY = Base line. $\widehat{XYZ} = 90°$. YH = $\frac{3}{4}$ in. HC = $\frac{1}{5}$ SL. HT = 5 in. (Size 7, 1/8 in. between sizes). TL = $4\frac{1}{4}$ in. (Size 7, $\frac{1}{8}$ in. between sizes). LG is parallel to HT. LL′ = $\frac{1}{2}$ in. TT′ = $\frac{1}{8}$ in. Connect L′T′.

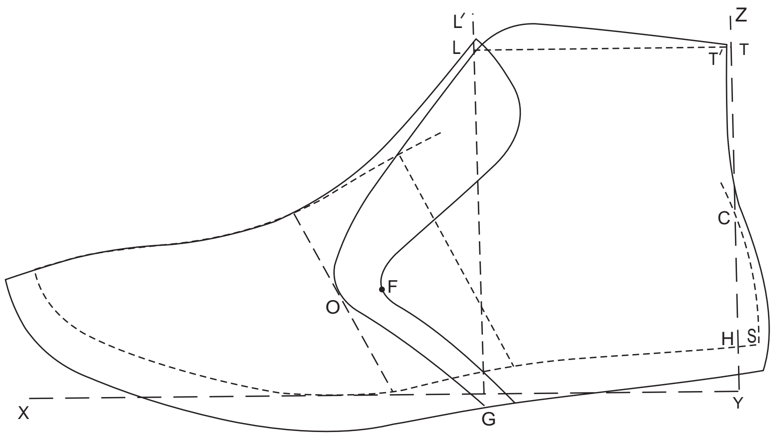


Figure 41. Chukka boot standard

Place the forme with the counterpoint on C and the joint resting on the base line. Trace in the outline. Design the back curve from T′ to $\frac{1}{8}$ in. behind C and $\frac{1}{4}$ in. behind S, keeping the curve between T′C full. Find the tab point (O) by following the instructions given for the Monk shoe, i.e. locate the instep, drop a perpendicular from the instep line and draw a line parallel to this and $1\frac{3}{4}$ in. lower. The front curve should be drawn in as shown in the diagram, noting that the top is generously rounded and then follows a more or less straight line, rounded off to the tab point and leaving the front well open. The side curve is only slightly curved to meet the line LG′.

It should be pointed out to the student at this stage that the measurements and proportions given are not unalterable. They are necessary to the beginner, enabling him to acquire the essential sense of proportion or appreciation of what a well-balanced design means. For example, the instructions just given will enable the student to cut a Chukka boot pattern, but there are many variations, in height of leg, in shape of the front, the number of eyelets, etc.

LADIES' SHOE STANDARDS AND SECTIONS

Court Shoe

Standard (Figure 42)—Trace round the mean forme and mark C. CV = $\frac{7}{10}$ SL. CQ = $\frac{1}{2}$ in. VJ = Joint line, passing through the inside joint position. VO = $\frac{1}{3}$ VJ. VV′ = $\frac{1}{8}$ in.

Connect QO and round off the throat curve to V′. The curve used should be related to the toe shape, i.e. the squarer the toe the squarer the throat curve. Add $\frac{1}{2}$ in. lasting allowance reduced to $\frac{3}{8}$ in. at the toe. Reduce the back by $\frac{3}{16}$ in. at Q and $\frac{1}{8}$ in. at C passing through S. This reduction is to allow for stretch in the materials being used. A backed leather such as suede would not be reduced so much.

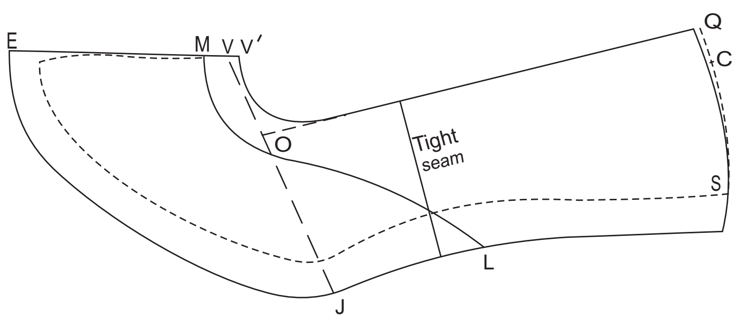


Figure 42. Court shoe standard.

Whole-cut Court— Place EV′ on a fold and trace round the standard from E to J. Pivot at O until Q is on the fold. Complete the outline. The throat curve will have to be adjusted. This pivoting reduces the area of leather that the pattern will cut into and has the effect of tightening the top line. On high-heeled shoes, however, Q will probably be above the line and either the pattern will be pivoted down and a further reduction made at the back or a three-quarter cut court will be made, joined with a tight seam in the inside waist.

Quarter Lining—V′M = $\frac{1}{2}$ in. L is midway between the joint and the back. Add $\frac{1}{16}$ in. seam from M to V′. Add $\frac{1}{8}$ in. undertrimming allowance from V′ to Q. Reduce at the back to form the stiffener pocket. Design the curve MOL to be $\frac{1}{2}$ in. wide at the throat and full to L.

Vamp Lining—Place EM on a fold; trace from E to L. Mark in the lining curve and allow $\frac{3}{8}$ in. underlay.

Heel Grip—Most court shoes have a suede heel grip. This may consist of a suitably shaped patch stitched on to the lining or a piece of the lining may be cut out and reversed.

Ghillie Shoe

Standard (Figure 43)—Trace round the mean forme.

SC = $\frac{1}{5}$ SL. CQ = $\frac{1}{2}$ in. CV = $\frac{7}{10}$ SL. VT = $\frac{1}{4}$ SL. WX = $\frac{1}{4}$ in. below VT. YZ = $\frac{1}{2}$ in. below WX.

Design the quarter curve from Q to T; add stiffener and lasting allowances. Mark on WX the loop positions, each loop to be $\frac{3}{8}$ in. wide with $\frac{7}{16}$ in. between each one. Draw lines through each point at right-angles to WX. A front loop is made above V, $\frac{3}{16}$ in. wide on the standard. Each loop is extended for $\frac{5}{8}$ in. above WX and in closing is stitched down about $\frac{5}{16}$ in. below WX.

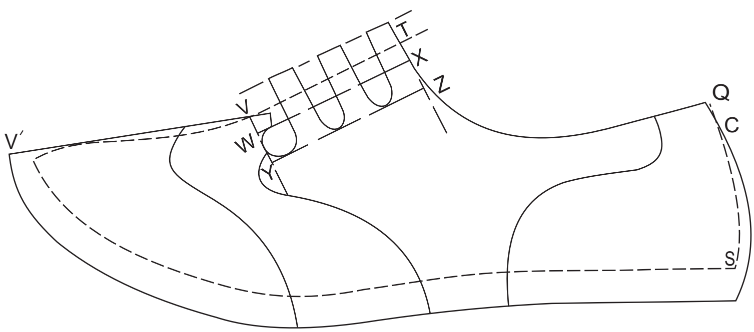


Figure 43. Ghillie shoe standard.

Ghillie shoes may be made whole cut, in which case the loops are cut separately. In the diagram a quarter curve has been drawn in and the shoe may, if required, be 'brogued' by the addition of wing cap and counter together with punching and gimping.

The lining may be cut $\frac{1}{2}$ in. in front of V as for the court shoe and up the line VT, having $\frac{1}{16}$ in. seam allowance added. This will hold the loops in place during lasting without their having to be laced. The surplus lining is trimmed away when the shoe is finished.

GRADING

Patterns for different sizes are obtained by making and proving a model, usually a medial size, and then with the aid of one of the modern grading machines, producing from the model the range of sizes and fittings required. Modifications of this straightforward procedure are described on pp. 98-9.

The grading machines give proportional enlargement where this is required, and this result is obtained geometrically by the use Of the properties of similar triangles (p. 95).

Hand grading is done, quite simply with triangles called the radial and restriction tools.

Hand Grading

These notes are intended only to provide practical instruction; a discussion of the principles involved will be found on pp. 95-7.

Insole Grading—Grade: length, $\frac{1}{3}$ in., width, $\frac{1}{12}$ in.

Cut an insole from a selected last and trace the outline on paper. Mark E and S and connect the two. Find the inside and outside joint positions and the breast of heel (Figure 44).

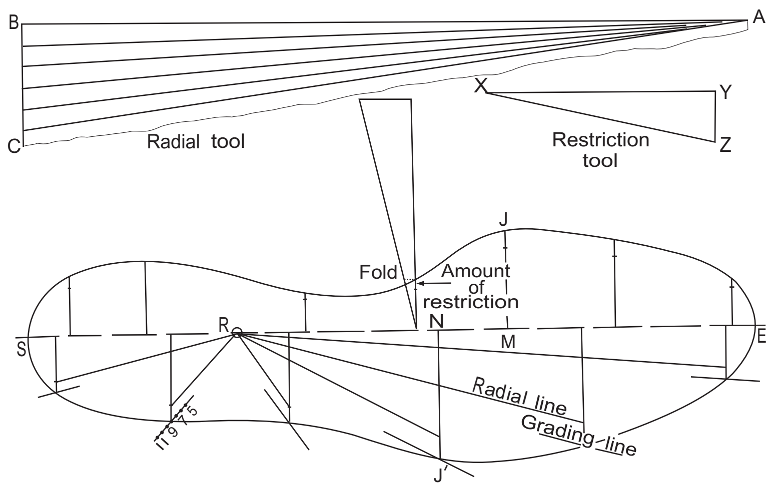


Figure 44. Insole grading, using restriction tool and radial tool.

The number of grading points used may vary but sixteen should be sufficient and they will be closest together where the curvature is greatest, i.e. at the toe, heel and inside waist.

Connect each grading point at right-angles to ES. These are the restriction lines.

Restriction Tool—This is a right-angled triangle. $XY = MJ + NJ'$ and $YZ = XY - \frac{3}{12}$ ES (Figure 44).

Place XY of the restriction tool on each of the restriction lines in turn with X on the line ES. Fold the tool parallel to YZ where it crosses the outline of the insole, and set off the width of the tool at that point along the restriction line measuring from the outline.

Select a radial centre (R). This may, in theory, be anywhere, but for convenience it is placed on ES.

Connect R to each of the restriction points, with radial lines and draw lines parallel to these through the grading points (grading lines).

Radial Tool—This is a right-angled triangle with the height (AB) equal to ES and the base equal to $\frac{1}{3}$ in. (Figure 44). To avoid moving the triangle for each size to be graded it is usual to mark as many $\frac{1}{3}$ in. as sizes required, *e.g.* in the diagram there are six.

Place A of the radial tool on R with AB along a radial line; fold the tool parallel to BC at the restriction point and along the fold will be found a series of divisions. These divisions represent the amount to be graded at that point. The grade should be marked on the grading line; the points nearest to R represent the smaller sizes. Repeat at every grading point.

When complete the stencil should be placed over a piece of paper and the sizes above or below the model marked, *e.g.* prick through each size 7 grading point and connect these points up with the model pattern. The size 6 points will be joined up with the size 7 pattern and so on.

Standard Grading

Trace round the standard to be graded. Find the width restriction by setting off along the line VJ the distance VK = $\frac{3}{12}$ EC.

Connect EK and continue the restriction line parallel to the standard to S′. The back of quarter is further restricted to give a grade of $\frac{1}{16}$ in and S′D = $\frac{3}{16}$ EC.

Select grading points as indicated in Figure 45 and transfer them where the grade is restricted. Make BA equal to S′D.

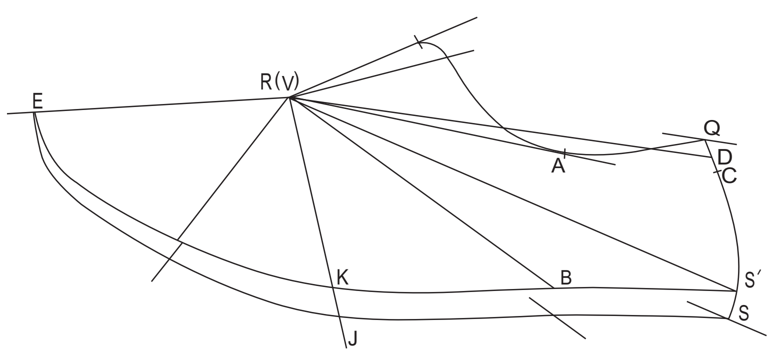


Figure 45. Standard grading: length $\frac{1}{3}$ in., width $\frac{1}{12}$ in.

The radial tool is made in the same way as for the insole grading with EC being the length.

The radial centre has been placed at V.

The procedure is from this point, the same as for insole grading.

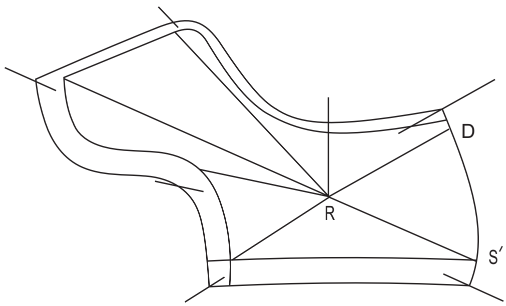


Figure 46. Section grading.

Section Grading

The radial tool is the same as for standard grading and the restriction line is taken from the standard. Figure 46 shows that restriction is made wherever pattern allowances have been added, i.e. folding and underlay allowances.

7
GENERAL

THE NOTES WHICH FOLLOW form brief discussions of many of the problems that have to be faced by the pattern cutter, and where possible, references are given in the Bibliography that will enable a student to continue his reading in the subject discussed.

DESIGN

More attention has been paid to the importance of design during the past few years than ever before and no attempt will be made to repeat what has already been well said. But although pattern cutting is not shoe designing nevertheless it does play a vital part in the production of a completed design, *i.e.* the finished shoe. The pattern cutter frequently has the responsibility of preparing for three-dimensional production a drawing in two dimensions that has often been executed with the object of attracting attention rather than to give technical information.

As has been stressed in Part I of this book the design of a shoe involves far more than the styling of an upper or the selection of materials; the complete design is only seen when the shoes have been made and the shape of the last used is just as important as the two factors of upper materials and style. The pattern cutter may not be in a position to select a new last for a style, but he must be familiar with the relationship between upper styling and last shape, since some modification of the style is often necessary to bring the two parts into harmony. A design is intended to have a certain effect, *e.g.* lightness, robustness, or in recent years, of ‘casualness’, and the last itself should have this effect. This effect must be inherent in the lines of the last and not only through the association of ideas; a last may be regarded as suitable merely because it has always been used for a particular type of shoe whereas a fresh approach would reveal that a different last would give a better result.

The pattern cutter should remember that if he is unable to use a last that blends with the style, then the style must be adapted if he is to produce an integrated design.

LASTS

As explained in the preceding section the last must blend with the style to be used and also it must be modelled so that the contours are harmonious and suitable for use with a certain type of shoe. There is ample scope for changes in appearance while still retaining the graceful lines that give a town shoe its sleek appearance and the more abrupt lines that give the sports shoe its robust look.

Economic factors may necessitate the use of one last for several different designs but even so the pattern cutter will find his work more effective if he realises that he is being asked to join two differing conceptions.

The student should obtain silhouettes of different last shapes and sketch simple shoe styles that are suitable for each. He should then try to switch styles from one last to another, noting the incongruities that occur and the modifications that are necessary.

FORME CUTTING

The shape of the last plays a great part in forme cutting and it may be that different methods of forme cutting should be used for different last shapes. In practice, however, experience and dexterity play such a large part in the successful cutting of formes that it is rare to find a pattern cutter who does vary his method in such a way.

The difficulties that arise in forme cutting are due to the varying contours of the last and the necessity of reproducing these on a flat surface. Forme cutting by measurement has been experimented with but the majority of methods in use today consist of moulding some flexible material to the last and marking its outline while so moulded. Inaccuracy is caused by the distortions involved either in moulding the forme material to the last, or in flattening it out again afterwards. The unceasing flow of new methods introduced is an indication of the difficulties involved in achieving a satisfactory standard of accuracy and consistency. The methods to be described have been selected either for their particular interest or their general use. In each case the last is marked as explained on p. 65.

Solid Forme

A flexible yet strong fabric or paper is generally used and after roughing out, the approximate shape is held to the last with the fingers while the last marks are transferred to the forme by a series of pencil lines. The use of transparent paper greatly facilitates this.

As the material is moulded to the last a number of wrinkles form, particularly about the joint line, and the effect of these wrinkles is to cause the toe of the forme to be twisted across the front of the last. If the forme is marked in this position the toe will return to its normal position when released and the result will be a ‘dead’ forme (Figure 47). Experience enables a pattern cutter to guard against this tendency and the method is one of the most widely used, particularly on low-heeled lasts where the tendency to be ‘dead’ is less serious and where the shallow curves do not present so many difficulties in moulding. A further point to be noted is that the compressive effect of the wrinkles results in a forme that is larger when the wrinkles are smoothed out, than the area of the last covered.

Slotted Forme

The method described on p. 66 is only one of the many versions of the slotted forme which range from fastening a solid forme to the last and putting in the minimum number of slots to the 'herringbone' forme which has $\frac{3}{8}$ in. strips left on each side of a central 'backbone'. These methods simplify the task of moulding the material to the last and the solid forme wrinkles can be eliminated. It should be noted however that the distortion now takes another form as the slots open and overlap thus giving a pattern which is in some places larger and in other places smaller than the corresponding section of the last.

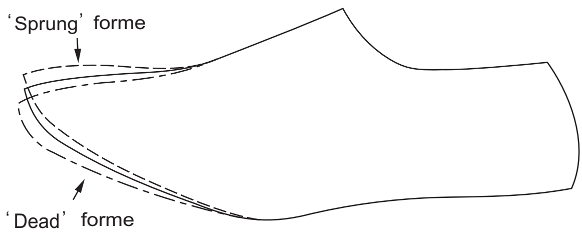


Figure 47. 'Sprung' and 'dead' formes.

The slots tend to open down the front of the last and the effect of this is to twist the toe of the forme away from the front of the last and when the toe returns to its normal position the result is a 'sprung' forme (Figure 47). Again, an experienced pattern cutter is able to guard against this tendency.

Blocked Forme

The object of this method is to obtain greater accuracy in the forme and thus get a better fit of the upper on the last. The last is fitted with insole, toe-puff and stiffener thus eliminating the necessity for making approximate allowances for these on the standard. A paper forme, whole cut, is tacked closely to the last, as many cuts being made as are necessary and the strips made are allowed to overlap or part. The surplus round the feather is lasted' over and stuck down. The tacks are then removed and replaced by strips of adhesive tape thus forming a complete shell over the surface of the last, the tape being prevented from sticking to the last by the paper forme.

The shell is then cut round the feather of the last, down the back and up the instep from the vamp point. On removal from the last the shape is retained.

The flattening process is the key to the whole operation and must be done with the greatest care. Cuts are made in the shell but except round the toe the strips must meet round the perimeter thus retaining the actual measurements of the last.

The amount of spring given to the forme varies with individuals and with the method of flattening. Experiment is necessary to discover the appropriate amount of spring for the different types of last.

It is claimed that the better fitting properties of this method reduce the amount of seam breakages in manufacture and that the uppers can be lasted more easily.

Geometric Forme

As already remarked, attempts have been made to overcome the distortion involved in moulding forme material to the last, by measuring the distance between selected points on the last and transferring to paper, gradually building up a complete forme based on accurate measurements. One advantage claimed for formes constructed in this way is that different people should get the same results. This method has never become popular partly owing to the extra time taken, (an objection which applies even more strongly to the blocked forme) and partly because it is believed that traditional methods give results which are as good.

Stretch and Substance in Forme Cutting

Discussion about accuracy in forme cutting has tended to overlook the great difference in substance and stretch in the materials used for shoe uppers. What is the advantage, so the argument runs, in gaining $\frac{1}{32}$ in. here or there in cutting the forme, when the upper may vary in substance and stretch enough to nullify a much larger saving? Until we have uniform material such small increases in accuracy do not affect the issue.

A method of forme cutting has been described by F. P. Wootton (see Bibliography) which is intended to allow for these two factors by using the actual upper material for the forme. The procedure is as follows. Formes are cut by an orthodox method and lining patterns are produced cut from the material to be used and lasted into position over the insole; toe puff and stiffener are also positioned.

A whole-cut upper with an instep piece inserted is prepared from the actual leather to be used and lasted over the fitted-up last. The feather line is then marked.

Experiment has shown that if the lasted upper is removed and flattened within 10 min. the permanent distortion is restricted to a small area over the top of the toes; elsewhere the leather regains its original shape.

Thus a forme is produced which allows for the substance and stretch of the material to be used, and the lasting allowance which is added is for lasting and not a combination of lasting, substance and reduction for stretch allowance.

Designing on the Last

One of the oldest methods of forme production was to use two pieces of basil cut to a forme obtained in paper, add a small lasting allowance and then fasten the leather to the last. This method has been revived with the introduction of the open type of shoe fashionable today, particularly those shoes with an upper consisting of straps. Inside and outside paper formes are cut and the shapes reproduced in leather. The two sections are zigzagged together down the front and back and then stuck down to the last.

When the leather has been stuck the pattern cutter designs his upper on the last thus avoiding one of the problems that arises when designing on the flat, that is, what effect will the contours of the last have upon the lines drawn. Removal of the leather from the last may result in some stretching so the 'shell' is coated with pyroxylin cement before attempting to take it off the last.

STANDARDS

The instructions already given for standard construction have consisted of definite proportions and measurements. Such an approach is quite suitable for styles that are not subject to the vagaries of fashion, although of course even a man's Oxford shoe varies slightly. The most noticeable changes as compared with some years ago are the widening of the throat to match the wide-toed lasts and the greater use of perforation. Neither of these changes affects the standard however, and the instructions given will not have to be varied within a few months. It has already been pointed out that the Chukka boot and, it may be added, the Ghillie style given, are not so stable; there are many versions of both. At the extreme end of the fashion trade we have a difference between each shoe produced and there can be no question of producing the standard pattern to some pre-determined measurements. Each style presents new problems which apply to that style alone.

It is worth while enquiring why certain styles have retained their popularity with such slight changes. Part of the answer lies, doubtless, in the reputed conservatism of men, but it is also likely that the styles themselves are fundamental in that they are reduced to essentials and are perfectly integrated. The Oxford shoe is, on this theory, a satisfactory design from the point of view of foot protection (given urban conditions), as an article of dress (appearance) and, lastly the dividing up of the sections into vamp, cap and quarter enables leather to be cut to the best advantage and lasting to be carried out correctly.

Shoe Standards

The proportions used in the production of an Oxford shoe are obtained primarily from a study of foot anatomy and movement. The depths of back and sides are governed by the position of the ankle bones and the necessity of keeping the shoe on the foot. The top of the facing must not be so high as to restrict the free movement of the ankle joint and the vamp position must be low enough to permit easy entry and yet high enough to clear the 'crease' line of the shoe, caused by the flexing of the foot. The cap depth must not rub the foot when the shoe is flexed. Obviously these requirements do not lead to definite measurements, and certain proportions, notably the vamp depth, may vary. For example a plain front Oxford should have a vamp $\frac{3}{16}$ in. shorter than one with a cap. Also shoes in the lower-priced ranges often have a shorter vamp as this increases cutting economy and enables leather with a smaller proportion of prime to be used effectively.

Ankle Boot Standards

The additional factor that must be considered is the relation between the foot and the leg. The leg should be at right-angles to the foot, but as the heel is raised this angle changes and of course the angle of the leg on the pattern must be changed accordingly. There are different methods of boot standard construction allowing for this changing angle or 'pitch' as it is called. Figure 48 illustrates one of these methods.

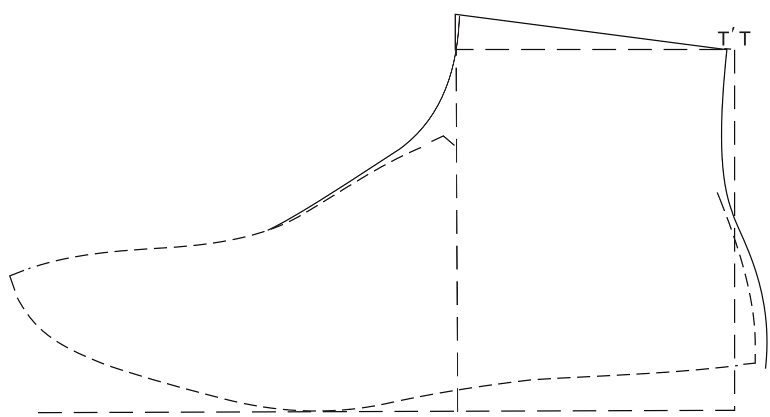


Figure 48. Ankle boot standard.

In the method of construction shown in Figure 48 it is assumed that a perpendicular through the counterpoint will be crossed by the back of leg curve at the ankle line. As the heel is raised the back of leg on the ankle line is in front of perpendicular. The distance then between T and T′ is the amount of pitch imparted to the pattern.

The pitch increases as the heel is raised and also with boots made from heavy leathers, since the forward tendency of the upper is less. The usual 'seats up' method of lasting tends to hold back the upper and therefore more forward pitch is needed than for a hand lasted (hoisted) upper.

High Leg Boots

When a boot that covers the calf is to be made two fresh factors come into the construction:

(1) the inclination of the front of the leg;

(2) in the case of riding boots, the pass point.

The line of the front of the leg curves slightly and the relationship between this line and the ground will vary as the heel is raised. High leg boots are usually made with low heels and the inclination line is often

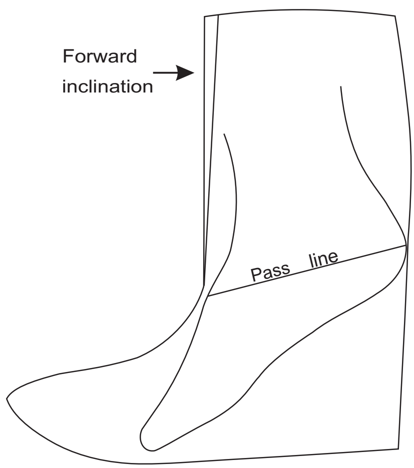


Figure 49. High leg boot.

made at right-angles to the ground, the slight curvature of the leg being disregarded. An alternative method puts the front of leg $\frac{1}{8}$ in. forward at the top, thus giving a slight forward inclination (Figure 49).

As the riding boot has no means of adjustment the leg must be made large enough to permit the insertion of the foot. This means that what would normally be the slimmest part of the leg, the ankle, must be made equal to, or slightly larger than the long heel measurement of the foot (Figure 49).

Fashion Shoes

Assuming that a design has been approved and that the pattern cutter now has the task of translating the drawing into a set of patterns, he may achieve this in two different ways:

(1) He may sketch the design direct on to a tracing of his forme, using some well-established measurements such as height of back, depth of vamp to assist him. (The design may require a short front, but the pattern cutter still needs to know the normal vamp depth to use as a guide.) Apart from these few basic measurements he must rely on his own sense of style in modifying, if necessary, the lines of the drawing, making them blend with the lines of the last. He will rely on his experience in making allowances for the effect of lasting on the lines and curves drawn on the flat paper.

(2) This method is described on p. 84. The shoe is designed on the last and the patterns obtained after the formes have been removed by pricking through on to paper. It has already been pointed out that the popularity of shoes with numerous straps, all of which need to be positioned very carefully, has made this method of standard construction an extremely useful one.

Inside and Outside Standards

When the inside and outside formes have been cut and compared, it may be found that there are very great differences between them, due to the shape of the last and the distribution of the wood. These differences are as follows: (1) the shape of the forepart, (2) the amount of spring, (3) the length, (4) the distance from back to vamp.

The difference across the forepart of the last can be adjusted very easily by cutting a mean forme and marking both inside and outside lines ready for transferring to the standard and sections.

The other differences are usually present to some extent and if not too marked a compromise can be made. If however the differences are very great it will be necessary to cut inside and outside standards.

The use of asymmetrical designs makes it necessary to produce inside and outside standards and the practice of designing these and other styles on the last has this effect.

When inside and outside patterns are being cut one of the most important differences that derives from the anatomy of the foot is the quarter curve under the ankle bones. The inside ankle bone is higher and further forward than the outside and the quarter curve can then be adjusted accordingly.

SECTION PATTERNS

Once the standard has been prepared the cutting of the sections does not, as a rule, present many difficulties. The actual tracing of the sections may be done with a blunt knife or by cutting along the section curves on the standard, leaving small ‘bridges’ to keep the standard

Intact; the sections are then obtained by marking through the cuts with a scriber and adding the necessary allowances.

Further adjustments may be made necessary in order to obtain greater economy, *e.g.*the wings of a vamp may be ‘sprung’ in towards each other in order to provide a closer interlock or an inconspicuous seam may be made in order to avoid having an awkwardly shaped pattern.

PATTERN ALLOWANCES

Tables 3, 4 and 5 give a simple and easily memorised list of allowances, but it should be noted that there are variations. The leather may be light, such as a reptile, but it is necessary to apply an adhesive backer that prevents nearly all stretching; under these

Table 3. Edge Allowances for Various Types of Edge and Different materials

Material	Allowance (in.) for types of edge				
	Folded	Gimped*	Bur-nished	Bagged†	Bound
Fabric	$\frac{1}{4}$	—	—	—	0
Light leather	$\frac{5}{32}$	$\frac{1}{8}$	—	$\frac{1}{4}$	0
Medium leather	$\frac{3}{16}$	$\frac{5}{32}$	0	$\frac{1}{4}$	0
Heavy leather	$\frac{1}{4}$	$\frac{3}{16}$	0	—	—

* The gimping allowance includes $\frac{1}{4}$ in. for giving a clean edge over the actual size of the gimp.

† The allowance of $\frac{1}{4}$ in. for bagging must be balanced by a reduction on the corresponding section (see Figure 72). The actual reduction may vary according to the curvature of the edge.

Table 4. Seam Allowances for Various Types of Seam and Different Materials

Material	Allowance (in.) for types of seam		
	Tight	Lap	Zigzag
Light leather	$\frac{1}{16}$	$\frac{3}{8}$	—
Medium leather	$\frac{1}{12}$	$\frac{7}{16}$	—
Heavy leather	$\frac{1}{8}$	$\frac{1}{2}$	—
Fabric	$\frac{1}{4}$	$\frac{3}{8}$	—

Table 5. Lasting Allowance for Various Methods of Lasting and Different Materials

Material	Allowance (in.) for methods of lasting			
	Hand	Welted	Machine Sewn	Veldt-schoen
Light leather . .	$\frac{6}{16}$	$\frac{7}{16}$	$\frac{8}{16}$	$\frac{9}{16}$
Medium leather	$\frac{7}{16}$	$\frac{8}{16}$	$\frac{9}{16}$	$\frac{10}{16}$
Heavy leather . .	$\frac{8}{16}$	$\frac{9}{16}$	$\frac{10}{16}$	$\frac{11}{16}$

circumstances a lasting allowance suitable for a heavy upper may have to be used. The converse of this can be found in the use of a heavy leather that is very stretchy.

In addition to this the lasting allowance is not the same from toe to seat. The practical instructions given show an increase of $\frac{1}{8}$ in. over the joints and leave the waist full, since the heel to toe tension set up makes the side pulls more difficult.

SPRING IN PATTERNS

This practice has been referred to several times and it can now be dealt with in some detail. The object to springing a pattern may be one of the following or a combination:

(1) to effect economy in cutting (Figure 50);
(2) to improve fit in lasting and therefore in wear (Figure 51);
(3) to make possible the use of certain sections (Figure 52).

The effect of springing a pattern, or changing the relationship between one part and another of the same patterns is to lengthen one line and shorten another. This effect is seen on Figure 51 where the springing is done for that purpose. The same thing happens in Figures 50 and 52 but is incidental since the springing is done for another purpose.

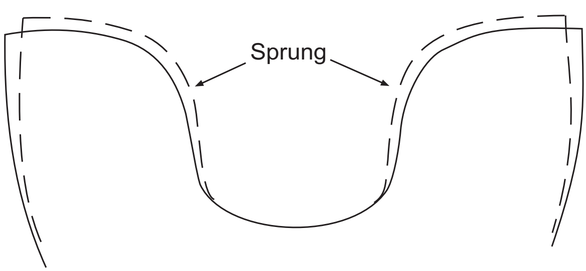


Figure 50. By springing, a closer interlock will be obtained.

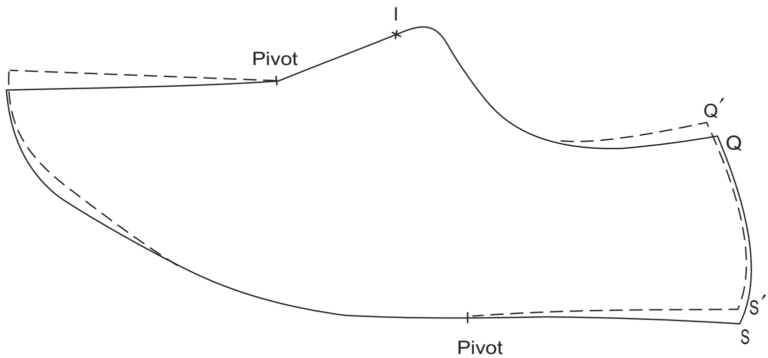


Figure 51. Springing the toe enables the laster to get the upper down to the last across the front; springing the back increases the tension along the top line.

In Figure 51 S′I and Q′I are shorter than SI and QI thus giving added tension when the back of the quarter is pulled down to its original position. The amount of spring ($\frac{3}{16}$ in. is suggested) must be applied with care since if the tension set up is too great the result may be burst seams in manufacture or a distorted quarter when the last is removed.

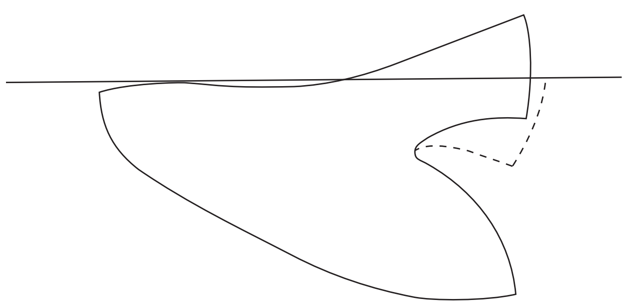


Figure 52. The tongue must be sprung in order to cut vamp and tongue in one piece.

PROVING NEW STYLES

The procedure adopted in producing a new range of shoes varies with the type of shoe and the extent of the size and fitting scale to be used.

The sample should be made on a middle size last since when the patterns are graded there is a danger that the desired appearance may become distorted if too many sizes have been graded from the model. In addition to this a style which looks most attractive on a size 4 may not look so well on a size 9.

When the sample pattern has been cut the following steps may be taken in preparing for bulk production:

(1) **Pull-over**

This is a form often used in testing out a new design. The leather selected is used and one odd shoe cut, possibly unlined. This quick test is intended to give a clearer idea of what the finished shoe will look like and may be used before the design is approved.

(2) **Samples**

This is a more prolonged and exacting test. The pair of shoes is cut and made throughout, watched and checked at every point since what is wanted here is not only a finished sample, but a report on the production of the shoe. Certain stages in making the sample may reveal unexpected hitches and these must be eliminated before the next step can be taken.

(3) **Pilot Experiment**

When the sample has been approved by both sales and production managers the patterns may be graded, not fully, but into the smaller and larger sizes and fittings. This test on a larger scale will show whether the grade is right, and provide a further check on production problems. It will also show whether the grading has resulted in any distortion of the proportion of the shoe.

(4) **Pattern Making**

Finally the patterns are graded in the sizes required and duplicated where necessary. Stitch markers are made and any clicking press knives, cut-out dies, *etc*., that are wanted placed on order.

An additional point that should be checked is the range of leathers to be used for the new sample. These should be tested to see if the same pattern can be used or if some modification is necessary.

PATTERN STANDARDISATION

The wide variety of shoes made today by the shoe manufacturer means that the number of patterns to be stored has been very greatly increased. This increase affects not only capital expenditure but also production speed, since modern methods of production are most effective when variety is reduced to a minimum. The urgency of standardisation is even greater when the considerably more expensive clicking dies are used.

The list which follows gives some of the advantages derived from the standardisation of patterns. Not all are of equal importance, but all should be considered:

(1) The outlay on patterns and knives is reduced.
(2) The storage space required is less.
(3) The clicker handles fewer patterns and can increase his output.
(4) The cost of cut-out and marking dies is reduced.
(5) Styles can be ‘switched’ from one last to another.
(6) Fewer stitch markers are needed, speeding up closing.
(7) Press cutting can be made economical.

Cost of Patterns and Knives

The cost of a pattern for a hand clicker is not great, in view of the number of times it will be used, and any saving on this ground alone is not likely to be worth while, since some sacrifice in accuracy or appearance is usually involved. When a die for the clicking press is affected the matter is different because of the much higher cost and the saving may be worth making.

Storage Space

Again any saving here on patterns is not likely to be of great importance, although this is not to say that such small economies should be ignored. The storage of press knives is very different. As far as possible these knives are stored near to the presses and there is space for only a limited number; economy of numbers is therefore essential, whether the knives are hung on boards beside the presses, placed on racks containing shallow shelves or kept in specially-made cabinets fitted with shallow drawers.

Fewer Patterns to Handle

The more patterns a clicker has to handle the less time will he be able to devote to cutting. Where the quantity being produced is large enough the practice is to use work tickets of, say, twelve pairs all the same size. This achieves the same result as a standardised pattern, as far as the clicker is concerned. Where this practice is not possible some saving can be made by using some sections in sizes only, *e.g.* caps. Another means is to use half fittings. Thus if 3, 4, 5 and 6 fitting shoes are being made the patterns may be graded into $3\frac{1}{2}$ and $5\frac{1}{2}$ fittings only effecting quite a large saving.

The press clicker gains even more from such practices because the knives he has to use are relatively more cumbersome and must be handled with greater care. A great advance has been made possible by the introduction of the double-edged knife eliminating the need for rights and lefts (see p. 131).

Cost of Cut-out Dies

The introduction of the Freeman and other cut-out presses (see p. 157) has resulted in the greatest demand for a standardised pattern.

The cost of these cut-out dies is so great that even where some adjustment for different sizes is possible the whole system of pattern grading has been modified to make one die do as much work as possible. This grading change is called centre grading and is described more fully on p. 99.

Using One Pattern for Several Lasts

In the fashion trade it is not at all unusual for an order to be received specifying a certain style but asking that it should be made on a different last. If the required last is completely different there is little that can be done except decide whether the size of the order is sufficient to justify making what is, in effect, a new shoe. If however the two lasts are not dissimilar, a little forethought and planning can make it possible for one upper to be fitted on to several different lasts. The way in which this can be done has been very fully explained by C. R. Wilkinson in a thesis called 'Rational Pattern Cutting', and every student is advised to study this carefully. There is not the space here to deal with the method, except to indicate the general approach.

Lasts are grouped according to their principal characteristic (heel height) and a master forme prepared from the individual formes for each last. The master forme is not simply one bigger than all the others; any individual forme that differs greatly may have to be treated separately or it may be possible to record the fact that the last needs a larger or smaller forepart than the others in that group. In the same way master standards are prepared so that different styles can be designed that may yet have some features in common.

An essential part of the system is the control of new lasts, to ensure that, as far as possible, a new last will fit into an existing group.

Stitch Markers

Although the cost of dies mentioned above is a more potent factor, the effect of the use of stitch markers on production has also been important (see p. 153). For a long time these machines were used solely to imprint guide lines on the upper for decorative stitching and punching. More recently the same method has been used for marking the lines of underlays on sections, thus providing the closer with a continuous line to work to instead of three or four widely-spaced small holes. The value of this change when linked with the 'held-together' method of closing is obvious.

At the same time if the marker and matrix had to be changed for each size the operation would be slowed up and again there is pressure for standardisation that will enable one marker to be used for several sizes.

Economy in the Use of Press Cutting

Owing to the cost of press knives the use of the press is not economical unless a sufficient quantity is to be cut, so that the advantage of speed outweighs the capital expenditure. If every style were completely different it would be impossible for any save the largest or most specialised factories to use clicking presses. If however steps are taken so that one pattern can be used for two or more different sizes of shoes the necessary quantity can be achieved (see p. 99).

CASTER SHAPES

Sole Shapes

The wide variety of shoe styles made in most shoe factories today involves a large number of different sole shapes. To make separate press knives or dies for each size and shape would be an extremely expensive undertaking, the storage space needed would be enormous and the press man would be obliged to change his knives frequently resulting in lower cutting totals. The last point is even more important when the varying qualities and substances found in any one bend are considered; it would be almost impossible for the press man to use the different knives so as to obtain even approximately the correct grade in all cases.

In addition, the sole for a welted shoe is rounded to shape on the shoe, since there can be no certainty that all shoes will be exactly the same shape as the insole channelling, lasting and welt sewing operations are partly governed by the quality of the material being used as well as the skill of the operator.

Master Shapes

If all the soles of a given size could be included in a master shape, the cutting and sorting of the cut stock would be greatly simplified. Such a measure of standardisation is seldom if ever practicable, because of the differences that are likely to occur between different sole shapes of the same size, but it is usually possible for three master shapes to be made covering the majority of sole shapes required; an extreme style may be treated separately if enlarging a master shape to include it would involve an undesirable amount of waste.

It should be realised that the use of master knives will involve more waste than the use of individual sole shapes, but this is outweighed by the factors listed above.

Two of the most important differences when grouping soles to obtain a master shape, are (1) the amount of 'twist' in the sole, and (2) the width across the tread. The shape of the toe may be the most noticeable difference but it is not the most important since caster shapes can be made with wide toes, using leather that would otherwise be wasted in imperfect interlocking.

When deciding on the range of soles to be included in any one master shape it is necessary to take into account not only the amount of waste involved but also the relative sales value of the different shapes, *e.g.* a sole pattern that is only likely to be required in small quantities would not be included in a sole master shape if its inclusion meant making the master shape larger, since extra waste would be involved on all the other shapes. These calculations can be made by a trial and error method, whereby the different shapes are grouped, examined and moved from one group to another until what is thought to be the best grouping is obtained. A more precise method has been evolved by the Research Association, whereby the different shapes are classified, a sales value given to each and the most economical grouping determined mathematically.

Caster Knives

The master shapes so obtained are marked out on a sheet of paper in the system to be used by the press man, and the inevitable waste between soles can be reduced by adding to the master outline until an almost perfect interlock is obtained, nearly all waste being made at the subsequent rounding operation.

This adjustment has the advantages that in some cases a larger sole shape can be included without additional waste, and the press man has a clearly defined system, which is simple to follow.

PRINCIPLES OF GRADING

Shoes, and therefore patterns, are made in different sizes and the pattern-cutter produces the range of sizes required by enlarging or reducing the model pattern which has been tested. This process is known as *grading*. In the factories a power grading machine is used, and by adjusting the setting of the machine patterns of any required size can be obtained. Hand grading is much slower, but demonstrates the principles on which all geometric grading is based; it will be noticed that on p. 77 reference is made to a radial and a restriction tool, both of which are triangles, and it is on the properties of similar triangles that all grading, whether by hand or machine, rests.

Properties of Similar Triangles

Triangles having their corresponding angles equal are said to be similar. Thus in Figure 53 the triangles ABC and DEF are similar because $\widehat{BAG} = \widehat{EDF}$, $\widehat{ABC} = \widehat{DEF}$, $\widehat{ACB} = \widehat{DFE}$. The triangles differ in size but are the same shape.

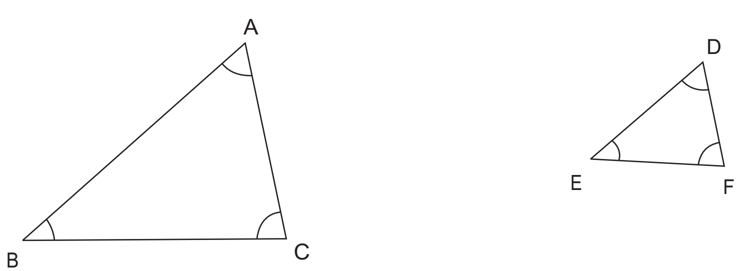


Figure 53. Similar triangles.

The important fact for pattern grading is that their corresponding sides are proportional, thus, AB : DE = AC : DF = BC : EF. Or, to give a simple example, if the difference in size is such that DE = $\frac{1}{2}$AB, then DF = $\frac{1}{2}$AC and EF = $\frac{1}{2}$BC.

Radial Projection

The properties of similar triangles make possible the proportional enlargement of any figure by means of radial projection. Thus in Figure 54*a* the figure MNOP is enlarged so that its perimeter is twice as long as before.

The enlargement is done by drawing lines from a radial centre R (which may be inside (Figure 54*a*) or outside (Figure 54*b*) the figure) through the points MNOP. If these radial lines are extended so that RM′= 2RM and RP′ = 2RP, then M′P′ will be twice MP, since RMP and RM′P′ are similar triangles and their corresponding sides are proportional.

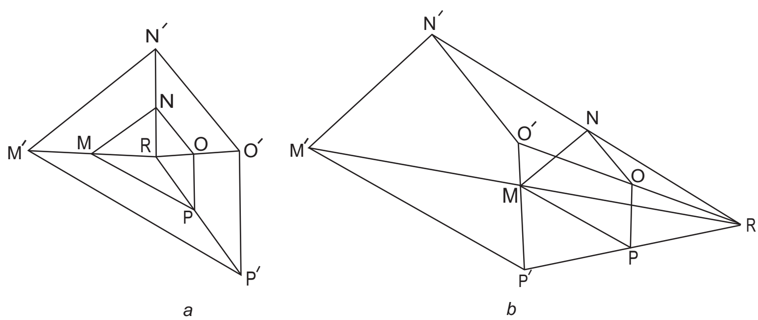


Figure 54. Radial projection

Similar considerations give the proportional enlargement of OP, ON, and NM. The two diagrams show that what is involved in each case is really four pairs of similar triangles. The triangles RMP and RM′P′ in Figure 54*a* are different from those in Figure 54*b* but the enlarged figure is the same because the proportions are the same, *e.g.* RP′ = 2 RP in each case.

The Pantograph

The properties of similar triangles are used in hand grading exactly as described in the preceding section, but for machine grading a mechanical device must be used to carry the principle into effect. The device is known as a pantograph, and the following explanation describes a pantograph which can be used to grade shoe patterns in the traditional sizes.

The pantograph illustrated in Figure 55 consists of four rods FA, AT, CP, BP, jointed at B, A, C, P. F is a follower, T a tracing point and P a fixed point. BP is equal and parallel to AC, CP is equal and parallel to BA, thus no matter how the device is moved, ABPC will always be a parallelogram. BF = BP = AC; CT = CP = AB. It can be shown by similar triangles that FPT always remain in a straight line.

If P is fixed to a table and the follower (F) moved round a figure, the tracing point (T) will mark out a similar figure. If the sections FB, BA, BP, PC, AC, CT are equal the figure traced will be exactly the same as the original or model.

If the sections CT, CP, AB are longer than the sections FB, BP, AC the figure traced will be correspondingly larger, and the ratio of the perimeter of the new figure to the original one will be the same as the ratio of BA to FB. Therefore any desired size can be produced from an original model by altering the length of the parts of the pantograph to the required ratio.

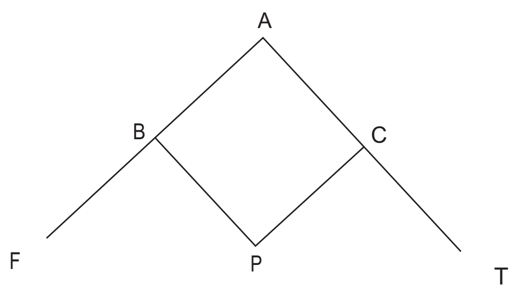


Figure 55. The pantograph.

Grading for shoe patterns can be done with a device similar to the one described if made to the necessary dimensions. Assume the length of a standard pattern to be 12 in. and the required increase $\frac{1}{3}$ in., this represents an increase in the ratio 36:37 (12 in. = $\frac{36}{3}$ in., $12\frac{1}{3}$ in. = $\frac{37}{3}$ in.) If the pantograph illustrated is made so that it is adjustable and a new setting made so that FB, BP, AC = 36 units and CT, BA, PC = 37 units a pattern 12 in. long can be enlarged by $\frac{1}{3}$ in. in length and proportionally in all directions, *e.g.* if at one point the width is one-quarter of the length the increase applied at that point will be one-quarter of the length increase.

In general terms, as the width or length of the part is to the length of the whole so the grade of the part is to the grade of the whole.

Example—Length of the whole 12 in. Grade of the whole $\frac{1}{3}$ in.
Length of the part (e.g. a cap) $3\frac{1}{2}$ in.
Let grade of the part be x

$$\text{Then } x/\tfrac{1}{3} = 3\tfrac{1}{2}/12$$
$$\therefore \quad x = \tfrac{1}{3} \times \tfrac{1}{12} \times \tfrac{7}{2} \text{ in.}$$
$$= \tfrac{1}{10} \text{ in. (nearest fraction).}$$

Restrictions

In pattern grading the increases are seldom left to proportional grading, but are fixed beforehand. The method of grading is unchanged but must be modified or restricted to give the required increase.

Example—Length of the whole 12 in. Grade of the whole $\frac{1}{3}$ in.
Length of the part $3\frac{1}{2}$ in. Grade of the part $\frac{1}{12}$ in.

It is obvious that the figures do not give the correct geometric proportion, therefore one factor, the length of the part, must be modified. To discover what length will give $\frac{1}{12}$ in. grade the following calculation must be performed:

Let y be required length

$$\text{Then } \tfrac{1}{12}/\tfrac{1}{3} = y/12$$

$$\therefore \quad y = \tfrac{1}{12} \times \tfrac{3}{1} \times \tfrac{12}{1} \text{ in.}$$

$$= 3 \text{ in.}$$

The difference between the actual length ($3\frac{1}{2}$ in.) and the restricted length (3 in.) is the amount of restriction, in this case $\frac{1}{2}$ in.

In machine grading an adjustment is made to the pantograph mechanism so that although the follower is moved round the original model the tracer applies the required increase of $\frac{1}{12}$ in. as if the part were only 3 in. long.

An example of the application of restriction to hand grading is given in Figure 44.

Further restrictions are applied to pattern grading when it is necessary for certain parts to be controlled in their size.

Underlays and folding allowances may be completely restricted so that no increase is applied throughout the range of sizes. The width of bars or straps is also controlled so that there is no increase. Lastly there is the use of co-ordinated and centre grading both of which involve the application of restriction to the model patterns.

Co-ordinated Grading

The name derives from the fact that the grade is primarily applied to lasts, and if the uppers are to fit correctly it is essential that the pattern grade should be modified in the same way.

Lasts graded normally would be enlarged in all directions when larger sizes were being graded. This would mean that the toe spring, heel height and waist curvature would change along with the rest of the last. The object of co-ordination is to produce lasts of all sizes in a range with the same toe spring, heel height and waist curvature, thus simplifying shoe making when selecting heels, shanks and stiffeners. Instead of grading from one model size all the sizes that are required, a few key sizes are graded and then wedged at the joint and breast of heel to bring the spring and heel height back to the model measurements. These alterations mean that the measurements on the lasts have been altered, but the model maker adjusts this, in effect creating not one but a range of models all having the same characteristics.

5	
3 ½ 4 ½ 5 ½ 6 ½ 7	Normal grading from one model size.
$3\frac{1}{2}$ 5 $6\frac{1}{2}$	Co-ordinated grading from three models.

Full co-ordination is not always practised, it being regarded as sufficient if the heel height alone is controlled. When patterns are graded for this co-ordination it is essential that the position of the back of the quarters should be controlled so that again, the same heel height is kept throughout the range.

Centre Grading

It has already been pointed out that normal grading involves the enlargement or reduction of all lines on a pattern. Further, it was noted that the increasing use made of cut-out and marker dies together with their high cost had led to a demand for a standardised pattern. Standardised in this connection, means patterns that retain certain features unchanged regardless of their size.

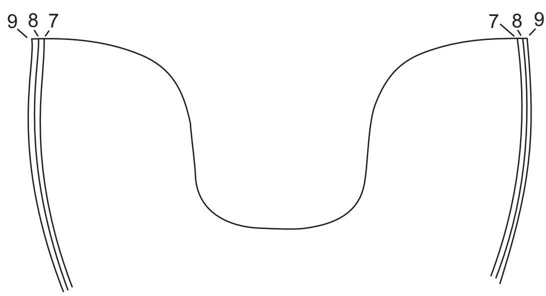


Figure 56. One die centre grading.

Centre grading may be done using, for example, one vamp curve for a whole range of sizes (Figure 56, one die). This is an extreme form and must involve an appreciable change in the appearance of the larger and smaller sizes. A better practice is to use two curves or even three (two die and three die grading). Examples of this grouping are as follows:

	One Die	*Two Die*	
Range of sizes in group ..	3 to 9	3 to $6\frac{1}{2}$ and	7 to 9
Centre grade size.. ..	6	5	8

	Three Die		
Range of sizes in group ..	3 to 5	and $5\frac{1}{2}$ to 7	and $7\frac{1}{2}$ to 9
Centre grade size.. ..	4	6	8

When centre grading is done the lasting edge and the back curve are graded normally to sizes and half sizes.

GRADING MACHINES

All grading machines are based on the principle of the pantograph (p. 96), most making use of a double-linked pantograph that enables length and width settings to be made. Modifications of this straight-forward grade consist of restriction devices that enable certain features such as underlays, folding allowances, straps, etc., to be kept at their original width and not graded up or down. Further modifications are necessary in order to produce the co-ordinated and centre-graded patterns already described.

The list which follows is not exhaustive but includes those machines in general use.

Hartford

This is a hand-operated machine that marks on card or cuts from paper the sizes required. The model is fastened to the bed of the machine and a follower wheel attached to one carriage is moved round the model. A tracer wheel on another carriage linked to the first then marks out the graded pattern. The machine is still used very widely by last manufacturers for grading the paper models used to check the accuracy of the graded lasts.

Reed

This machine is a power grader that cuts the patterns out at the same time as they are graded. Although newer machines have additional features it is claimed that the Reed gives adequate results.

Linham

This Swedish machine which is popular in this country is capable of giving all the refinements that are expected in pattern grading.

Universal

This is a BUSMC machine. The most recent model, the No. 2, is claimed to be the last word in pattern grading. The machine has a fixed base which carries the cutting mechanism and adjustable pivots for the two pantographs. The moving part or jack carries a frame to which is fastened the model and the pattern board or other material to be used.

The pantographs are fixed to the jack and also to the base at a movable point. As the jack can be moved in any direction it is clear that the pantographs will also be moved. A guide pin is situated at the centre of the pantograph bars and will therefore move as the jack is moved. The model is run round the guide pin which is not fixed but has its range of movement limited by the size adjustments made.

With a model size setting the jack is moved, carrying the model round a stationary guide pin, the pattern material follows the same line round the cutting punch. If a larger setting is made, the guide pin moves as the model passes round it with the result that the pattern material travels a greater distance, producing a larger pattern.

PATTERN MAKING

When a sample pattern has passed all tests and has received final approval it is sent to the pattern room along with instructions as to the range of sizes and fittings required, the sizes that may need to be duplicated or triplicated and (vitally important), the method of grading to be used.

Grading models are cut from sheet iron, checked with the greatest care, and the full range of patterns graded on one of the machines referred to above. If the patterns have been cut from card no filing or sandpapering will be necessary, except perhaps at the corners. The use of sheet iron or zinc for the cutting patterns complicates this, because although the graders will cut such patterns, most patternmakers prefer to avoid the strain on the machine and grade in stiff paper, cutting the metal patterns by hand with a pair of gap shears.

After grading the patterns are checked for the accuracy of the grade and then stamped with any details that may be necessary for identification. The information so put on the pattern will vary according to the coding used in the factory and the system of pattern storage. In most cases details of edge treatment, *e.g.* folded, gimped, will be stamped near the edge referred to and in the centre of the pattern will appear the size, fitting, last no. and style no. of the pattern. In some cases these items can be combined in a single code, the size only being separate. In this case the code number can only refer to that pattern on that last, and if the number is also printed on the clickers' instructions the danger of mistake is reduced.

Card patterns are now 'bound' with brass or steel strip. This tape may be bought ready moulded into a U-shape or it may be obtained in coils of flat tape and moulded as required in the factory on a strip-forming machine which also can be used to measure the exact length required for any pattern. The binding machine consists of two wheels and a guide, the pattern, with the moulded tape in position is placed in between the wheels and pressure put on thus clamping the tape on the pattern which is then 'fed' between the wheels. The tape may be secured by soldering the join.

If the clickers have to 'prick' the sections, small holes will be punched where necessary and protected by the insertion of an eyelet.

STITCH MARKING

The increasing use of stitch markers both for decorative stitching and for underlay marking has already been noted. This has meant additional work in the pattern room where the markers are prepared. There are, of course, a number of variations in the way these are made.

Differences in construction between the machines used are restricted to:

(1) the way in which the markers are fitted into the machine;
(2) the marking medium (usually marking ink on sponge rubber);
(3) the means of operation (by hand or foot).

The markers themselves vary considerably, but the following are among the best known:

(a) $\frac{1}{2}$ in. plywood is grooved with a special machine (or a closing machine fitted with a chisel instead of a needle) to the required depth, and a strip of $\frac{1}{4}$ in. phosphor-bronze tape inserted and pressed home. The board is often coated with shellac to help keep the tape in place and finally treated with varnish.
(b) A strip of metal, triangular in cross-section, is soldered on to a metal plate.
(c) The tape is held on to the board by means of small split pins which are clamped into holes punched into the board.

The matrix or bed on which the section to be marked is fitted usually consists of a sheet of card on to which part of the outline of the section cut from card is fastened.

Another method is to cut the outline of the section from one sheet of card and fasten the skeleton on to another piece of card.
The operation of stitch marking is described on p. 153.

PATTERN STORAGE

Undoubtedly the most satisfactory method is for the pattern store to be under the control of one man, who issues patterns to the clickers. The advantages may be claimed to be as follows:

(1) Patterns can be checked in and out, lessening the number of losses.
(2) Patterns can be examined and repairs carried out when necessary.
(3) The clicker is saved time.
(4) There should be no mistakes in the pattern used.

This method is not widely used, largely because the size of the average shoe factory makes it more economical for the clickers to be paid for finding their own patterns. A pattern system is therefore needed which will enable clickers to return a set of patterns to the correct place quickly.

One of the best methods of pattern storage makes use of metal racks into which are fitted bins holding the patterns. If the racks are clearly numbered and the bins numbered correspondingly a glance will show whether a bin is in its right place. Each bin is fitted with a small frame into which can be inserted a card carrying details of the patterns in the bin.

A system of coding which gives the patterns consecutive numbers will enable them to be stored so that locating any style will be easy and quick.

PART III

CLICKING

A. V. GOODFELLOW

INTRODUCTION

ALTHOUGH MOST SHOE FACTORIES are organised on a departmental basis this should not be allowed to obscure the fact that the making of a shoe involves a sequence of processes each of which affects, to a greater or lesser extent, other processes. The work done in the clicking room affects a greater number of subsequent operations than any other single process, and this fact alone is sufficient to justify the closest study. If leather is used, it is often so variable that great difficulty will be experienced in making the shoes unless the clicker is thoroughly familiar with his material, and thus able to make the best use of it. In order to enable him to do this every effort must be made to simplify clicking by purchasing materials that are suited to the shoes for which they are intended, and by careful sorting before issue. Even with this help the clicker must be a skilled craftsman, and a further check applied in the close scrutiny of his results.

Methods of cutting have been established by hand clickers, but the ever increasing use of the press means that traditional methods must be investigated to see if any modifications are needed in order to take full advantage of the new technique. Attempts are continually being made to introduce some uniformity into the material by the use of fabric backers, and where these are used some change in traditional cutting systems is possible. If a new synthetic and uniform material were successfully introduced the use of presses would be greatly extended, but it should be a point of special concern to all supervisors to ensure that practices perfectly adapted to hand clicking should not be taken over and used, uncritically, by the press clicker.

The cost of upper materials is such that the greatest care must be taken when estimating or checking their use. A systematic examination of the records kept is necessary in order to check the profit or loss that may be made on cutting, with the object of discovering the cause and finding a remedy if one is needed.

The section is concerned then, not only with the tools and technique of the clicker, but also with the buying and selection of the materials used, their special characteristics as they affect the shoe maker, with the methods of costing in general use and with the management of the room and leather store.

8
MATERIALS
CLASSIFICATION

A STRICTLY SCIENTIFIC CLASSIFICATION into animal, vegetable and, perhaps, synthetic categories would not prove satisfactory or particularly helpful since the materials used for shoe uppers may cut across these divisions. A more useful classification is under the broad headings as they are used in the trade, *i.e.* leather, fabric, synthetics.

Leather

(1) Mammals (domestic), *e.g.* cattle, goat, sheep, pig, horse.
(2) Mammals (wild), *e.g.* kangaroo, badger, deer, seal.
(3) Reptiles, *e.g.* snake, lizard, crocodile, alligator.
(4) Birds and fishes, *e.g.* ostrich, shark, sea leopard.

Fabric

(1) Vegetable, *e.g.* fabrics made of cotton, flax, jute, hemp.
(2) Animal, *e.g.* fabrics made of silk, wool.

Synthetics

(1) Rayon, *e.g.* fabrics made of artificially formed cellulose filaments.
(2) Nylon, *e.g.* nylon mesh fabric.
(3) P.V.C., *e.g.* materials made of polyvinylchloride.

Note: Although rayon and nylon mesh are both synthetic products they are included in the tables on fabrics because of the form in which they are used.

CHARACTERISTICS OF SHOE LEATHERS

The properties of leather as they are described on pp. 8-19 are a sufficient reason for its use as a shoe material, but there must also be considered the special characteristics of the skins that vary according to the kind of animal and with such differences as environment, age, sex and food.

The skins of younger animals are softer and more supple than those of the old, yet possess greater strength in relation to their substance and weight. The bull calves are more likely to be marked badly with growth marks and cattle that have been fed on cattle cake will have skins that are coarser and less firm than those from pasture fed animals. Again, the finest goatskins come from countries that provide poor pasturage, the skins being stronger than those from the richer fed animals. All these differences are of great importance when the quality, and therefore value, of the skin is assessed. The method of curing, or temporary preservation after flaying, also makes a lot of difference to the finished product; those skins that have the loose flesh scraped off and are then salted and left to dry will not soak back easily and the resultant leather tends to be harsh.

The great bulk of shoe upper leather is obtained from calf-skins and cattle hides, with goat and sheep coming next in order of importance. The different characteristics of the cattle skins are those of degree rather than kind, and the leather can be distinguished by the appearance of the grain*, and a 'feel' that is distinctive (particularly when it has been chrome tanned). Goatskins and sheepskins are quite different, but there is a type of sheepskin, the Persian, that occupies an intermediate position and cannot always be readily picked out, if mixed with the softer lining goatskins.

The wide variety of fancy shoe leathers, represented in the pages that follow by snakes, lizards, ostrich, *etc.*, are not used in large quantities, but they make it possible to select leather that is in keeping with the type of shoe to be made, giving perfectly adapted materials for footwear that range from miners' boots to the lightest shoes for evening wear.

Full Chrome Calf

The leather that is made from the skin of a calf, i.e. an animal that is still milk fed or has not been out to pasture long enough for the skin to become too coarse, and is tanned with chromium salts, is universally recognised as the finest material available for ordinary footwear. A full description of an ideal calf-skin will therefore provide a standard against which the value of other leathers can be judged.

Size—The 'spread' or area of a calf-skin may vary considerably since the definition given above (*i.e.* milk fed) is not always closely followed. Skins from 5 sq. ft. up to as much as 18 to 20 sq. ft. have all been described as calf-skins if the general standard of quality is suitable.

Structure—The fibrous structure should be strong so that the leather will not break easily. The strength should not fall away too much in the belly.

Grain—When folded grain inwards the creases formed, *i.e.* 'the break', should be small. Folded grain outwards and doubled, there should be no cracking, showing too tight a grain. The 'holes', *i.e.* sweat glands, and hair follicles must be small (fine).

Substance—The thickness should be greatest in the butt, with little variation over the rest of the skin.

* The trade name for the surface or outside of the skin.

Table 6. Characteristics of Calf and Cattle Skins

Leather	Origin	Size (sq. ft.)	Tannage	Substance*	Finish	Use	Characteristics
Milk calf	Milk fed European calf	4–6	Chrome	L.	Smooth grain or suede	Ladies' 1st quality	Extremely fine grain, soft supple 'feel', very elastic. Fine nap on suede. Bull calf coarser and liable to growth marks.
Calf	World wide supply, mid-European best in quality	7–10	Chrome	L.M./M. H.M.	Boarded grain	Men's and ladies' 1st quality	Slightly coarser grain, liable to bad growth marks. Very strong, elastic, plump 'feel'.
Veal	Skins from cattle not yet mature	11–20	Chrome	H.M./H.	Boarded grain	Men's 2nd quality	Coarser grain than calf, fibre structure is looser, giving a stretchy leather.
Kips	Small breeds of cattle, specially E. Indian	8–10 (sides)	Chrome	H.M.	Boarded grain	Men's 2nd and 3rd quality	A very firm leather, with a tight grain. Good cutting area.
Sides	Fully grown cattle	11—24 (sides)	Chrome Semi-Chrome Stuffed	H./XH.	Boarded or printed grain heavy suedes	Men's 2nd, 3rd and 4th quality	A rather coarse heavy leather with numerous defects, *i.e.* brands, ticks, warble holes, wire scratches.

* The letters used to indicate substance are abbreviations, *i.e.* L. = Light. M. = Medium. H. = Heavy.

Table 7. Characteristics of Goat and Special Leathers

Leather	Origin	Size	Tannage	Substance	Finish	Use	Characteristics
Kid	Milk fed	$1\frac{1}{2}$–$3\frac{1}{2}$ sq. ft.	Chrome	L.	Glazed, gold or silver kid	Ladies' 1st quality town and evening	Tight grain, recognised by regular pattern formed by hair follicles and sweat glands. Strong for its substance.
Goat	Best quality from hot countries	4–6 sq. ft.	Chrome Vegetable	L./L.M.	Glazed Moroccan grain	Ladies' 2nd quality town Slippers	Coarseness of the grain increases with size of skin. Soft leather, round grain formed by boarding in different directions.
Snake	India, Africa	1–3 m. (length)	Vegetable or synthetic	L.	White or slightly tinted	Ladies' 1st quality fashion shoes	Bold natural pattern distinctive of each type *e.g.* python, boa, karung; thin leather but hard wearing.
Lizard	East Indies	8–20 in. (width)		L.	Usually dyed	Ladies' 1st quality fashion shoes	No distinctive pattern other than the normal scales except in the case of the ring marked Java lizard. Strong.
Horse	European		Chrome or stuffed	H.M./H.	Smooth grain	Men's sports shoes	Horse fronts used in place of side leathers, rather coarse and tendency to looseness. Crup is a stuffed leather.
Kangaroo	Australia	8–10 ft.	Chrome	M.	Boarded	Men's and running shoes.	A hard wearing yet soft leather that resembles both calf and kid.
Ostrich	Africa			L.M.		Fashion shoes	A soft leather easily recognised by the prominent quill holes which perforate the leather.

Table 8. Characteristics of Principal Shoe Leathers (Linings)

Leather	Origin	Size (ft.)	Tannage	Substance	Use	General description
English calf	U.K.	7–10	Vegetable	L.M./M.	Men's and ladies' 1st quality	A firm plump leather, soft feel yet good wearing qualities. Natural or tinted.
E.I. calf	E. Indies	7–10	Vegetable	L.M./M.	Men's and ladies' 1st and 2nd quality	Similar to the above, tending to be harsher. Natural and tinted.
Kip sides		8–12	Vegetable	M./H.M.	Men's 2nd and 3rd quality	A firm leather, solid rather than soft, grain coarser than E.I. calf. Tendency towards loose grain on some. Natural or tinted.
Shoulders	Africa, America, etc.	6–10	Vegetable	H.M.	Men's 4th quality	Harsh, coarse grain, loose fibred structure. Natural or tinted.
Bellies	As above	4– 8	Vegetable	H.	Men's 4th and 5th quality	As the shoulder except that the leather is often more solid. Natural or tinted.
Goat	India	4– 6	Vegetable	L.	Ladies' 1st and 2nd quality	Light but strong. Usually glazed and dyed. May be identified by regular grain pattern.
Persian	Asia Minor	4– 6	Vegetable	L.	2nd and 3rd quality	Finished as above, but normally matt. A looser structure than goat and irregular grain pattern.
Sheep						
Lamb	Various	2– 3		L.	2nd quality	A soft white leather used in children's shoes.
Basil		6– 8	Vegetable	L.M.	5th quality	A coarse low grade lining.
Shearling		6– 8				Bootee linings.

'Feel'—This term refers to the way leather handles. Calf should be rubbery, indicating elasticity not mere plasticity, and 'plump' another term which means that the 'feel' is lively and of good substance.

Colour—The dye should have penetrated well so that there are no light patches.

Clear Grain—There should not be an excessive number of vein marks under the grain, and the surface blemishes should be few.

FABRICS

New uses for fabrics are continually being introduced into the shoe industry and there seems to be no limit to the variety that is available for different parts of the shoe upper. The simplest preliminary classification is into (1) outsides, (2) linings, (3) inter-linings. The last category includes a number of materials that are not true fabrics but are included because of their function.

Outside Fabrics

The increasing use of fabric for shoes of widely differing types has greatly helped the shoe designer by providing him with a choice of materials, whatever the style of shoe being designed. Slippers, sandals, evening shoes, and even bootees are all made with fabric uppers ranging from a plain heavy canvas through the gaberdines, corduroys and plaids to the brocades and satins. A definite advantage of fabric over leather is its uniformity which makes clicking much simpler, makes press cutting more advantageous, and results in uppers that will not vary in substance or stretch. Outside fabrics are usually combined with at least one other lining or backing layer to give added strength; in some cases a three-ply is used and no lining is necessary.

Lining Fabrics

The most important development of recent years has been the practice of using combined instead of single fabrics. The duck and drill single fabrics were usually supported by a swansdown interlining in the lighter shoes and this has resulted in a pre-combining of the two, reducing cutting costs and also eliminating a closing room operation. A combined fabric known as faille is used a great deal in the better quality shoes as its appearance is lustrous and attractive owing to the use of a rayon warp.

Interlinings

This category may be further divided into backers, interlinings, underlays and stiffeners. The backers are of the acme backer type (see Table 9) and are ironed on to cut sections in order to in-

Table 9. Characteristics of Principal Lining Fabrics

Fabric	Fibre	Weave	Use	General description
Duck	Cotton	Plain 1/1	Vamp linings, side linings and 'all fabric' shoes	A strong weave presenting a broken surface. Wide variation in quality, according to fibre and cloth specification used. May be heavily sized for side linings.
Drill	Cotton	Drill 2/1 or 3/1	Vamp linings	The weave gives a softer cloth than duck and the characteristic diagonal lines a more attractive appearance.
Swansdown	Cotton	Twill 2/2 or drill 2/1 or plain	Interlinings	A fairly open weave with a loosely twisted condenser weft which may be raised on one or both sides giving 'single' or 'double' swansdown.
Flannelette	Cotton	Twill or plain	Interlinings	Normally a condenser cloth raised with a short felted nap.
Combined linings	Cotton	Twill or plain	Vamp linings	Light to medium lining, bonded with latex or paste. Bottom cloth usually a swansdown.
Faille	Rayon and cotton or all rayon	Plain	Vamp linings and quarter linings	As above except that the top cloth has a rayon warp closely packed and a stout cotton weft, giving a rayon faced cloth with heavy ribs running from selvedge to selvedge.
Acme backer	Cotton	Plain	Backers	Backing cloth coated on one side with thermoplastic gutta percha and wax, or rubber/wax. Available in various weights and colours.

Table 10. Characteristics of Principal Outside Fabrics

Fabric	Fibre	Weave	Use	General description
Satin	Silk or rayon with cotton weft	Satin	Evening wear	The weave gives the characteristically smooth surface allowing the silk's lustre to be effective. Always combined to a cotton bottom cloth for strength and support.
Crepe	Silk or rayon	Plain	Evening wear	Hard twisted (crepe) yarns are used in the weft: these shrink producing the pebbled appearance. Usually combined to a cotton bottom cloth for strength and support.
Brocade	Silk, cotton, rayon, metallic covering	Figured	Evening wear	Additional silk wefts or gold or silver threads included to give a pattern. Usually combined to a cotton bottom cloth for support.
Canvas	Cotton	Plain	Sports	A heavy cotton cloth usually combined and waterproofed.
Linen	Flax	Plain or fancy	Spats and evening wear	A wide variety of cloths is produced by using fancy yarns and special weaves.
Corduroy	Cotton	Complex	Casuals and slippers	Ribs formed by a weft pile running the length of the material. Floats of the pile weft are bound in so that they may be cut by a knife.
Nylon mesh	Nylon	Knitted	Evening wear and inserts	Characteristic smooth appearance.

crease strength; the backers are made in various colours, weights and degrees of stretch. Single backing fabrics may also be stuck to whole skins before cutting, a practice used on light suedes. Interlinings do not increase strength appreciably, but are used to give a softness and plumpness to thin leathers; swansdown and flannelette are the usual materials. The perforated uppers common today have underneath the holes pieces of light, suitably coloured fabrics, such as croydon and suedene (used under suede uppers). Stiffeners such as tufsta, and buckram are used in the first instance to strengthen weak places in the upper e.g. seams at the back of the shoe and, on sliplasted shoes, where the upper is stitched to the sock. Buckram is used as a stiffener of, for example, a tongue that forms part of the design.

Tables 9 and 10 give brief descriptions of some of the principal shoe fabrics.

SYNTHETICS

Sheet plastics, as used in the shoe industry, have not proved very popular, largely owing to the fact that they are impervious to air and water-vapour. Used in a shoe upper they should comprise 50 per cent or less of the total area (see p. 12).

Although available plastics have had these disadvantages however, it should not be assumed that such impermeability is a characteristic of all plastics. As synthetic materials, plastics can be made with very different properties, and if the demand were sufficient it is quite possible that a porous plastic could be developed.

Strips of plastic have been used on sandals and the bright attractive colours have made them particularly suitable for this type of footwear.

A third use of plastic for upper materials is the practice of coating leather with a resin emulsion which when plated gives a high polish. Such leather has the advantage that it can be cleaned easily but the impermeable coating may give the leather the same disadvantages as those of plastic sheet.

Perhaps the most important development will prove to be the use of plastic coated fabric as an imitation leather quarter lining.

9

CLICKING TECHNIQUE

APART FROM THE USE of the knife, the clicker's technique is entirely governed by the quality requirements of a shoe and the characteristics of the material to be cut. The shape and variations in the leather or fabric, the different pattern shapes and the quality requirements, all combine to form problems which vary with each change in one of the conditions. The last of the three factors does not vary to any great extent, although subject to modifications. The shape of the pattern presents a problem that, experimentally, with some ability, can be solved. The clicker tries to find an arrangement of the patterns that can be repeated and does not result in unnecessary waste between the patterns. The variations met with in the material are most diverse in leather and this material calls for long experience if the best use is to be made of its special properties. More uniform materials such as the fabrics are not so difficult to handle since once a pattern system has been devised that takes account of the width of the fabric and of the direction of warp and weft threads, a little care will enable the clicker to repeat the system as often as he wishes. An analysis of some of the customary systems serves as an introduction to the more complex systems necessary on leather.

The variations met with can be defined and, in a sense, standardised for training purposes so that 'ideal' pattern lay-outs can be devised that avoid waste, and make full use of the quality in the leather while allowing for these variations. In practice, these lay-outs would need considerable modification, but they do supply a starting point for further study based on the characteristics of individual skins.

The technique in using the clicker's tools is rather summarily treated below but it is, of course, important though more easily mastered than the other aspects of the craft treated at greater length in these prefatory remarks.

Equipment

The equipment of the hand clicker is very simple, but not all clickers are equally adept at keeping their tools in good condition.The board on which the cutting is done is made up of small blocks of wood clamped together so that the knife edge cuts across the grain giving a greater degree of control than would be possible if the cut followed the line of the grain. If too much cutting is done and too little attention paid to maintenance the surface becomes rough and 'picks-up', *i.e.* small pieces of wood become detached leaving a very rough surface which hampers the free movement of the knife. The board should be scraped (buffed) regularly with a broad flat scraper or buff knife to remove the top layers of wood on which the cutting has taken place and then dressed with boiled linseed oil which is absorbed by the wood and causes it to swell, closing up the cuts which were too deep to be buffed off. It follows from this that the expert clicker does not cut too deeply into his board, exerting just enough pressure to sever the material.

The knife used most widely is the ‘American handle’, a type which can be fitted with knife blades that are renewed or changed when necessary. A change of blade is necessary when the clicker has to cut different material. For example the heavy or thick leathers are best cut with a blade that is curved, as the strength exerted by the clicker is aimed at pulling the blade through the leather and the curvature of the blade ensures that the cutting edge is nearly at right-angles to the surface of the leather. Such a blade used on thin leather would result in dragging or rucking the leather and probably forcing the point too far into the board. A straighter blade results in some downward pressure being exerted, thus helping to keep the leather in place.

The blade is usually shaped on a Carborundum grindstone and kept keen and smooth with a ‘rifle’ or ‘emery bat’, alternative names for a piece of wood with emery paper and greased leather attached.

Prick holes for closing guides are made with an awl and a crayon is used for marking the different sizes and fittings.

CUTTING FABRICS

Fabrics are supplied in rolls varying in length and width, although a roll of lining fabric would probably be 100 yd. long and about 36 in. wide. The only limitation of shape or size that need be considered then, is the width. The structure of all fabrics consists, basically, of sets of yarns running at right-angles to each other and interwoven in different ways. The yarns running the length of the fabric are called ‘warp threads’ and are made strong so that they stand up to the tensions set up and the friction incurred in weaving. The yarns running across the width of the fabric are termed ‘weft threads’ and need not be as strong, although some shoe lining fabrics are deliberately woven with weft threads as strong as if not stronger than the warp threads, a sufficient reason for having new fabrics tested before use.

The weft threads usually stretch more than the warp since the ‘crimp’ imparted in weaving is first pulled out.

The patterns, as they are placed on lining fabrics should be in one of three positions: (1) with warp threads in the heel to toe direction; (2) with weft threads in the heel to toe direction; (3) placed on the bias. For many years the ‘warp’ system was regarded as the only good one since the strength of the warp threads made it possible to set up a good heel to toe tension in lasting. Unfortunately the lack of stretch in some of the fabrics led to breakages and the practice grew of cutting with the weft threads from heel to toe which gave a greater degree of plasticity, or even with the bias in the heel to toe direction, a method which avoided breakages but was criticised on the grounds that the linings tended to be loose because little tension could be set up. The increasing use of combined fabrics has led to the wide use of bias systems since only thus can sufficient stretch be obtained.

The different patterned fabrics used for outsides result in a modification of the simple lining systems, since the patterns must be placed so that the pattern is correctly positioned on the shoe upper.

The illustrations given are of the structure of a simple fabric (Figure 57), a warp system of cutting (Figure 58), a weft system

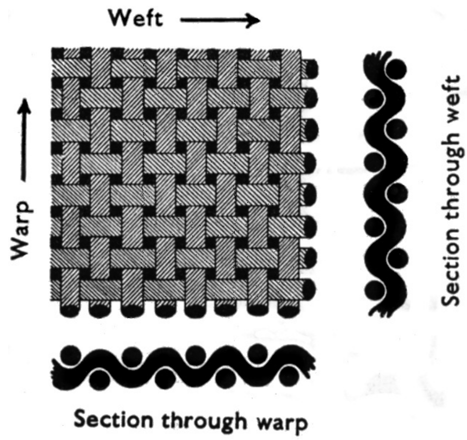


Figure 57. Plain weave as used in duck lining. Warp and weft interface alternately.

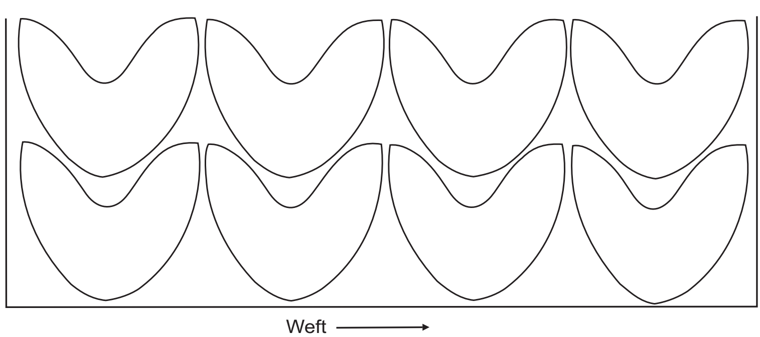


Figure 58. Warp system of cutting. In this and similar diagrams the space between patterns is much greater than that actually allowed in clicking.

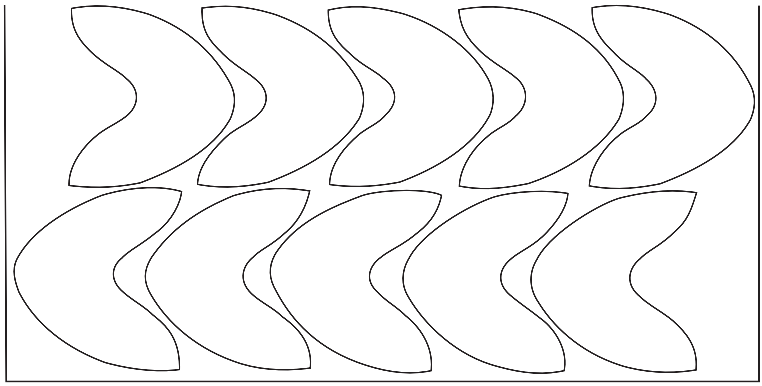


Figure. 59. Weft system of cutting.

(Figure 59) and a bias system (Figure 60). The patterns used are for vamp linings.

The warp system shown in Figure 58 is probably the simplest of the fabric systems. Other warp systems have alternate patterns reversed through 180°. The most effective system is the one that has the least waste and therefore the system used may vary with the size and shape of the pattern.

The bias system (Figure 60) has the advantage that by small alterations in the angle of the pattern, different sizes can be cut without changing the system or making much waste.

If an angle of 45° is maintained a considerable amount of waste is made along the selvedge, but a reduction of this angle can eliminate this waste. The initial waste (marked A) is not repeated until another cut edge is reached.

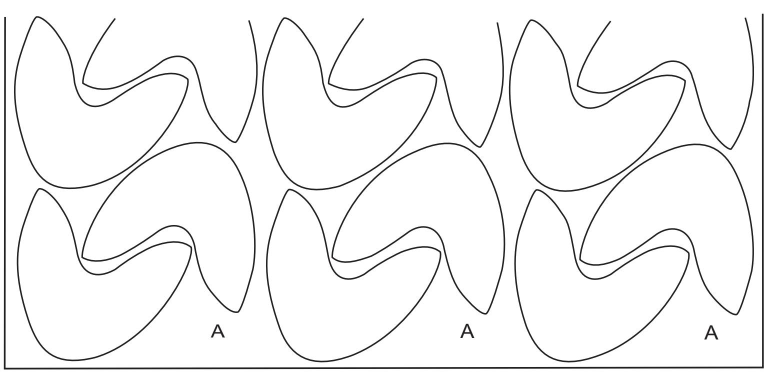


Figure 60. Bias system of cutting. A is the initial waste, which is not repeated.

VARIATIONS IN LEATHER

The characteristics of leather from different animals have already been outlined, but before commenting on the ways in which the clicker uses his material to the best advantage it is necessary to examine the variations between the different parts of the same skin. The differences vary with the type of leather, but the three outstanding ones are those of quality, substance and stretch.

Quality—The term covers a number of different properties among which may be listed texture of the grain, structure of the leather and surface defects.

Substance—This refers to the thickness of the leather which will be found to vary more on medium size calf-skins than on larger skins which are shaved in the tannery.

Stretch—This is one of the 'hidden' differences that must be closely watched since any error in judgement can easily result in an upper that is seriously distorted.

A calf-skin is used in the examples given.

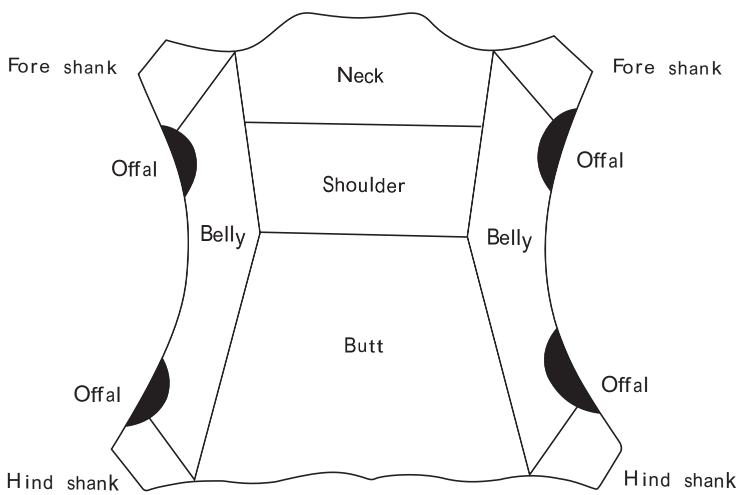


Figure 61. Diagram showing different sections of a skin.

Figure 61 has the virtue of being easily memorised, and it will be used as the key for the description of differences in quality and substance; it is, however, only a diagram and the student must always remember that there are no sharp lines of division on the actual skin.

Variations in Quality

The leather in the butt is the ideal from the shoemaker's point of view being relatively free from surface defects of any kind, of a strong character and with a fine texture in relation to other parts of the skin. The lines drawn in Figure 61 show the extent of the leather that can be regarded as of this first quality, but there are, of course, differences even here. The leather near the bottom is lighter and of a less compact structure. That part of the butt which adjoins the belly or flank begins to take on some of the character of the belly, i.e. the leather stretches more easily and the 'break' (i.e. creases formed when the leather is pinched, grain inwards) becomes larger. Towards the shoulder the falling off in quality is less noticeable, but growth marks often create serious problems if they extend far into what should be butt leather.

The shoulder comes next in order of quality since it has good wearing properties. Disadvantages here lie in the fact that the leather is so often badly affected by growth marks and other defects. There is usually a small area on either side of the backbone that is free from these blemishes and the extent of this area governs the use made of the leather and the way in which it is cut.

On a calf-skin the neck and belly are very different in appearance, strength and texture and yet it may not always be a simple matter to decide which is the better quality. The neck is undoubtedly the firmer, stronger leather of the two, but the belly may be clear, i.e. free from defects, whereas the growth marks on the neck are often very deep and disfiguring. The neck may be classed as third in quality following the butt and shoulder, on the grounds that it is a firmer stronger leather than that found in the belly. The belly then takes fourth place.

The shanks vary considerably in length and in quality. In some cases they are useable and may be classified as fifth quality leather, whereas in others much of the shanks must be classified with the shaded patches of offal which occur just inside the legs, the armpit and groin as it were.

Variations in Substance

The lines of demarcation follow closely those used for the quality divisions, and indeed the two are very closely linked. The butt is the thickest leather with a gradual loss of substance towards the shoulder and belly. The neck is often slightly thicker than the shoulder, and the shanks are usually thin. The order of substance is not of great value because it can vary so much. Once the butt has been accepted as the thickest, the remainder can vary from skin to skin. For example, the belly may, in some cases be slightly thicker than the neck, and yet the neck leather is so solid in structure that there is no comparison in their wearing qualities. Again the shoulder may be a little thinner than the neck but its superiority in quality again more than cancels out this slight difference.

The student may be reminded of the remark that the clicker is guided by certain general rules, but must modify them according to the unique character of the skin in front of him.

Variations in Stretch

A skin that did not stretch at all would make movement impossible, and from this necessity of some stretch it follows that we should expect to find the greatest amount of stretch where the amount of movement is greatest. This, in the animal, is obviously near the legs, in the belly and across the neck. Tests on a piece of good quality chrome calf-skin will

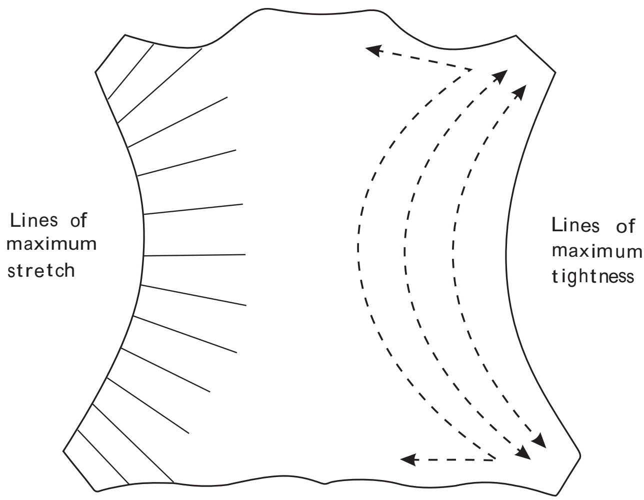


Figure 62. Variations of stretch and tightness.

show that there is no part of the skin which does not stretch, but that in some places the amount of extension is considerable and permanent and in others, slight and temporary.

The lines on the right-hand side of Figure 62 show the direction in which the leather provides the greatest resistance to stretch. The butt is not marked, for here there should be little difference in stretch in any direction.

The lines of maximum stretch drawn on the left-hand side are intended to show where the greatest amount of stretch occurs. There is, of course, some stretch in the butt, and in every direction, but it is along the lines drawn that the greatest amount of stretch is found and particularly in the shanks.

The differences given above are common to the great majority of skins used for upper leather. There are others, restricted to certain types of skins, for example, differences in shade and pattern; these are described at greater length in the sections on leather sorting and special techniques in cutting.

CUTTING LEATHER

The Shoe Upper

The variations found in the same skin mean that the clicker must exercise considerable care in placing his patterns. Before he can do this he must know not only what those variations are, but also what is expected of the different parts of the shoe upper.

The front is easily the most conspicuous part of a made-up shoe, and it is essential that it should be of good quality and appearance. Further back

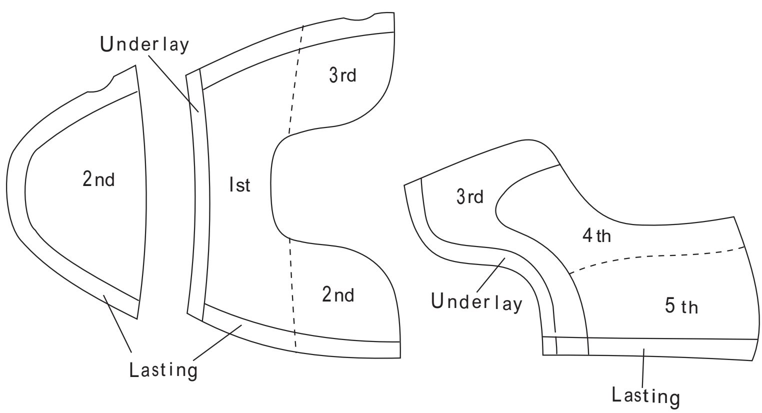


Figure 63. Qualities of leather required for toe-cap, vamp and quarters.

the flexing of the foot sets up considerable tension and leather of poor quality would soon crack and break under the strain. As this part is also easily visible, it follows that not only do we require leather with good wearing qualities but also a good appearance, i.e. free from blemishes. The facing of a tie shoe must be strong enough to withstand the strain of lacing and to hold the eyelets securely in position. The top edge of a shoe must be solid enough to keep its shape without any strong reinforcing, but the presence of a stiffener supports the back of the shoe, so leather that has less substance can be used. Lastly it should be noted that the inside of the shoe (particularly the inside waist) is less noticeable than the outside, so the clicker will try to place his patterns so that the poorer quality comes on the inside. This is particularly important when cutting the quarters.

Quality Requirements

When the shoe upper is divided into sections, familiarity with the quality requirements described above will enable the clicker to place the patterns correctly even though their shape may be new to him. The variations he will meet with mean that no section is equal in quality all over, and in some cases the difference will be considerable. Where this is so, the clicker must be able to place the section so that the better quality leather will occur where it is most needed. He must also remember that the different sections will be joined together after he has cut them and therefore there must be no sudden change in quality from one section to another along the line of the seam. This is also of importance for the strength of the seam.

The portions marked in Figure 63 which represent the underlay and lasting allowances are not seen, and any leather can be used, regardless of appearance, so long as it is strong enough to withstand the strains of lasting and to hold the closing seams securely. The divisions shown are, of course, arbitrary ones; a vamp cut from the centre of the butt will be of

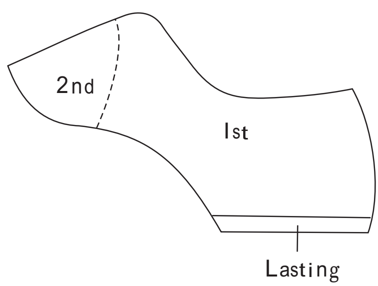


Figure 64. Qualities of leather required for quarter lining.

first quality throughout, but in many cases decisions will have to be made which correspond to the distribution illustrated.

Comparing the different qualities of the different parts of the skin and the requirements of the shoe upper it will become apparent that on a skin of average quality the vamps will be cut from the leather that is both good to look at and hard wearing, i.e. the butt. The caps must be clear and, where it is not marked by growth marks, the shoulder is used for the purpose. The remainder, neck, belly and shanks must be used for the quarters where the quality is good enough.

The requirements for a quarter lining (Figure 64) are rather different. The front or ‘nose’ of the quarter is completely hidden unless the shoe is specially unlaced and examined.

The back receives the greatest amount of wear and is easily seen; it must therefore be cut from the best available material.

Lines of Tightness

A last and most vital point before beginning to place patterns on the skin is to remember that all major sections must be cut tight to toe. That is, the lines of tightness must run in the heel to toe direction. The importance of this rule will be realised by anyone who watches a shoe upper being pulled over the last (see p. 278). In machine lasting the upper is first secured at the back and then placed in the machine and pulled down to the last. The pair of pincers which grips the toe takes the strain first and sets up a very great heel tension. Any weakness in this direction will mean that the weak part will stretch more than the others, even if it does not actually break. This distortion means that the proportions and lines of the upper are thrown out of true. A very common fault is to find that one quarter (the quarters are cut from the part which stretches most) stretches more than its fellow with the result that one side of the upper is larger than the other. The laster must keep the cap or vamp straight and as a result the back-strip is twisted to one side. There are numerous other distortions that may occur, not only in lasting, but also in closing, although the latter are more likely to be caused by leather which stretches too much in the transverse direction. Any naturally stretchy leather should be reinforced with a fabric backer. The lines of tightness and the rule, cut tight to toe, do not apply when the leather is not likely to stretch very much in any direction, *e.g.* in the butts of good quality skins, or, as already stated, where a fabric backer has been applied.

Pattern Systems

Owing to the irregular shape of upper patterns it is inevitable that some waste should be made when fitting them together on the skin. The more intricate the shape of the pattern the more waste will be made, and this waste will, when the butt is being cut, be the best in quality. The pattern cutter should test his patterns to see how much waste will be made, and make adjustments where possible, but he must retain the essential features of the design and the two requirements are often contradictory. The clicker should experiment to find the way of fitting patterns together which throws the smallest amount of waste and then repeat the arrangement so far as the leather will allow. This method of placing or pattern system should be established and used wherever possible. Examples of pattern systems were given when illustrating the cutting of fabrics and the methods given there are true systems in that they may be repeated indefinitely in any direction. This may seem a strange demand when leather is so variable in quality and limited in area but the object is to ensure that the system which results in the least waste shall be found and used.

The area and shape of the skin must play a great part when deciding which pattern system to use. On large skins or sides an arbitrary system can be applied, but on small calf- or kid-skins the system must be qualified as the most economical for that pattern on that particular skin, since most of the waste is likely to be caused by the restricted area.

The examples of pattern placing which follow consist of systems that may be used on skins of different types that can be regarded as ‘ideal’, that is, there are no serious surface blemishes and the extent of butt *etc*. is normal. Such lay-outs must, of course, be modified when cutting imperfect leather, but they are examples of ideal lay-outs and as such, are of greater use than lay-outs adapted to an imperfect skin.

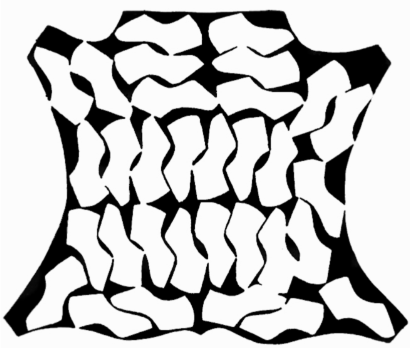


Figure 65. Small calf-skin with quarter lining lay-out.

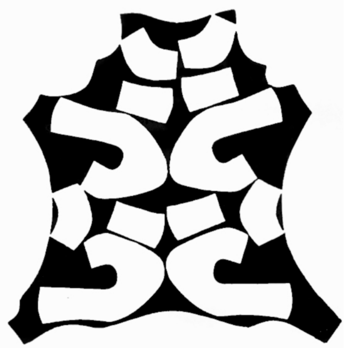


Figure 66. Goatskin with three-quarter court shoe and heel cover lay-out.

The suggested lay-out for shoe quarter linings (Figure 65) should be studied since it shows how three of the rules have been applied. The row of quarters along the tail edge has been placed so that they are in accordance with the lines of tightness as have the linings near the four shanks. It will also be noted that the noses of the quarters are placed so that the poorer quality leather is included. Lastly, a definite system has been adopted and maintained.

Figure 66 shows a lay-out for three-quarter cut court shoe and heel cover. The use of such a pattern means that very little poor quality leather can be included; only the inside counter can be said to be at all inconspicuous. The patterns are placed therefore with the object of ensuring the best possible quality. Waste is best avoided by careful selection of skins that are the right size and shape.

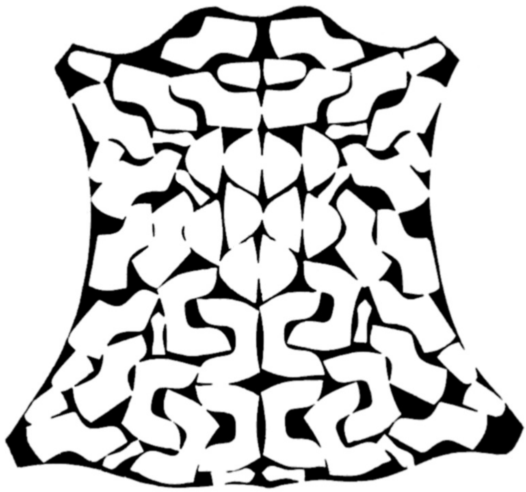


Figure 67. Medium size calf-skin with Oxford shoe layout.

The lay-out in Figure 67 shows vamps and caps fitted in a system and within the butt and shoulder areas respectively. The vamps near the tail are placed so that the inside wing comes nearest the edge. The belly and neck are too limited to allow a system for quarters, but they are placed tight to toe and with the better quality leather near the position of the vamp seam.

Figure 68 shows a Derby shoe (cap) lay-out. The Derby shoe vamps will not interlock closely and therefore a different system has been used.

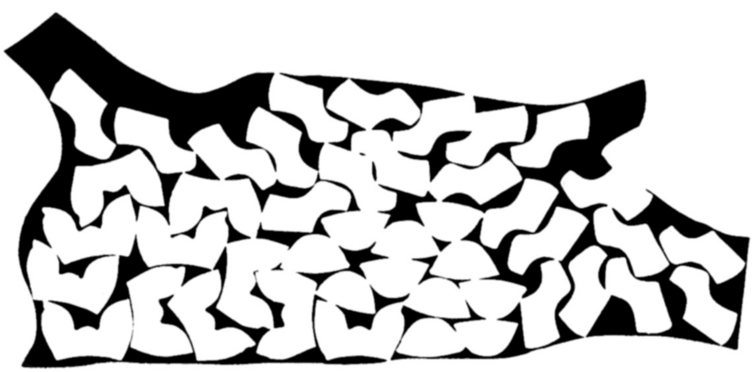


Figure 68. Box side with Derby shoe (cap) lay-out.

Examples of this kind may be repeated with endless variations, but the four which have been given illustrate different techniques and show the interaction of pattern shape, skin shape, quality and shade upon each other. If leather has been closely sorted it will be possible for the clicker to develop a lay-out for the whole skin and repeat it, with only small changes, throughout the whole bundle of skins. A control of this type means that ideal lay-outs can be developed and used instead of each skin being cut by improvised methods. Such a control is only practicable, however, where large quantities of leather are being cut into several different qualities and styles of shoes.

Quality Variations

The areas marked ‘butt’ and ‘shoulder’ are by no means consistent; they indicate only the approximate extent of first or second quality leather. On examining a bundle of leather issued to him the clicker will often notice that on some skins the area of first quality leather is greater than on others, even where the total area is the same. If there are no other complications the cutter will try to ‘force’ vamps from the better skins. That is, he will, from a skin 10 sq. ft. in area estimate that he should cut, for example, five pairs complete, but instead of doing this he will cut six or seven pairs of vamps with correspondingly fewer caps and quarters. The balance is restored when cutting the poorer quality leather, a higher proportion of quarters being cut in this case.

Colour Variations

The differences in colour or shade, can cause the clicker some of his biggest troubles. The differences may be between different skins or parts of the same skin. Small coloured kid-skins often vary appreciably in shade and before cutting the clicker should grade them carefully from light to dark shades, so that if, in cutting, he is compelled to complete a pair from another skin he knows that the difference between the two skins will not be enough to matter.

The large sides, dyed in a shade of brown, often reveal considerable differences between butt and neck or between butt and belly. The fibre structure is different in all three cases and the dye absorption is different. There is a noticeable darkening in shade between butt and shoulder and again between shoulder and neck; the belly too, is often darker. A side of this sort, cut according to the principles already given, would result in light vamps, dark caps and still darker quarters. To avoid this the clicker must cut his work in pairs, making sure that vamp, cap and quarters are all cut from parts of the same shade. In order to achieve this he must depart, to some extent, from the best standards of quality cutting. Caps and vamps will be cut from the butt and matched with ‘belly’ quarters; caps and vamps cut from the shoulder will be paired up with ‘neck’ quarters.

Patterned Leathers

The ever popular reptile leathers, python, karung, crocodile, lizard etc. require special cutting techniques because of the very limited area and the outstanding pattern on many of the skins. The pattern is the attractive part of the leather and the clicker must make full use of it. For example, the characteristic pattern on a python skin must be placed in the front of the vamp and in the same position on both shoes in a pair. This requirement, combined with the narrowness of the skin, restricts the clicker's freedom of movement and often causes wasteful cutting. The sides of the skin that are not patterned must be placed in the inside waist as far as possible. In order to make the best use of the leather and to avoid undue waste the patterns are usually kept small by making a number of sections. This helps the clicker in some ways, but introduces a further complication in that each section must be cut so that its pattern blends with the corresponding pattern of the piece to which it is joined.

Cutting Plans

It is assumed in the following account that the clicker holds his knife in his right hand.

In most cases the clicker begins at the bottom or butt end of the skin, but the first cut may be taken either next to the backbone or in the shank. In either case the cutter will make sure that there is enough room for the pieces he wishes to place before beginning to cut. Again some clickers prefer to start with the right- hand shank and work across to the left, the argument being that the cuts are made away from the main body of the leather. Those who begin with the left-hand shank maintain that they have a clearer view of the leather to be cut.

Whichever practice is adopted the vital points to remember are: (1) never cut any section without making quite sure where the next two cuts are to be made, and (2) always keep the skin 'square', *i.e.* do not leave long, narrow, or awkwardly shaped pieces to be used afterwards, but cut across the skin from side to side.

PRESS CLICKING

The Clicking Press

The different clicking presses in general use are all based on the principle of a swing beam which can be brought over any part of the cutting block and then depressed by a hand-operated tripping mechanism, so striking the knife below it. In most types a safety device is included which takes the form of a second handle that must also be used to operate the machine, thus ensuring that both hands are on top of the beam. The leather, unlike bottom leather, is lying flat on the block and the knife need not be held in position.

The amount of pressure exerted can be adjusted according to the material being cut.

When double-edge knives (see below) are being used the swing beam is fitted with an aluminium plate which does not damage the upper edge of the knife.

The cutting blocks may be of hard wood, hard rubber or bonded fibre-board. Whichever is used it is most important that the surface should be hard and level to prevent sticking and to get a clean cut.

Press Knives

The early knives were extremely strong and had a long life but were subject to three serious objections: (1) they were expensive; (2) being single-edge, two knives were needed for left and right patterns; (3) they were awkward to handle. Research has tried to improve in all three directions and the result has been a hard steel alloy knife which is cheaper than the ordinary single-edge forged steel one, very much lighter and has a double edge, thus avoiding duplication for lefts and rights (see also p. 508).

The double-edge knife may be forged or a prepared steel strip may be used which is shaped while cold and, in one type, ‘bound’ on to a steel pattern. These latter often have rubber studs fitted which help to prevent sticking in the cutting block. The larger forged knives are provided with struts to increase rigidity. The prick holes made by the hand clicker are made simultaneously by the single-edge clicking knife which has the points incorporated. A newer practice on the double-edge knife is to make a V on the edge showing the depth of the underlay. Sizes are usually indicated by a system of notches on the edge of the knife.

Comparison of Hand and Press Clicking

One of the advantages of the clicking press is the greatly increased speed of cutting over the hand method. In order to take full advantage of this speed all the factors tending to slow the press clicker down must be eliminated as far as possible. Too great a variety of knives has this effect and therefore the aim should be to give the clicker as few different sizes as possible, thus helping to reduce the number of times that he has to change over. Another way of achieving this is to use skins with a large area that will enable the clicker to use one pattern a number of times in succession. The job which involves a number of different knives, and skins that are small in area, causes the clicker to spend excessive time in putting down and picking up knives which are not so easily handled as the card patterns of the hand clicker.

Some of the advantages of the two methods have already been described or implied, but the lists which follow will make them clearer. There are, in addition to the factual advantages and disadvantages, others which at the present time appear to be matters of opinion. These will be referred to separately and assessed as far as it is possible to do so. The important point to remember is that the advisability of cutting by hand or machine should never be discussed in isolation, but always with reference to some particular job of work when the weight of the various arguments, for and against, can be more accurately tested.

The use of press clicking has increased considerably and would increase still further were it not for the fact that the average shoe factory is small and makes a fairly wide variety of styles; thus only short production runs are possible.

In order to assess the saving to be made by press clicking some of the points already made should be taken into consideration:

(1) Long 'runs' enable cutters to use one knife for a large number of cuts.

(2) Leather that has a good spread should be preferred as this again gives the opportunity for continuous use of one knife.

(3) The double-edge knife has greatly reduced the cost.

Bearing in mind these points, the advisability of cutting a new line on the press may be decided by taking into consideration the following additional factors:

(4) The cost of making card patterns may be omitted, unless the knives are ordered by supplying models in stiff paper instead of card.

(5) Hand-cutting costs—wages.

(6) Press-cutting costs—wages.
knives—cost, repair.
press—initial cost—depreciation and interest, maintenance, power.

Note: Wages—The piece-rates for press clicking are at present (1952) $33\frac{1}{3}$ per cent less than those for the hand process.

Knives—The estimated cost of repairs may be based on experience.

Press—Depreciation can be found by estimating the life expected. Maintenance costs can be based on experience.

Press Clicking Advantages

(1) It gives greatly increased speed of cutting over the hand method. The actual difference depends on the intricacy of the outline to be cut (the more intricate the shape the greater the difference) and the number of times a knife can be used without changing for another shape or size.

(2) Intricate outline can be cut with absolute accuracy.

(3) The sections are always cut true and there is no danger of waste due to overcutting.

(4) The increased speed results in a lowering of labour costs when long enough runs can be set up to cover the increased initial cost of the knives.

Hand Cutting Advantages

(1) The cost of the patterns is much less, and therefore, short runs can be cut more economically.

(2) Storage space is greatly reduced.

(3) The patterns are easily handled, so that on small skins from which several different shapes must be cut, very little time is lost in changing from one pattern to another.

In addition to the above considerations, there is a widespread opinion that the use of clicking presses leads to a lowering of the standard of quality. The argument in favour of this view is that the mere effect of increasing the speed of the operation tends to result in less time being spent on examining the leather, although this need not follow. The answer to these objections is that any such tendency can be effectively controlled (*a*) by careful selection of the leather to be cut, (*b*) by proper training and supervision, and (*c*) by sorting the cut stock. In brief, by an intensive form of quality control.

Once the initial cost has been established the point at which a saving can be made becomes evident. Only the wages cost increases at all rapidly and at a certain pairage the total cost of cutting by hand becomes greater (and will continue to increase) than the cost of press clicking.

The point at which the saving commences may be brought lower by cutting extreme sizes by hand since there are not likely to be many of them. Another method is to use knives for whole and half sizes,* and combining knives of two sizes into one upper,† thus keeping very close to the required shape. Practices of this kind mean that styles which are not likely to be made in sufficient quantity for ordinary press clicking to pay, may be brought within the scope of the method.

*A size 7 knife is also used for size $6\frac{1}{2}$.

† *e.g.* size 7 quarter and size 6 vamp.

10

CLICKING ROOM MANAGEMENT

UPPER COSTING

THE HIGH COST OF upper materials has resulted in more attention being paid to the accurate estimation of the cost of the shoe upper. The word 'estimation' points to the source of the difficulties involved since costing after cutting is simple enough, but costing before cutting, or estimating, means that all the variable factors must be listed in advance and an allowance made for each. Detailed descriptions of these variable factors and of the way in which allowances for them may be arrived at can be found in the text-books and articles listed in the Bibliography. These present notes are intended to survey the whole field and provide the student with enough background information to enable him to read with a clearer understanding the articles and books mentioned. Since most upper leather is bought by area the methods of costing described are based on area, although a reference will be made to the use of weight as a check on costs.

Variable Factors

(1) The area of the patterns when fitted together.
(2) The size and shape of the leather to be cut.
(3) The effect of different quality requirements on the area used.
(4) The size of the patterns used.

Pattern Area—The area of the pattern itself is not needed since it is its shape which determines the waste made.

A square pattern would obviously cut in quantity without waste whereas a round pattern of identical area could not be cut without waste. This waste which cannot be prevented is called the *first waste* and when added to the actual area of the pattern gives the *basic cutting area*. This is the area that would be used if the patterns were cut repeatedly from uniform material of unlimited extent and is the first factor.

There are a number of methods used in finding the basic cutting area and all consist of placing the patterns to be used on paper and measuring the area thus covered. Sometimes all patterns are used and fitted together without system, the avoidance of waste being the only guide. To total areas thus obtained are added percentages which include *second waste* or the waste involved in cutting leather of limited area and variable quality. These percentages are based on past experience of cutting figures.

It may be objected that this process could well be shortened by marking up an average skin of the type to be used, and this method has been and no doubt still is used. The disadvantages are the difficulty of finding (*a*) an average skin, (*b*) an average clicker and (*c*) of ensuring that the clicker will take 'average' care. The method is too imprecise when accurate costing is essential.

The most reliable method of ascertaining the basic cutting area, is that originally described by Russ and Small in their book *Scientific Allowance and Cost System*. Each pattern is marked up separately, the closest possible interlocking system being used. After marking the first pattern, the second is rotated through 180° without being turned over, and interlocked as shown in Figure 69. This procedure is repeated until

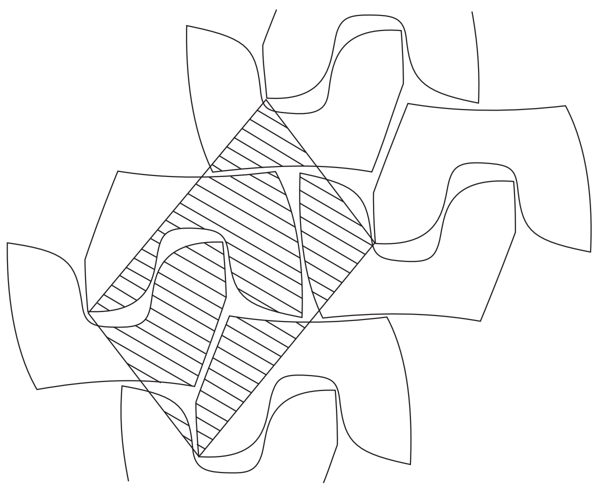


Figure 69. Basic cutting area.

there are at least eight patterns marked, four in each of the two positions. Connect four corresponding points on the four patterns in the same position, and the area of the parallelogram thus formed will equal the basic cutting area of two patterns. The shaded sections in Figure 69 will fit together to form two whole vamps.

Size and Shape of the Skin—Having calculated the basic cutting area for the different sections, the second waste can then be found by referring to the tables provided in the text-books and articles quoted. The percentage thus found refers to patterns' of a given size cut from a skin of fixed area, and is converted to a multiplier (see example below). (*Note:* a number is increased by 5 per cent if it is multiplied by 105/100, *i.e.* 1·05). The tables give figures for patterns and skins of all reasonable sizes.

Variations for Quality—As the perfect skin is not likely to be met with, further allowances must be made for the different grades of leather. The leather is sorted into qualities according to the surface blemishes that occur and an appropriate percentage added to the second waste factor multiplied by the basic cutting area. It has been suggested that a difference of 5 per cent should be made between the different grades.

Grade	1st	2nd	3rd	4th
Percentage added to the pair allowance	0	5	10	15

The total area thus obtained represents the cutting area for that particular pattern from leather of a particular size and quality.

Pattern Sizes and Fittings—The use of different sizes and fittings means that fresh allowances are needed. These are calculated from the actual increase or decrease in pattern area. The percentage suggested is converted to a multiplier as before, therefore, if there is a difference of 5 per cent between sizes the size 9 cutting area would be calculated by multiplying the area of the size 8 model by 1·05.

A variation of 2 per cent is suggested for fittings.

Example—Man's Oxford Shoe, sample size and fitting 8/4, cut from box calf, average size 10 ft., grade 2.

	Basic cutting area	×	*Second waste factor*	=	*Total (sq. ft.)*
Cap (2 to pair)	0·280	×	1·235	=	0·346
Vamp (2 to pair)	0·420	×	1·247	=	0·524
Quarters (2)	0·365	×	1·223	=	0·446
Quarters (2)	0·365	×	1·223	=	0·446
Strip (2 to pair)	0·050	×	1·211	=	0·056
Tongue (2 to pair)	0·120	×	1·216	=	0·146
					1·964

To the total add a further 5 per cent for grade 2 quality = 2·06 sq. ft. Calculate the area for the range of sizes and fittings to be cut by adding the percentages given above.

The Krippendorf System

The Krippendorf Kalculator Company render a service to the American shoe industry which is based on the method of area measurement already described. On receipt of a set of patterns accompanied by full details the Company work out and return to the manufacturer feetage allowances for ten different leathers.

Before this can be done, however, a representative of the Company visits the shoemaker and examines the leather to be used and the grade of work cut. From this information, the Company are able to work out the feetage for any pattern supplied to them.

A machine is also supplied which can be set to the range of sizes and fittings for any ticket together with the estimated allowance and on operation will produce the total area for that ticket.

Checking Costs

One of the variable factors that has not so far been considered is the ability of the clicker who is cutting the shoes that have been so carefully costed. The efficiency of the whole room varies from time to time and it is one of the most important of the foreman clicker's duties to see that the level of efficiency is kept high. He is assisted in this by the system of issuing stock sheets with the work to be cut. The information that these sheets convey is often extensive, but, for the purpose of checking costs only, all that is needed is the area and value of the leathers allowed set against the area and value used, showing the gain or loss that has been made in feet and money. The stock sheets often provide space for details of the time taken on the job, labour costs and the weight of the sections used as a check. In this last item, the leather-issued is weighed, and on return the cut sections, offal and scrap are weighed and checked against an approximate percentage figure. Such a check is of value when there is some doubt whether a loss is due to wasteful cutting or an unduly high proportion of offal. The offal cannot easily be measured but it can be sorted out and weighed.

The stock sheets are examined on return and any unexplained discrepancies investigated; the information is then transferred to the stock ledger as described on p. 142. The results may also be used to check on the efficiency of any individual clicker over a period of time, on some particular leather or in general. It is the proper use of records of this kind which enables the foreman to maintain a high standard of work in his department, since by their help he is able to put his finger on any weak spots and take appropriate action.

Labour Costs

The prices to be paid to clickers are based upon the definitions of standard patterns which appear in the *Statement of Prices for Clickers*, a statement agreed between manufacturers and trade union representatives. There are, in addition to these standard pattern definitions, further tables showing the extra payment which may be claimed for work which is more elaborate than the standard.

There are allowances for size marking and shading (where this has to be done by the clicker) for small tickets (under twelve pairs) and for 'hard' cutting. The full list is, of course, too lengthy for inclusion, but the details given show the type of variations for which allowance is made.

If a new pattern shape is introduced a fresh price is agreed upon, usually by referring to an existing shape and allowing for the differences.

As the wage agreement in the shoe industry is 'tied' to the cost of living index it follows that the simplest way of dealing with the changes that occur, is not to recost each individual item, but to add a percentage to the whole.

LEATHER BUYING

The responsibility for buying leather is usually placed on one of the factory executives with a sound knowledge of the material, but the foreman clicker or the chief leather storeman, will be expected to give expert advice. In the small factory, the foreman clicker will also be storeman and buyer, only seeking executive authority for large orders.

The buyer, whatever his position, must be familiar with the production plans of the factory, and the type of order he places will vary according to those plans. A stock line of work that is not subject to any great extent to seasonal variations requires a steady supply of leather, each delivery being comparable in quality and price as far as the market conditions will allow. For such a line, a contract may be entered into for a delivery of a certain quantity (based on production requirements) at monthly or quarterly intervals, the contract being cancelled only after an agreed notice has been given.

Seasonal lines of shoes may be covered by a single order, the quantity again being calculated after production plans and costing estimates have been made.

The great bulk of upper leather is measured in square feet, this being done mechanically in the tannery and written or printed on the back of the skin. Certain waxed leathers are still bought by weight since this is an indication of quality. Other exceptions to the general rule are snakes, the lengths of which are measured in metres, and lizards which are measured in inches across the width of the skin, but are not purchased at a fixed price per inch. The skins are sorted into widths and sold at a fixed price per skin e.g. 16 or 18 in. skins. Crocodiles are also measured in inches across the width but the price is per inch and not per skin. Leather as supplied by the tanner is usually carefully sorted into qualities and possibly into substances as well. The variations will, of course, depend on the use the shoe manufacturer has for the different types. One shoe-one leather has serious disadvantages since all the leather bought must go into that shoe with unavoidable variations in quality, unless the tanner is willing to supply one carefully sorted selection. In most cases, the tanner will have sorted the leather into various qualities the differences between them being as follows: (1) clearness of grain; (2)

percentage offal; (3) grain texture; (4) grain structure (must not be too tight or too loose). If different substances can be used, these selections are sorted in light, light medium etc. as shown on p. 141. Sometimes leather can be bought 'table run', that is unsorted by the tanner. Sorting of such a purchase in the factory will probably result in a wide variation of qualities but can show a good profit on buying.

All leather, whether sorted by the tanner or bought 'table run' should be carefully examined against a sample when received in the factory, and then sorted or re-sorted into factory grades. The reason for this is that the tanner's standards are not likely to be exactly the same as those of the factory; also the tanner sorts for value whereas the factory sorting is for quality, e.g. a badly damaged skin of low value may yet produce uppers of first quality even though a loss on cutting is made. Each factory has its own standards of quality and the leather should be sorted into these different grades. After re-sorting, the leather may be revalued according to factory costs, thus showing a profit or loss on buying and providing an indication of the buyer's efficiency. It does not follow automatically that a profit shows efficiency or a loss inefficiency since rising or falling prices are outside the buyer's control. The system of recosting after sorting into factory grades may be too rigid, but in this case, the calculation is carried out when the leather is issued to the clicker, the buying price being set against the estimated price and the profit or loss recorded and kept distinct from the profit or loss that may be made by the clicker on his cutting.

THE LEATHER STORE

The value of the leather stored and the fact that deterioration occurs when conditions are unsuitable makes it essential that the store should be carefully sited and, where practicable, the temperature and humidity controlled.

Strong sunlight will cause leather to fade and lose its suppleness, so a generally diffused light should be sought; it is better to depend on artificial light between the racks. Too much heat can also dry the leather and if combined with a low degree of humidity the tendency will be aggravated; a damp store will involve the danger of mould.

The racks used for storing the leather should vary in size or may be combined so that a single rack can be used for small skins and sides while two racks placed back to back will accommodate the larger skins. Ideally, the racks should not extend to the ceiling, but considerations of space often require this sacrifice of accessibility. The lowest shelf should be well clear of the floor and no leather allowed to be placed under the racks. To simplify handling the heavy leathers should be kept on the lower shelves.

The storeman's memory should not be regarded as a sufficient record of where leather has been placed and all racks should be numbered and lettered or coded in some way, so that each section can be identified. This rack code is entered in the stock ledger and a glance at this will show where the lot is to be found.

An essential piece of equipment is an adding machine, both for checking receipts and for counting the leather issued to clickers. A double saving is made since the clicker can check the leather issued to him quickly and easily.

LEATHER SORTING

Several references have been made to leather sorting as the different people who handle the material sort it into the different grades suitable for their purposes; the tanner because the different grades can be priced separately, the clicker because it is necessary to the efficient carrying out of his job, and reception sorting to put the different qualities bought into line with factory requirements. The sorting done before issue is the most important of all these, since on the grade of leather issued, and its suitability for the job in hand, will depend the quality and appearance of the finished shoe upper. Reception sorting, thoroughly carried out, will of course, greatly simplify sorting for issue, but some sorting will remain to be done, for there will always be variations. Before describing sorting for issue in more detail, it will be as well to consider the various differences that are found between skins of the same type, and their relevance to the clicker's work.

Differences between Skins of the Same Type

Size—The tolerance permitted in the size of skins in the same grade will vary very widely according to the average size. Small kid-skins with an average size of $2\frac{1}{2}$ sq. ft. should not vary through a bundle by more than $\frac{1}{4}$ sq. ft. above or below this average. Calf-skins with an average size of 10 sq. ft. may vary between 9 sq. ft. and 11 sq. ft. and large sides measuring 20 sq. ft. on the average may vary by as much as $2\frac{1}{2}$ sq. ft. up or down, *i.e.* $17\frac{1}{2}$ to $22\frac{1}{2}$ sq. ft. The size of the skin is not of such great importance to the clicker except that he may cut the larger sizes from the larger skins which give him greater freedom of movement.

Shape—A skin that is long in relation to its width will be more wasteful in cutting than one which is well grown *i.e.* square in shape. The reason for this is that the line of the backbone often effectively divides a skin in two and there is little space on a narrow skin between the backbone and the lower quality leather in the belly. Even if the backbone may be included in some parts of the upper, there is still considerable restriction of manoeuvre on a narrow skin. The importance of shape in this connection is well known; what is, perhaps, less appreciated is the importance of the relationship between the shape of the skin and the size and shape of the pattern. It does not always follow that large patterns should be cut from the largest skins; a little experiment may show that the large pattern will cut from a medium size skin with very little waste, whereas the larger skin merely throws more waste with no increase in pairage. The shape of the skin is just as important as the size in this connection, since the sorter should know what width of skin is needed for the efficient cutting of any given style.

Substance—The thickness of leather (variously referred to as heavy or light, good or thin) is measured in millimetres. The code in general use has already been referred to and there is no definite scale used by the industry in which is laid down that, for example, leather of medium substance shall be of a certain thickness. The following scale is then, only intended to give the student some idea of the range used.

	Light	*Light medium*	*Medium*	*Heavy medium*	*Heavy*
Code	L.	L.M.	M.	H.M.	H.
Thickness (mm.)	0·75–1·0	1·0–1·25	1·25–1·5	1·5–1·75	1·75–2·0

Outside this scale there are the 'X' grades, XL. or very light, XH. or very heavy; also a bundle of large calf-skins may be marked XXH. and indeed they would be very heavy indeed as calf-skins, although, if compared with other leathers the code H. would be the right one.

The thicker skins are used for the heavier types of footwear and also for the larger sizes. The sorter, then, must ensure that the substance is right for the shoe to be made and that if a variation in substance is unavoidable, there shall be a sufficient quantity of the heavier skins for the larger sizes. It sometimes occurs that large skins vary widely in substance over different parts of the same skin, and the variation is such that the thinner parts are unsuitable for the shoe to be cut. Where such an issue is made, the sorter can mark the skin to give the clicker a guide as to what is wanted.

Percentage Prime—Prime leather in this connection refers to all that, regardless of quality, which can be used in the shoe to be cut. The remainder or offal is usually of so loose a structure that it would not withstand the strains of making and wear. The percentage of prime leather really indicates the size of the skin from the clicker's point of view, rather than the figure marked on by the tanner. The policies of tanners may vary, since some prefer to round the skins very closely so that little offal remains; needless to say such a skin commands a higher price per square foot than one which has had considerable areas of loose offal left on. The feetage allowed the clicker is based on a certain allowance for offal, but if this is exceeded a feetage over that allowed, will be taken. The sorter is responsible for maintaining a balance over the whole parcel of leather issued.

Texture—The size and character of the hair follicles gives to leather much of its characteristic appearance, and those skins with very small holes are said to have a fine grain or texture. This texture is of particular importance on glace kid-skins where it is one of the chief indications of quality. A lady's shoe cut from glace kid is expected to have a grain of a certain appearance (the higher the cost of the shoe, the finer must be the grain) and each skin should be carefully examined to see that it is of the right texture for the shoe to be cut.

Grain Structure—The nature of the skin, method of curing and tanning processes all affect the finished grain which should be closely knit to the fibre structure so that there is no looseness when the leather is creased. Too tight a grain will mean that when folded cracks will appear. These points affect the quality of the leather and if either is present to excess the material is not suitable for shoe making, but sometimes they do not become apparent until the shoe is lasted or in wear. Heavily plated (*i.e.* ironed) leathers sometimes break up very badly when creased, the smooth appearance may be recovered by ironing in the shoe room, but this is only a temporary measure since a few minutes' wear will break up the surface again.

Clear Grain—The number of blemishes that can mar the surface of leather can seriously affect the cutting value of the leather, but they do not necessarily affect the quality of the leather itself. The butt of a skin may carry a large brand, and a large number of scratches may disfigure it, but those parts which are clear may be suitable for the best quality shoes. Growth marks and veins, warble holes and scab marks all reduce the cutting value of the leather more by interfering with the close fitting together of the patterns than by the actual area they cover. The sorter again must endeavour to issue a parcel of skins, only a fair percentage of which are badly flawed.

Shade—The differences in shade that occur on coloured leathers have already been described. The sorter should try to avoid issuing any skins that are 'odd', *i.e.* abnormally dark or light, unless there are other skins close enough in shade to make combination possible. The type of lighting available in the clicking room is of vital importance when coloured leathers are being sorted.

Pattern—Reptiles and similar skins with a conspicuous but varying pattern should be issued in quantities that will enable the clicker to cut whole pairs from skins that are practically identical.

Records—The person in charge of the skin room is expected to be able to supply at a moment's notice a close approximation of the stock held of any particular leather. Production plans cannot be completed until existing stocks are known and fresh orders (if needed) placed. The information wanted is kept in an upper leather stock ledger. The information obtainable from such a ledger is more comprehensive than that needed by the skin room man. Not only are details of the leather, remaining stock and its value recorded, but also the profit or loss made on issue, profit or loss made on cutting and labour charges, these last being used for departmental cost accounts.

When a fresh sheet has been filled in with details of the leather in stock, each cutting sheet received from a clicker is checked and entered up, thus maintaining an up-to-date record of existing stocks and showing whether any leather is consistently showing a profit or loss on cutting, or whether any particular style is not cutting according to the estimate made. With this information, the supervisors are able to discover any unusual features and carry out an investigation into their causes.

Where large stocks are held, the skin room staff may keep an additional record on a card which carries the feetage of each bundle of leather. As a bundle is removed or broken into the card is marked off accordingly and thus gives an approximate total of the remaining stock and an additional check on the quantities held.

Sorting Cut Stock

It is impossible for any individual to maintain, without reference to some existing standard, an even quality in his work. This is particularly true of the clicker who uses material which may itself vary in quality. The careful sorting of the leather issued and the accurate estimation of the feetage allowed go far towards the maintenance of quality standards. An additional check is supplied, however, when it is important that a uniform standard of quality should be maintained; the cut stock passes from the clicker to a sorter and is closely examined to ensure that the clicker has kept to the required standard and that no blemishes have escaped his notice. The sorter himself is usually a skilled clicker, but care should be taken to see that the standard of quality set by him should not vary.

QUALITY CONTROL

This term which has come into use of recent years covers a very wide field. In the shoe industry, practically every supervisor is concerned with quality control, although the work he does with this in view may not always be part of a plan that covers the whole of the factory. As far as the clicking room is concerned quality control begins with the establishment of a definite standard of quality for each grade of shoe. Next comes the work of the leather buyer whose object is to obtain leather of the required quality at (or perhaps slightly under) the allowed price. The sorting into factory grades, sorting before issue and sorting of cut stock are all aspects of quality control. Also the clicker himself must be familiar with the standard required since he is the key man and the efforts of buyer and sorters are aimed at making his work more effective.

These safeguards on quality are sometimes reinforced by a bonus system in which a careful record is kept of the clicker’s results (as observed by the sorter) and a bonus awarded according to the way in which he has kept to the standard set. It is worth while emphasising here, that such a quality bonus can only work fairly if the greatest care is taken in the buying, and sorting of the leather and in the estimation of the feetage allowance.

ORGANISATION

The planning of a clicking room is far less complex than for the other major departments since the problem of securing a balance of production from many different machines with varying outputs does not arise. The planner has to ensure that there are enough clickers to do the work and that they are working under conditions conducive to efficiency. It is, of course, the last requirement which is most difficult.

The equipment needed by the clicker has already been described; the extent to which it is supplied by his employer varies from factory to factory. The cutting board and the working bench need careful consideration as do other points, but the really vital consideration is the light. Close scrutiny of the leather is essential; to make this possible the clicker requires a good light source with an absence of glare.

Light

In most factories daylight provides the main supply with electric light as an emergency measure when the daylight is inadequate. The daylight may come from side or roof windows (north lighting) or from both. The advantage of roof lighting is that an even quantity is available over the whole room, whereas the light from side windows lessens as the distance from the windows increases so that in the centre of a large room artificial light may be necessary throughout the day. Where side windows only are present, the most skilled clickers, *i.e.* those cutting the most difficult leathers, are placed nearest the windows, thus imposing a fairly rigid form on the physical organisation. Roof lighting or complete dependence on artificial light enforces no such limitation.

The artificial light may be obtained from tungsten filament lamps or from fluorescent tubes, the latter giving a more even distribution of the light without heavy shadows or glare. The lights may be suspended or fastened to the benches.

Benches and Scrap Disposal

These two may be taken together since the clicking benches are often designed to facilitate disposal of the scrap. The benches should be wide enough to accommodate the cutting board with a sufficient margin for arranging cut stock and patterns: the depth of the bench should be the same as the length of the rectangular cutting board so that the ends of the board can be used, otherwise the clicker cuts in one place only and the board rapidly becomes uneven. A shelf is often fitted at the back of the bench so that cut sections can be kept clear of the working area and of scrap. Skins to be cut are arranged on a rail which is fastened to the front of the bench, the clicker using the rail on the bench behind him.

The pieces of waste or scrap are saleable and should therefore be placed in a bin so that they can be collected easily. This is not always so simple as it sounds, since the easiest way of disposing of small scrap is to flick it on to the floor while larger pieces are thrown to the back of the bench. In some benches a hole is cut in one corner with a scrap bin on the shelf underneath, but this is not always used. The ideal would appear to be a wide chute at the front of the bench, similar to those used on clicking presses, if this can be arranged without forcing the clicker to stand too far away from the front of his bench. Some benches are fitted with drawers on either side which can be used for scrap.

Pattern Store and Skin Room

These should be regarded as integral parts of the clicking room, and so situated that the clicker can collect leather and patterns without delay.

Supervision

Many of the aspects of the foreman clicker’s work have already been touched on, but in addition to these may be recorded the need for training juvenile labour, and maintaining a labour force able to deal with the quota of work for each day. The production plan is usually based on the day sheet and should consist of a balanced programme for the whole factory. Although clickers are adaptable it frequently occurs that some specialise on certain types of leather and the foreman should be ready to have cut any given quantity of one style. The number of patterns available should match the quantity of work to be cut, but this should be arranged between the production and pattern departments.

A last point of vital importance: the ‘jobs’ should be issued to the clicker without delay. This can only be done if the skin room has sufficient notice and if the foreman knows approximately when each clicker will finish the work he is on.

PART IV

CLOSING

L. W. ELLIOT

INTRODUCTION

CLOSING IS THE NAME given to the preparation, fitting together and stitching of the various cut sections to produce the completed uppers in readiness for lasting. This involves a considerable number of small operations, varied, and in different sequence for different types of uppers.

The sub-divisions of (1) preparation, and (2) fitting together and stitching, to which can also be added in certain circumstances finishing off, are important since they constitute two main sections of the department, and can therefore be used to give a clear picture of the general work of the department and the gradual build up of the finished uppers.

It should be realised that the first appearance of most closing rooms does tend to awe or confuse the student, and that he or she finds difficulty in discovering the sequence of operations at certain stages at least. This difficulty grows steadily worse as types and styles multiply, but if it is borne in mind that basic types are quite few, and that the sub-division of the department is as previously stated, it will become an easier matter to follow the course of the uppers.

11

PREPARATION

PREPARATION IS, AS THE name suggests, a series of operations in preparing sections for the ultimate stitching.

Its importance is very great, and the necessity for constant supervision at all points is essential.

Difficulties and failures at later stages of manufacture can be, and are, regularly traced to indifferent preparation, and it must be the first consideration of any supervisor to be conversant with all aspects of this section.

It is possible not only to call the preparation department a subsection of a closing room, but if the size of the factory and output warrant it, it may be a complete separate unit with its own supervision. The advantages or disadvantages of this course will vary according to the individual firms, but from the point of view of supervision a possible advantage will be gained. Whether the ultimate responsibility should be upon the general closing department is a matter of opinion, but if it is not, a considerable amount of friction seems probable owing to the effects of poor workmanship, mentioned above, upon the stitching operations.

The method of receiving work from the clicking department and number of pairs per lot will vary with different firms. It is customary to use a type of carton or similar receptacle with divisions for accommodating the sections which must be kept in their correct order of sizes to avoid trouble at a later stage. For this reason small parts, such as back-strips, must be tied up. The amount per carton is dependent upon the procedure adopted in making—size of rack, type of production etc. It is essential that a regular flow of work should enter the department from the clicking room; once again the method employed e.g. day sheet system, will determine the intervals and amounts.

OPENING OR CHECKING

Before commencing major operations in the department a system of checking is necessary, not only to assure that the correct number of pairs is in the container, but also that the correct sections, fittings, backers, or any other items for the particular shoe concerned are all there. It will be appreciated that this important task demands a person with considerable knowledge of the varying styles and the parts necessary for the completion of the uppers. It is very disconcerting to reach a certain stage of production and then discover that some minor but essential fitting or backer has been forgotten. The checking is not always done in the closing room, but it is performed by the clicking department in many firms. This can cause friction between supervisors, and the question of blaming the openers in such cases is bound to cause bad feeling. However, it is the clicking room's responsibility to ensure that everything is correct, and if the checker does his or her work properly no undue trouble should result.

Whichever method is used the sectional parts should be complete in the container and a work ticket attached. Details of style, method of closing, treatment of edges, thread to be used, perforations etc. must be included in the appropriate sections of the ticket. The number of pairs and sizes etc., will, of course, also be included.

A ll parts are counted and if errors are found the whole container should be returned at once for rectification, care being taken to note time and date of return. It should be realised that re-cutting one quarter or even back-strip can cause considerable delay owing to difficulty in finding the correct colour to match. If checking is carried out in the clicking department this trouble is automatically the responsibility of that department and the problem is solved.

Before describing the individual operations, it would perhaps be an advantage to give a very brief picture of the course of events in the closing of the uppers.

Firstly it should be understood that although it is possible for one operative to close an upper completely on one type of machine, this is not done. Sub-sections of closing machines are laid out with the object of performing one operation or a small series of operations; thus it will be realised at an early stage in the department that the breaking down, or parting of sections of uppers is done to feed the sub-sections of machines simultaneously.

IDENTIFICATION MARKING

It is necessary to provide some method of identification for the benefit of later stages of closing when the upper is being assembled, and it is also necessary to give identification of size and possibly fitting during most operations.

It is essential also in the case of coloured work to give information of shade coding. Methods adopted by various organisations are as follows:

(1) *Crayon Marking*—This is no doubt the original method—marking size and colour by crayon on the back of the leather plus ticket number on at least one section of vamps, quarters, caps, etc.

(2) *Notch Marking*—This method is of more concern when uppers are cut on the press, consisting of a code of notches in the lasting edges of cut parts. It is essential to mark lot numbers by crayon on the back of the leather.

(3) *Colour Marking*—A series of coloured paints is coded to sizes, and the lasting edges of cut sections are then painted the

appropriate colour. This is an excellent method for tickets of one or two sizes, but is rather involved with long size runs when colour shading is required. An example of the coding is given.

Men's sizes	5	6	7	8	9	10	11
Colour	Mauve	Yellow	Red	White	Blue	Green	Brown
Women's sizes		2	3	4	5	6	7

Half sizes—Pink

Shading by a previously arranged second colour code.

Care must be taken to ensure the edges being painted will later be covered, or lasted away

(4) *Machine Marking*—This method is by far the best but is unfortunately the most costly. With intricate work, long size runs and fittings, and also colours it does give better results and cause less trouble later. With the BUSMC Match Marking Machine it is possible to stamp all information such as size, fitting, lot number, colour number, *etc*., with one movement.

Colour of stamping can be quickly changed to suit varying coloured leathers. Position of stamping is adjustable to suit the needs of different sections.

Here again the lasting edge is used, or any position which will subsequently be covered.

To sum up, marking is an important operation to avoid difficulties at later periods of upper construction. It is sometimes combined with opening or checking and performed by one operative.

Lining Marking

Not only for identification during manufacture, but also for information to the wholesaler and retailer, it is essential to provide certain details in a conspicuous position without detracting from the appearance of the footwear. The quarter lining is the usual position chosen, but in some cases the tongue has to be used, or even a small tab specially stitched in.

Essentials to be stamped are the size, fitting, last and shoe number. Other details to assist in repeat orders being executed correctly can be ticket numbers, order numbers and date code. There is not a standard method of stamping and in many instances codes are in use for sizes, *etc*.; this may be perfectly satisfactory to manufacturers and retailers but is confusing to the general public.

Types of printing are manifold, but the main requirements are clarity and neatness.

It is worthy of note that marking by hand using Indian ink is still practised and does make an attractive method giving a certain 'hand-made' appearance to the shoe; in fact it is copied to a certain extent by some forms of machine type.

A useful machine for lining marking is the BUSMC Lining Marking and Embossing Machine with its controlled heating element and simple type change. Any colour of paper can be used up to 3 in.

width; it is fed from a roll and pressed on to the leather by the hot die. The Standard Engineering Co. machine uses compressed air to apply the pressure and the length of time of contact or 'dwell' of the stamp with the material, is controlled automatically by an adjustable time switch.

Stitch Marking

Ornamental stitching and perforating *etc*. are commonly used on many styles of shoes, and it is.. essential to provide a means of supplying the necessary marks to enable the operators to perform their work accurately. The methods used are:

(1) *Slotted Patterns*—Board patterns of the same shape and size as the cut sections are slotted along the required design lines; these are placed on the leather and a pen with a coloured ink, or alternatively, a dull awl, is run along the slot.

(2) *'Pimple' Marking*—The required design is punched on to a metal pattern so as to give a row of depressions along the design line. This is then put into a small mangle with the leather section which thereby receives a corresponding series of depressions.

(3) *Stitch Marking Machines*—There are several makes available but they all work on the same principle. A flat horizontal plate carrying the marking pattern is joined by a parallel linkage to the base of the machine so that it can either be pressed on an ink pad or paint-impregnated cloth at the back of the machine, or brought forwards and downwards on to the accurately positioned upper section in front. The forward movement is effected either by hand or foot pedal; a spring returns the carrier to the rest position. (The method of producing the actual markers is described on p. 102.)

Not only does the marker provide the means of doing stitching *etc*., but it can incorporate the positions for any overlaying sections, eyelet holes, or cut-out positions. It is often necessary to provide dies for each size to obtain perfect results, which although costly repays if a considerable quantity of that particular style is produced.

Markers used in conjunction with group graded patterns reduce the need very often for dies for each size.

The use of marker lines for the accurate holding of one section to another for machining gives better results than the older method of using clickers' pierce holes, which were very unsatisfactory on such leathers as suedes and grains, and also great assistance is given to the trainee to produce a higher standard of work.

SKIVING

Skiving is the reduction in thickness of certain edges of upper sections to facilitate various treatments of edges, to allow seams to be produced without bulkiness, to avoid discomfort in wear, to improve the appearance of the finished upper, and to give a uniform substance of edge when sections vary considerably.

To a large degree all these conditions are complementary; if a seam is produced with a thick unsightly appearance it will obviously be uncomfortable to the foot; and since the treatment of edges is usually for appearance's sake, a neat edge will also be comfortable in wear.

Skiving is a machine operation although it is by no means unusual for a fitter to be seen with a long knife and marble slab attending to the finer details.

The machine usually to be found in closing rooms today is the BUSMC 'Marvel' Skiver which is composed of a rotating disc type of knife, an adjustable guide for varying length and depth of skive, and a feed for carrying the work to the knife. The knife is sharpened by a pair of revolving grinding stones which can be instantly brought into use even while the operator continues her work. A safety device is fitted (or should be fitted to comply with the Factories Acts regulations) to prevent the operator from opening the top of the machine while the knife is revolving.

Also in use is the 'Fortuna' Skiver comprising a drum-shaped type of knife.

The No. 8 'Marvel' skiver has an attachment which permits two pre-set skives resulting in a considerable saving of time in handling sections.

Before describing the actual types of skive used it would be as well to stress the importance of the good workmanship necessary at this operation. More troubles can and do develop from indifferent skiving, not only in the department itself but also in subsequent departments (lasting chiefly), than, probably, from any other cause.

Types of Skive for Various Edges

Raw Edge—Upper sections are occasionally left with raw cut edges and the only skive necessary is to obtain uniformity of substance. In the case of box and willow calf of average substance a skive of up to one third substance is taken as shown in Figure 70*a*. Heavier leathers such as grains can be treated similarly; the substance remaining will be greater than the calf, but will be in keeping with the heavier appearance required in that type of shoe. Light calf will be very lightly skived. It will be realised that a certain responsibility always remains upon the operator and strict supervision is always necessary.

Gimped or Gouged Edge—The same principle of raw edges applies here if gimping is performed first. If skiving is done before gimping the allowance of waste must be provided for, a slightly longer skive being used.

Edged—The description of this edge is given later, the skive required being as Figure 70*b*. This is produced on a machine, the BUSMC

'Marvel' No. 5 specially set for a 40° skive, for this operation only, and any adjustments should be made by a skilled mechanic. To obtain good edging results a perfect skive is essential and great care should be taken in acute curves.

Folded Edge—Once again the description is given later, but the skive required (Figure 70c) is twice the amount of fold, which can vary from $\frac{1}{8}$ in. to $\frac{3}{16}$ in, therefore for light leathers a skive is usually $\frac{1}{4}$ in. and on heavier materials $\frac{3}{8}$ in. The ideal is to reduce to a very fine edge, but the machine folder requires a slight substance at the edge to obtain a uniform amount of turn-in. The object is to obtain, when folded, the normal substance of material.

Bound Edge—As binding is chiefly used on women's shoes of a light type the skiving of the edge is not always necessary. The details given regarding raw edges will apply in cases of materials of a slightly heavier nature.

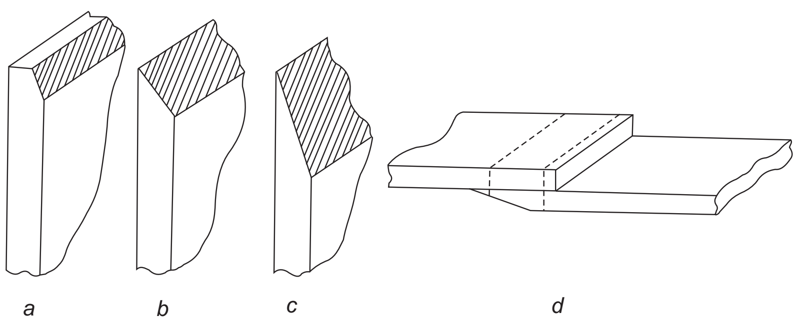


Figure 70. Skives for various edges and seams: *a* raw edge; *b* edged; *c* folded edge; *d* lapped seam.

Type of Skive for Various Seams

Closed Seam— The general principles applied to raw edge skiving apply equally to reduction required to produce the closed seam. As this seam is principally used for back-seams it is of the greatest importance that care is taken in skiving, otherwise trouble will be experienced in broken backs at a later stage of manufacture. By skiving too much away the material will ultimately break; and, alternatively, if insufficient is removed on heavier leathers the thread in the seam is under a great strain and will possibly break. With light leathers it is unnecessary to skive at all. The real object in a seam of this type (described later) is that when rubbed down it is as flat as possible, to prevent unsightly appearance or hurt to the wearer.

Lapped Seam—It is essential to skive away the underlaying part when two sections are joined by being lapped one over the other to prevent ridges showing, and other troubles. This type of seam (Figure 70*d*) is the most commonly used in the shoe and attention to detail in skiving will result in a good appearance of the finished upper, and also of course the finished shoe. The amount to skive is indicated to the operative by pierce holes, marker lines, or corners cut away. It should be the maxim of the skiver never to skive to the depth of the marks, but to reach approximately $\frac{1}{16}$ in distance away. This will give full substance for the machinist for the first row of stitching and strength is not impaired. The skive is taken to the finest possible edge to prevent a ridge printing through later.

To sum up, it is the management's duty to pay particular attention to this operation, continual supervision being essential to check depths and widths of skives in relation to the varying leathers in use, to check for damages which can be a very expensive item today, to make certain damages are quickly re-cut, and also to watch carefully for leathers which may cause later troubles unless skived in a manner slightly different from the usual.

PERFORATING AND GIMPING

Perforating is an operation for ornamenting the uppers by means of series of holes of varying shapes along edges of sections and also in some styles to give pleasing effects on the body of the upper; in some cases, the holes pass through the lining also.

It may be true to say that the machinery available today for perforating and incorporating other subsidiary operations has advanced during the last few years more than any other machinery in the department.

The BUSMC No. 3 'Royal' Perforator and the BUSMC No. 4 Perforator are machines in extensive use in most factories, and in contrast to types described later, a single punch or die is used, the work being fed through the machine. The die can be a single hole or a small number of holes; innumerable variations are available, and as each movement of the die is completed the feed carries the work forward to position for the next punch movement. A narrow strip of paper also feeds directly beneath the die and under the work to produce a clean-cut punch hole, at the same time protecting the cutting edge of the die. Great skill is required to produce good results especially when acute curves have to be negotiated and when it is borne in mind that a machinist has probably to stitch each side, in many cases one of those sides being the edge row. Correct spacing is important to give a good appearance; the popular large hole and two small which are contained on the one die should be spaced to give the effect of a continuous flow.

Gimping, which is the serrating of an edge, can be done by the 'Royal' Perforator. A die containing the knife is inserted in the machine and work is fed through as in perforating. Spacing is again important to obtain a clear cut sawtooth effect; overcutting or a ragged cut must be avoided. It is also necessary for the operator to use the correct margin as allowed by the pattern cutter, otherwise material is lost and the fit of the sections affected. This margin is usually $\frac{1}{12}$ in, just sufficient to obtain a clear cut without undue waste.

It is sometimes possible to combine gimping and perforating in one operation, the qualification being that the section must be fairly straight, otherwise spacing is destroyed.

A method of perforating differing from the foregoing is the use of a complete set of punches to suit a certain section, and a press movement to complete the operation.

In its simplest form a series of punch tubes to the shape of a straight cap are made up and affixed in a suitable type of light press. The cap is inserted to a pre-arranged template and after power is applied perforation is complete. To enlarge on this it is possible to instal a gimp knife and also the centre design, so one operation is producing a uniform result, very quickly, and by the use of unskilled labour.

An example of this type of machine is the Freeman Press which is to-day becoming almost the universal method of perforating. Its scope is very wide as the size of the working plates is 14 in. × 10 in., the designs built into the plates being almost unlimited, variations being possible between sizes on the one plate, and several small sections being also accommodated if necessary. Gimp, gouge or straight-cut knives are interchangeable; sections of punches are also interchangeable; marker lines in coloured ink can be used, and a method of raising a moccasin front or similar style by the use of heat and pressure is possible. Size marking *etc*. can also be performed. As in the 'Royal' Perforator the punch tubes are protected and a clean cut ensured by the use of a roll of thick cartridge paper feeding through the machine.

The use of this machine or similar types and the heavy cost of plates has resulted in somewhat revolutionary changes in principles of pattern grading, which although outside the scope of this section will be discussed from the viewpoint of the closing room.

When a certain style has been adopted and sales considered to warrant the cost of dies, one must decide the minimum number of dies necessary to produce the range of sizes, and possibly fittings, without the character of the shoes being destroyed. If, for the sake of argument, the number required is reduced to three, then the size range is divided into three sections, and in the case of men's shoes we may use size 6 shape for 5 to $6\frac{1}{2}$; size 8 shape for 7 to $8\frac{1}{2}$; size 10 shape for 9 to 11.

Taking a wing cap as an example, the operator on the Freeman Press is only concerned with (*a*) die number 1 (including sizes 5 to $6\frac{1}{2}$) which has the peak and wing shape of one common size (6) although varying around the lasting edge, (*b*) die number 2 (sizes 7 to 8½), common size of 8, and (*c*) die number 3 (sizes 9 to 11), common size of 10.

A certain amount of waste cannot be avoided in using the press type of perforator as the section is placed to the template and a margin of approximately ⅛ in. is given to clear the top die from the template. From this is will be seen that intricate curves and difficult cutting in the clicking room can be avoided by skilful use of the template shapes, the cutter merely casting a shape rather than the desired finished shape.

Several types of machine are available with a smaller effective work area. The BUSMC No. 3 Fancy Design Punching and Marking Machine has a sliding work table of 9 in. × 7½ in. and is suitable for single sections for perforating and marking. It is also possible to perforate closed uppers on this machine.

EDGE TREATMENTS

Cementing

Before folding it is necessary to apply a cement to the skived edge to be turned, the adhesive keeping the margin in position until it is ultimately stitched. Latex is commonly used, a machine applying a film to the leather to a pre-determined width. Rubber solution can also be used, the method of applying being by hand brush to a group of sections spaced quickly to the approximate margins. Great care should be taken to avoid solution being spread on the face of suedes or fabrics and damaging the appearance of the finished shoe. Cements can also take colour from calf leathers, but if precautions are taken and facilities provided for placing sections to dry no serious trouble should develop.

Folding

Folding is the turning of an edge of a section, usually to the amount of between ⅛ in. and $\frac{3}{16}$ in. to give a pleasing and finished appearance (Figure 71*a*).

The variations in the amount of turn in are usually the result of differing substances of leather in use. For light calf or glace kid ⅛ in. is sufficient; and the other extreme, heavy grain will need $\frac{3}{16}$ in. It is impossible to have patterns for all types of leathers, and it is no unusual occurrence for a margin of ⅙ in. to be allowed as a standard. It is also common for factories producing women's shoes to standardise at ⅛ in.

Folding a straight piece of leather presents no difficulty providing skiving is correct but to fold a convex curve it is necessary to pleat the excess material in the shorter circumference. The concave curve demands the opposite; the folded edge must assume a greater circumference and short cuts are made at right-angles to the edge, which, when turned, open and provide the extension required (Figure 71*b*).

Pleating should be neat and regular and be invisible in the finished upper. If indifferently performed the bumps will cause irregular stitching and probably show badly later.

Troubles due to lack of cutting of concave curves are lifting of the fold, small allowance taken and loss of shape.

Overcutting can cause serious troubles later; the cut will possibly tear if subject to strain; shape will be lost if cuts are widely spaced, the curve resulting in a series of semi-straight lines.

Folding is possible on most leathers except the heavier and greasy types. It is usual to fold all sections of glace kid, quarters of box and willow calf and the lighter grains.

All fabrics are folded to avoid the shredding of the threads; a rather larger allowance is made in this case.

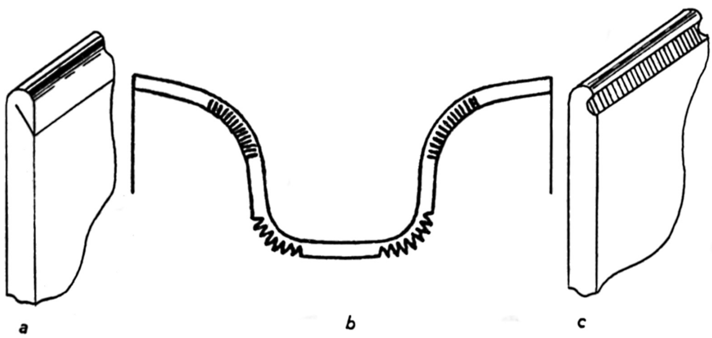


Figure 71. Edge treatments: *a* folding straight edge; *b* folding curved edge; *c* edging

Folding can be efficiently and quickly done by machine; the BUSMC Model 'H' Folder is in general use and a skilled operative will produce excellent results.

The edge is lifted, turned over and tapped down as the section is fed through the machine. The feed is controlled to facilitate difficult curves and allow pleating in a uniform manner, and a knife attachment can be brought into work to cut the concave curves. The machine is treadle-controlled leaving the operator with free hands to control and guide the work.

A fairly recent development is the applying of a $\frac{3}{16}$ in. tape to the leather while folding, the turn of the edge lapping the tape, which has previously run through a quick drying cement. This gives a firm top line when applied to quarters.

An older method, using the 'Booth' Folder, still in use in some factories, is to turn the edge to a template, the whole operation being completed in one movement of the machine. A standardised shape is necessary; for instance, the cap curve is readily considered for this type of folding machine.

Points to watch in folding are:

(1) correct allowance being taken;
(2) retention of shape of curves and corners;
(3) pairing of sections, e.g. lengths of facing *etc*.;
(4) running off at end of fold and loss of shape;
(5) checking with exact patterns on intricate straps, *etc*.

Edging

Like many other operations in the shoe trade, edging has several differing names including ironing, setting, searing and burnishing. The last named can cause confusion as burnishing has in the past been a well-known method of edge treatment; actually a raw edge is stained and fed past a heated tool, producing a burnished and well finished appearance. It is not, therefore, unusual to find the name applying to a similar operation in popular use today.

Mention has been made of the importance of the skive in producing good edging and unless the machine is in correct adjustment and a uniform skive is made, it is impossible for the edging operator to continue.

Edging can be defined as the treatment of a specially skived edge, which, when passed under a small heated iron causes a sharp contraction and turning of the grain of the leather and produces what is in effect an excellent imitation fold (Figure 71*c*). A feed carries the work under the iron which is heated by an oxy-acetylene flame or electricity, a guide keeping the edge of the section in its correct position in relation to the iron. A hammer movement completes the operation.

Materials suitable for this treatment are calf or light grains, but not glace kid. Vamps and caps are generally edged, giving an excellent appearance, considered by many equal to folding. The bulkiness experienced with folded vamps on the heavier calf is completely absent with edging, and also the saving of the fold allowance is of great importance from a cost point of view, as the folded vamp pattern will not usually lock and is extremely wasteful in cutting allowance.

Quarters are not suitable for edging, a firm top line being essential; the folded edge is the better of the two.

Important points are:

(1) correct skiving;
(2) correct heat adjustment for type of material used;
  (a) burning causes undue turn of edge and cracking of edge,
  (b) insufficient heat gives little turn of edge and poor appearance;
(3) checking of acute concave curves which are often by-passed, causing edge to be unturned;
(4) checking of convex curves, often pressed unduly against guide causing ridging, or excess turning.

Binding

Binding is the treatment of an edge by the use of a fabric tape or leather strip, stitched and turned in several differing methods.

Perhaps the most popular type in use in the shoe trade is the narrow fabric bound edge, often referred to as galloon binding, French binding or Paris binding.

This tape which can vary in width, but is usually $\frac{3}{8}$ in. for normal purposes has selvedged edges, is of good appearance, and is firm and non-stretchy.

The method of applying to the required edge is to stitch the binding to the outside section face to face, very close to the edge (Figure 72*a*). After applying solution the binding is lifted and pulled tightly over the top and

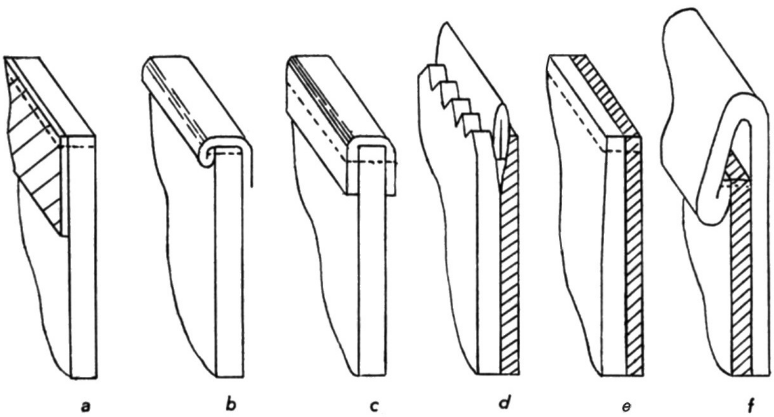


Figure 72. Edge treatments: *a* binding, stitched; *b* binding, completed; *c* flat binding; *d* slip-beading; *e* bagged edge, stitched; *f* bagged edge, turned but not rubbed down.

cemented down at the back of the leather (Figure 72*b*). Later the lining will cover this surplus and stitching will permanently secure it.

The type of machine to stitch this material will be described later; it will suffice to say here that it is necessary to stitch very close to the edge of the leather and also the binding; in the first case, if wavy stitching is done, a wavy width of binding edge results; in the second if the binding is stitched irregularly, difficulty may be experienced in not having sufficient to turn over.

The same difficulties apply to turning binding as in folding, and cutting is done to negotiate curves. Often a type of binding is used with a serrated edge on one side so avoiding the need to cut.

The seam in stitching is, in effect, a close seam, and in cases of leathers such as calf it may be necessary to rub down that seam to secure a neat turn of binding. The machine, known as the French Binding, Straightening and Cementing Machine, which applies the cement also rubs down the seam at the same time.

The BUSMC Turning-over Machine Model 'G' follows the folding machine principles, lifting the binding, turning and hammering down. This machine is often used with a heating element for use with pre-coated binding, the heat fusing the strip of thermo-plastic cement on the back of the binding, and cementing securely.

A more recent machine applies a thin stream of cement to the edge as the work proceeds through the turning-over machine.

The advantages of a bound edge are strength, non-stretching and excellent appearance, all qualities very essential in certain women's styles such as courts, bars, *etc*. It is a good edge treatment for fabric uppers, preventing fraying, and being of similar appearance.

On many sports shoes a similar edge treatment is done by means of a strip of leather, either in self or contrasting colour. The production of the edge is the same, but in many cases a bolder binding is shown by stitching slightly away from the edge of the section, in which case a greater width of binding is required. Binding can be used to form the inside collar on such shoes as unlined casuals, but it must be remembered no cutting should be done or appearance will be bad.

Other types of binding include a fabric strip to bind fabric shoes, the stitching machine turning the strip to the shape of a U and then stitching through. This method is known as flat binding (Figure 72*c*).

Narrow binding is also turned over the combined outside and lining to give a finished effect, especially on fabric-lined styles.

Points to watch in binding are:

(1) Check width of stitching.
(2) Check allowance cut away by knife attachment.
(3) Check selvedged edge is not cut by knife attachment causing breaking away at turning-over.
(4) Confirm tightness of turning over.
(5) Watch for solution (if used) on suedes, *etc*.

Slip-heading

This is an edge treatment usually confined to the more exclusive types of footwear, as it is essentially a hand operation and therefore costly.

A prepared leather strip, folded and approximately $\frac{1}{4}$ in. in width, is fitted under the outside section to protrude slightly from the edge (Figure 72*d*). Cement is used to retain the fit until stitching finally secures. Curves are negotiated by the usual method of having the slip bead slashed along its bottom edge. Good effects are achieved by contrasting colours and neat workmanship on women's styles, while a good edge results by slip- heading the gimped ankle curve of a man's brogue shoe.

Bagged Edge

The bagged edge is not used to the same extent today as previously, but a brief description follows.

The amount of bagging or turn can vary, but it is usually approximately $\frac{1}{6}$ in. as this produces a neat appearance without any undue difficulties.

The skive is double the turn, in this case $\frac{1}{3}$ in, but a reasonable substance must be left on the edge to hold stitching. The lining and outside are placed face to face and seamed $\frac{1}{16}$ in. from the edge (Figure 72*e*), the seam is opened out and rubbed down, and then the outside is rubbed flat at its 'net' edge, leaving a collar of outside material to the extent of $\frac{1}{6}$ in. showing on the inside (Figure 72*f*).

Shoe quarters along the ankle edge are suitable for bagging, as are Derby and Balmoral top quarter edges.

BACKING OR DOUBLING

Backing or doubling is the application of a material to the reverse side of the outside sections to assist in the manufacture and wearing qualities of footwear.

A number of materials are used, including swansdown. Acme, Tufsta, leather, adhesive tapes and woven tapes.

Swansdown is commonly used, and is an excellent material for light leathers, giving a feel of plumpness, preventing undue stretch during lasting, and assisting the shoe to retain its shape during wear. Rubber solution is used to keep swansdown in position but a very light application is preferable for best results. The BUSMC 'New York' Cementing Machine is ideal for this operation.

An adhesive backer such as Acme is fused to the reverse side of the leather by means of the application of heat either by hand-iron or press. As a means of preventing stretch it is very useful.

Leather is occasionally used, especially for light-weight reptiles, rubber cement being the adhesive. Tufsta is a firm non-stretching material, excellent for maintaining shapes of cut-outs or narrow strappings. Adhesive tapes are used for staying seams, applying to the ankle edge of quarters to preserve a firm top line, underlaying punching, *etc*. Opinions differ as to the advisability of stitching through doubles or alternatively sticking on after stitching. Quarter doubles stitched into the back-seam do help to retain straight backs, and any fancy rows stitched through assist in keeping uniform and limited stretch. One disadvantage is the tearing of swansdown when held rigid at the back, the tear printing through the outside. If a considerable amount of stitching is through outsides and doubles this trouble will probably be negligible.

Stitching-through will also cause an upper to be tight in lasting if originally it was not doubled, or if doubles were lightly cemented in.

FITTING

The main preparatory operations are now complete, although it must be said at this juncture that certain stitching operations are necessary to allow the completion of some sections in various styles, (*e.g.* seaming backs for galloon binding). However, although the definite division of the preparation department is fairly obvious in most factories, a clearly defined line cannot be claimed between the fitting-together and the stitching sections; indeed they are interwoven in varying degrees according to types of uppers in production, and in some cases are one and the same operation.

For the sake of clarity a description of fitting will now be given, but it should be clearly understood that as sections of uppers are gradually brought together, so in various positions in the department will be found fitters for that work.

Fitting as an operation is the positioning of a section, or sections, to other single or partially completed portions of the upper. Rubber solution is the normal adhesive used to retain the fit until the machinist has stitched to secure permanently.

It is of course possible to fit every part of the upper before machining, and if cost is of minor importance, such as in the production of highest grade hand-made footwear, then this procedure may be adopted. Cost is of major importance to the majority of firms and varying degrees of fitting are to be found. If we turn to the other extreme and decide the machinist must stitch without the benefit of the parts being 'fitted' together, the term 'held-together' is used.

Several considerations are involved in deciding which system. should be used, or indeed perhaps a part of each system.

(1) Type of work is of great importance; intricate designs may make fitting imperative.
(2) Class of work, mentioned above.
(3) Skill of operatives; it may be advantageous to fit certain parts to secure good results if using moderate labour.

Flat Fitting

Flat fitting is the positioning of section to section on a flat surface, usually with the object of stitching on a flat bed machine. Examples are cap to vamp, counter to insertion, quarters to quarter linings, *etc*. Advantages gained are perfect fit and detail. Disadvantages are cost, and, in the case of quarters to linings or similar parts which will eventually assume a round shape, an enlargement of the inside section develops which can cause difficulties in lasting and the finished shoe.

Block Fitting

Block fitting or round fitting is a method in which sections are placed over a wooden block of similar shape to a last, plus the addition of a leg, and positioned to assume a shape relative to the final shape of the shoe. Examples are outsides to linings, vamps to quarters, *etc.*

Advantages are obvious; a far better shaped upper results, and linings are clear and well fitted. Another point is that the responsibility is lessened for the machinist who can concentrate on the stitching without worrying if the section is correctly in position.

Disadvantages are cost—block fitting is a fairly slow job under any conditions—and, unless carefully watched, the use of excess adhesive can cancel out the advantages of clear linings. Care must be exercised in the use of adhesive on outside sections otherwise uppers can be unduly dirtied.

Fitting is a highly skilled operation, something more than just cementing one piece of leather to another; it has been said a well fitted upper is half lasted, and a certain amount of truth is contained in that assertion. Unfortunately it is a craft that is dying, the 'held-together' principle being now in general use and producing, in the circumstances, quite good results.

Held-Together

This system simply means the machinist positions the sections to the marks provided, and stitches along while still maintaining the fit by holding firmly. It is natural therefore, that some loss of exactness results; the top section tends to 'grow' as stitching proceeds; detail work such as the centring of peaks or narrow straps is difficult; the machining of vamps and at the same time maintaining correct underlay and centralising, demands great skill. A flat, poorly-shaped upper in comparison to a fitted upper is often the rule rather than the exception when vamps are held and stitched in a flat machine. However, by the use of post machines for certain operations many such faults can be overcome and satisfactory uppers produced.

Many firms combine the two systems and hold together some of the less important parts and fit the more important ones; for example, in a brogue shoe, lining making, counters and backstrip and undertrimming could be held, wings and vamps fitted.

12

STITCHING AND PROCESSES

SEAMS

SEVERAL METHODS ARE EMPLOYED in stitching sections together, many factors being involved, including type of shoe, substance of leather, position in shoe and strength required in manufacture and wear.

Plain Closed Seam

Plain closed seams are produced by facing together the two sections and stitching approximately $\frac{1}{16}$ in. from the edge (Figure 73*a*). After opening outwards a ridge is left rather prominently exposed on the inside (Figure 73*b*); a ridge that would cause much discomfort in wear unless flattened, an operation usually termed rubbing-down (Figure 73*c*).

The first point of importance in a closed seam must be the skiving (see Figure 70). It must be understood that uniformity is essential, so unless the material is very light skiving should be done even if only to reduce the odd section or even part of section which is plump. In the case of stouter leathers it may be advantageous to reduce a little more than the third of the substance skived away, as suggested earlier. A considerable amount of tension exists in the stitching after the seam is opened out and this rises as substance increases; the fact that seams break in manufacture does not automatically point to inferior thread. It is entirely a responsibility of the foreman to consider the skiving in relation to substance and characteristics of the leather involved.

The stitching should be a uniform distance from the edges, great care being taken that the underside does not slip away causing a weakness or perhaps a broken seam: also stitching back can be adopted, that is, the first few stitches made are repeated to fix firmly the end of the seam and prevent its pulling open. Care must be taken that this does not cause cutting of the material by the needle and eventual breaking of the leather later in manufacture. The length of stitch should also be constant, a machine with fixed stitch length being the most suitable.

To flatten the resulting ridge on the back of the leather it is usual to run the seam through the BUSMC No. 4 Rubbing-down Machine which separates the two substances and presses them back. If one part varies in substance or is more harsh than the other, it is difficult to rub the seam flat, the tendency being for the weaker side to fold over, a bulky seam resulting.

An adhesive tape is often placed down a seam of this character, giving slightly more strength and spreading the ridge substance. A machine is available for this operation, or alternatively seam rubbing and taping can be done on a combined machine. It should be stressed at this point, that closed seams must never be hammered, as this will break the seam without doubt. This applies equally to the lasting room as to the closing room.

Any two parts of the same shape are suitable for this type of seam, the most obvious and most generally used being the back seam, in the outsides and in the linings. It is also quite common to see a seam of this type up the centre of the front of the shoe.

If a closed seam is required in which the two sections are of different shapes, then the stitching assumes an increasing importance and greater skill is needed by the operator.

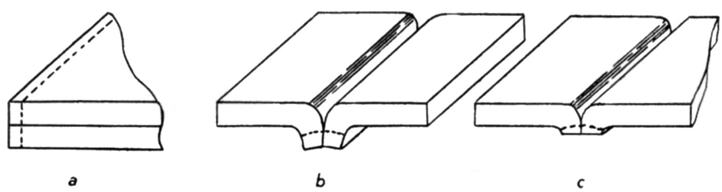


Figure 73. Plain closed seam: *a* stitched; *b* opened; *c* rubbed down.

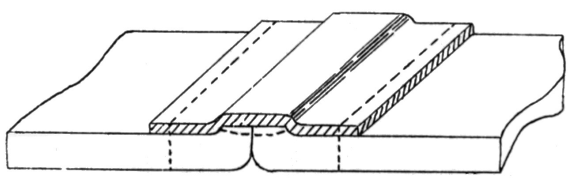


Figure 74. Open stitched seam.

Silked or Open Stitched Seam

This seam is originally produced as the plain closed seam and all details as to skiving and stitching etc., are identical, but after rubbing down, a tape, preferably a woven type of a good quality, is stitched down the seam as shown in Figure 74. The stitching is parallel to the original seam, and to secure good results a twin machine, that is a flat bed machine with twin needles, is used; a guide keeps the seam in position, a roll of tape being fed also through a guide under the leather, the stitching being automatically on the margin of the tape.

A considerable increase in strength results from this method, and the silked seam is used extensively for back-seams on the heavier women's and ordinary men's types. It can be used on front seams, when the added strength resists collapse over the toe often experienced with the plain closed seam.

To add strength at the top of a back-seam, it is often an advantage to

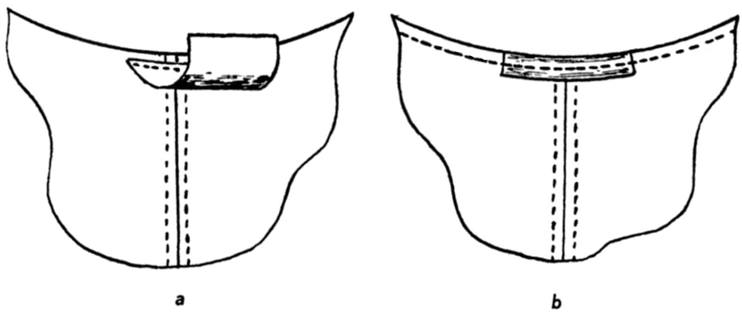


Figure 75. Close seam stay: *a* stitched; *b* cemented, turned and stitched.

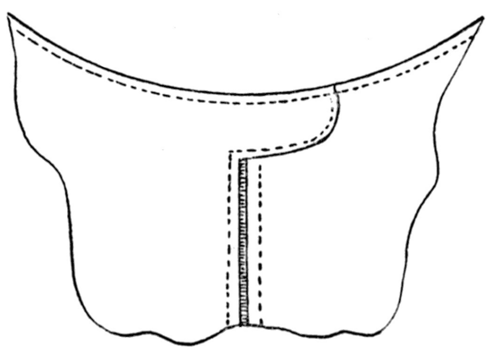


Figure 76. Dog-tail method of strengthening back-seam.

stitch a light substance piece of leather across the seam (Figure 75). This is cemented and turned over the top edge and later stitched in the top row.

One other method to resist breaking of the back-seam is the addition of a small wing of leather, sometimes called a dog-tail, on one quarter, which is stitched over the opposite quarter as shown in Figure 76. This necessitates the taping rows being stitched by single needle machine.

Welted Seam

Welted seams are a variation of the closed seam and are often used on heavy leathers. Mention has been made of the tension of thread when heavy substance leathers are close seamed, and it has been found that by inserting another substance, often of the same material, between the two sections to be stitched (Figure 77*a*, *b*) a flatter seam is produced and the thread is buried in the extra substance. The welt, as it is known, is stitched flush with the other sections and when opened out the excess material is ploughed out and stained to give a neat appearance.

This method can also be used to give pleasing effects on women's shoes; a contrasting coloured material is obtainable not as a single substance but a prepared folded piping. In this case we require the folded edge to be in an exact position relative to the seam, but to add to the difficulties, it is out of sight between the two sections to be stitched. Consequently the piping is fed through a guide which is set in a position in relation to the needle, and a uniform width of piping is shown when the

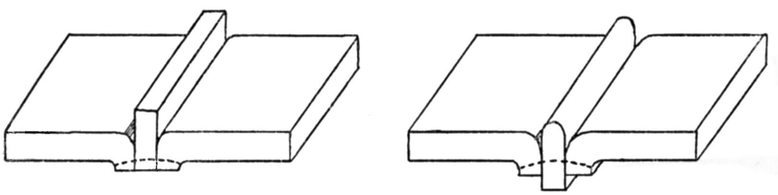


Figure 77. *A* welted seam, before trimming; *b* piped seam.

seam is made. The amount is variable, and to suit certain styles The guide is moved to produce heavier or lighter types of piping.

Lapped Seam

This seam, the most extensively used in the closing room, is produced by placing one section above the other and stitching through (Figure 70*d*). It is the strongest of seams and it is possible to use more stitches to the inch than in any other type. The top section has usually had some previous treatment to the edge, while the under section has been skived to a feather to prevent unsightly appearance and discomfort in wear. Details of skiving have already been made in the section concerned with that operation but a few remarks concerning allowances are appropriate here. Underlays vary according to materials and number of rows of stitching, but for light substance leather to be stitched with one row or two close rows the allowance can be as small as $\frac{1}{4}$ in. As substance increases so should the underlay increase to prevent a sudden drop from the two sections to the one, a gradual diminishing allowance being the objective.

If two or more spaced rows are used there must be sufficient material for the outer stitching to secure. This is very important if perforating is used on the edge of the top section; the failure of the second row to stitch on the underlay will cause the perforations to elongate when lasted, and appearance will be ruined. It is quite common for underlays for perforations to reach $\frac{1}{2}$ in. or $\frac{5}{8}$ in.

Note has been made previously in skiving of the importance of stitching the first row on full substance, and it is emphasised here that supervisors should watch carefully for over-skiving, and its seam-weakening effect.

Examples of lapped seams are cap to vamps and vamps to quarters.

Zigzagged or Butted Seam

This is a seam, usually of a temporary nature, in which the cut edges of two sections are butted together and a special machine stitches by a needle which alternates from one section to the other, forming a zigzag stitch as shown in Figure 92*a*. The seam has little strength, but its advantage is that it is completely flat, and is ideal for backs of quarters, for instance, when a back-strip is to be put on later. Owing to the fact that a large amount of thread is used in the seam it is a comparatively elastic method of stitching, another advantage for taking the strain when lasting.

Hand-Closed Seam

Another type of seam used extensively in shoes of the moccasin or apron-front style is the butted or hand-closed seam. As the name suggests, the two sections (the apron and front in the style mentioned), are cut to fit edge to edge and the seam is produced by sewing through part of the substance of both sections. Several variations of this seam can be made; both edges may be shown by sewing through full substance of the two sections; either cut edge may be shown by sewing full substance of the one section and part substance of the other.

The principles of sewing and also thread used are similar to hand-sewing of welts, except of course, a lighter weight thread and finished seam is required.

A system of producing a similar seam by machinery has been evolved by an attachment fitted to the BUSMC Model ‘O’ Stitcher (see p. 308). Preliminary work necessary for this method is the skiving of both sections, a very stunted skive being required, the turning outwards of the edges which can be accomplished by a folding machine and the cementing and careful fitting-together of the edges.

STITCHING THREADS USED IN THE CLOSING DEPARTMENT

The choice of thread for closing any particular type of upper is governed by several factors:

(1) breaking strength,
(2) elasticity,
(3) appearance,
(4) uniformity,
(5) functional use.

It is true that these factors are to some extent complementary to each other, but each one must be considered separately.

(1) Breaking strength is obviously of great importance, not only for the eventual strength of the seam to be made, but also to withstand the production of the stitches by the machine, with which we shall deal later.

(2) Elasticity allied with strength is an important asset in threads, allowing a certain degree of ‘give’ to a seam in lasting and in wear. A thread which stretches is less likely to break suddenly.

(3) Appearance must be considered, especially in the case of women’s footwear, conformity of stitching with the style and type of product being most essential.

(4) The sewing machine being in most cases a delicate and finely adjusted mechanism, a uniform thread is required for its satisfactory operation.

(5) Stitching agents must be suitable for the eventual function of the shoe involved, whether it be dancing pump or army boot.

The threads extensively used are:

(1) cotton, (2) linen, (3) silk and (4) nylon.

Cotton

A thread which possesses to a reasonable degree the characteristics and the factors listed above is cotton, produced from fibres of the seed pod of the cotton plant. Relatively cheap, uniform, of good appearance, of adequate strength and slight elasticity, and suitable for most types of footwear, cotton is used widely in all closing rooms.

Strands of cotton are twisted to produce the final thread, the method adopted being to twist three strands or cords of a certain size, giving what is known as a three-cord thread. Multiples of three are taken and twisted to give six-, nine-, twelve-cord threads, strong, uniform and well balanced threads resulting.

Linen

Linen fibre is obtained from the stalk of the flax plant and produces a very strong thread. It has the tendency to be coarse, and for this reason is unsuitable generally for fine threads for light uppers, and is consequently used for footwear requiring strong, heavy stitching. Being suitable for waxing (it is sometimes known as wax thread), the thread is often run through a waxpot on the machine; this helps to lubricate the thread during stitch production and also makes a water-resisting seam. Special machines are used for heavy linen threads.

Silk

Silk thread is produced from the filaments spun by the silkworm, and as a stitching agent gives excellent results. It is strong, very elastic, and, as is expected, has a fine appearance, but unfortunately is very expensive. Strands are twisted in a manner similar to cotton giving three, six, *etc*., cords.

Nylon

The use of spun nylon thread as a cheaper alternative to silk in closing women's shoes is increasing. It has a greater breaking load and stretch than cotton and stands up well to repeated strain and abrasion such as is experienced, for example, by the back-seam of a shoe. The SATRA *Bulletin* for February 1952 describes tests carried out on nylon thread and gives several hints on its proper use. No particular difficulties occur in stitching leathers up to $1\frac{1}{4}$ mm. in substance but after that frictional heat may cause fusing of the separate nylon strands. The strands of silk thread used on a $1\frac{3}{4}$ mm. leather were broken but not fused. No really practical and effective way has yet been found of applying a lubricant to the nylon to reduce the friction and the main point to be watched is that both needle and shuttle threads should be at exactly the right tension which should be obtained by setting both at a minimum to begin with and then increasing. The winding tension of the shuttle should be a minimum.

Thread Sizes

A considerable amount of doubt exists concerning the origin of numbers applicable to threads used in the closing department.

As a result of enquiries to thread manufacturers it has been found impossible to give definite information of any accepted system in general use.

To quote one manufacturer: 'The origin of many of these numbers has been lost in antiquity, but as a result of long and constant use, they have become trade custom and there tends to be a different range of numbers applicable to threads supplied for different purposes.'

As an example of variations, types suggested by this producer as suitable for upper closing, were:

nine-cord—No. 70, 80, 90 and 100.

six-cord—No. 24 and 36.

It should be stated that thickness of thread is not a means of measurement.

In numbering cotton yarn, the number of hanks (840 yd. being a standard hank) to make 1 lb. weight gives the count or number. This may produce the 70 to 100 type of number, but obviously bears no relation to the 16 to 36 type which is also in common use.

NEEDLES

The selection of the correct size of needle, and also size and quality of thread for the sewing machine, is of great importance in the producing of a strong seam of good appearance.

The three main points to consider are:
(1) eye, (2) point and (3) grooves.

Eye

In forming a stitch the thread passes backwards and forwards through the eye a considerable number of times and it is essential it should be polished to a high degree of smoothness to prevent fraying and breaking. Also the size must be correct for the thread size to prevent undue movement, but at the same time must not obstruct free movement.

Point

The function of the needle point is to pierce the leather or fabric with the minimum of friction and at the same time shape the punctures so that the stitch will have the desired appearance. The cutting edges on the points of the needles are therefore set at various angles to meet the requirements of each class of work.

(a) Round Point (Figure 78*a*)—Although this style of point is designed for stitching cloth, it is also used for sewing lighter grades of leather, but it is not recommended for leather work where high speed or heavy sewing is involved. It makes a round penetration, enlarging the needle hole without cutting. It is therefore adapted for sewing the cloth linings of shoes, because it does not cut the strands of the fabric but penetrates between them (Figure 790).

(b) Narrow Wedge Point (Figure 78*b*)—This is similar to the wedge point (with its two almost flat sides forming a slightly rounded cutting edge in line with the eye), but its cutting edge is narrower and particularly suited for leathers of a soft character. This results in smaller perforations in the leather and allows the stitches to be brought still closer together. The straight cuts in the material at right-angles to the line of stitching result in slightly raised diagonal stitches (Figure 79b')

This type of needle is used very extensively in the closing of shoe uppers.

(c) Cross Point (Figure 78*c*)—This needle might be considered as being the opposite to the wedge point. It also has two sides, almost

flat, but the cutting edge formed by them lies at right-angles to the line of the eye.

As the straight cuts made by this style of point follow the line of stitching, it is obvious that the cross point needle cannot be used for very short stitches. However, this needle point produces a straight stitch and buries the thread deeply in the seam (Figure 79c). Of similar characteristics is the reverse spear point needle.

Many other types of point are available for special purposes including twist points cutting at varying angles to the line of stitching. Diamond and triangular points are self explanatory.

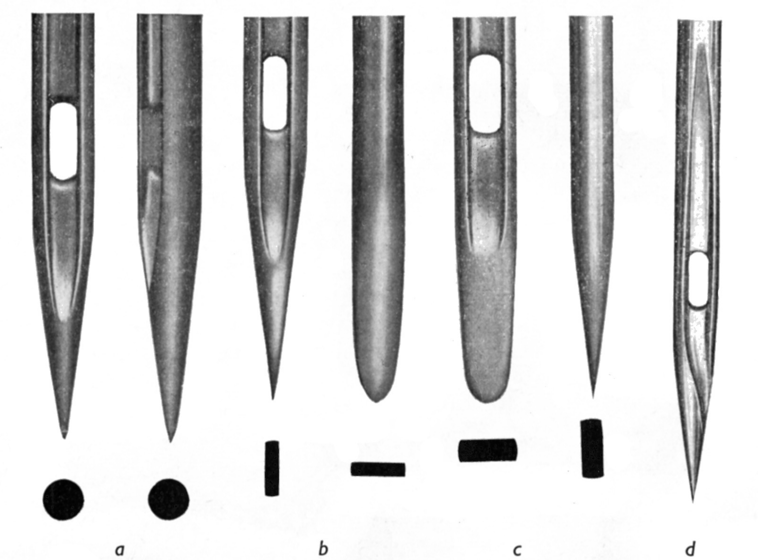


Figure 78. Needle points: *a* round point; *b* narrow wedge point; *c* cross point; *d* left twist groove narrow wedge point.

Grooves

The needle has two grooves, one long, the other short; the long one, which is of considerable length reaching from the point to the shank, is there for the object of guiding and protecting the thread during the making of the stitch. The point in entering the material makes a puncture sufficient only for itself, and the thread immediately above would be subject to severe frictional strain and chafing unless the recess in the needle were present. It is obvious, therefore, that the needle is inserted in the machine with the long groove to the thread feed and opposite to the bobbin.

The short groove is opposite to the long one and is to assist in the producing of the loop for the lock-stitch. Some needles are made with a twist groove below the eye of the needle on the short-groove side to assist in the prevention of chafing (Figure 78*d*).

Needle Sizes

The characteristics of the needle having been considered, especially with regard to threads and the production of a good stitch, it is apparent that choice of threads to be in harmony with the material will dictate the size of needle to be used.

As a guide to needle sizes, size 12 is an average for women's work, and size 16 for men's; variations in both cases are made for lighter and heavier materials and threads.

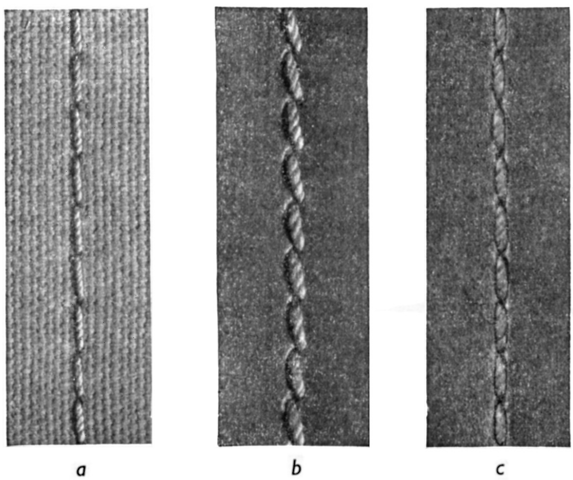


Figure 79. Stitches made by various types of needle: *a* round point; *b* narrow wedge point; *c* cross point.

STITCH FORMATIONS

Stitching machines used in the closing departments produce, in the vast majority of cases, a lock-stitch, although a machine making a chain-stitch is occasionally used for some operations.

Lock-stitch

The lock-stitch is made by the use of two threads, the top thread feeding through the needle, and the bobbin thread contained on a small metal reel in the bed of the machine.

The action necessary to complete a stitch is as follows:

(1) The descending needle pierces the material, and carries the thread below the needle plate.

(2) A small loop is formed as the needle commences to rise, and the rotating hook of the bobbin goes through it and thereby interlocks the bobbin thread.
(3) The needle still ascending, and assisted by the take-up lever, draws up the loop and slack thread causing the lock to position itself centrally in the material.

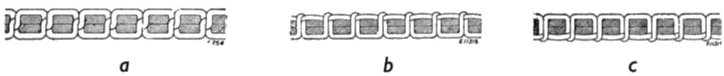


Figure 80. Lock-stitch: *a* correct locking stitch; *b* tight needle thread tension; *c* loose needle thread tension.

It will be realised that very fine adjustments are necessary to achieve correct results with the lock in the centre (Figure 80*a*) and if for some reason that adjustment is lost, one thread will pull the opposite one right through the material causing an unsightly appearance and weakness of seam (Figure 80*b*, *c*).

The strength of the lock-stitch lies in the fact that each stitch is formed by two taut threads firmly embedded in the material, and should one be broken the next stitch is not seriously weakened.

Chain-stitch

The chain-stitch is made by one thread only, and the action is as follows:
(1) The needle pierces the material and leaves a loop of thread below.
(2) After the needle ascends the material feeds to the next stitch position.
(3) The needle again descends to pierce the material and also the loop left from the previous stitch.

The top view resembles the lock-stitch but the under-side is composed of the loops, giving the appearance of a chain (Figure 81).

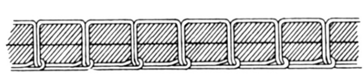


Figure 81. Chain-stitch.

In contrast to the lock-stitch, a broken stitch will cause the whole seam to weaken and disintegrate. Although a somewhat more elastic seam, the chain-stitch has little to commend it for use in shoe uppers. Under no circumstances should it be used where any abrasive action is possible.

TYPES OF STITCHING MACHINES USED IN THE CLOSING DEPARTMENT

A considerable variety of stitching machines is to be found in most closing rooms and it will be noticed that modifications exist even on apparently similar types. The essential characteristics of most machines are the same, however, and the description of one type will cover many others.

Without going deeply into the mechanical workings of the sewing machine it is necessary to understand the functions of the major mechanisms and movements essential to produce the stitch.

The machine used for many operations in all sections of the department is known as the flat-bed machine, of which there are two distinct types, the variable stitch length, and the fixed stitch length or gear machine.

The variable stitch length machine is an excellent all-purpose machine which is used extensively for many stitching operations in men's upper production, and is also used in many rooms producing women's uppers.

The fixed stitch length machine is very suitable for women's upper production.

The Variable Stitch Length Flat Machine (21W162—SSMC)

Machines of this type have the vertical rotating sewing hook with stationery bobbin case mechanism on the right of the needle for making the lock-stitch. The hook driving shaft receives its rotary motion from the arm shaft and link connections.

To Thread the Needle—Place the spool of thread on the spool holder; pass the thread through the thread leader (1, Figure 82) near the needle bar, then under the thread retaining guide wire 2, up over the thread retainer 3, and draw it between the tension discs 4, under and up over the notch in the thread controller 5, under the controller spring 6, thence up through the take-up lever 7, down through the thread guide 8, and through the needle bar thread guide 9, threading the needle 10 from the left towards the arm.

To Thread the Bobbin Case—Place the bobbin in the machine so that the unwinding thread will turn it in the same direction that the hook runs, and draw the thread down into the notch and under the bobbin case tension spring.

To Regulate the Tension—The tension on the needle thread is regulated by the thumb nut (4, Figure 82) at the front of the tension discs.

To tighten the tension turn thumb towards front of machine; to loosen turn nut away.

The tension discs are of great importance, and consist of two steel discs pressed together by the action of a coiled spring. The thread passing between the discs is restricted in its movement by the pressure applied by the spring.

To ensure the locking of the thread in the centre of the material the machinist must use this simple but effective device with intelligence and great care.

The tension of the bobbin thread is regulated by a screw at the centre of the bobbin case tension spring.

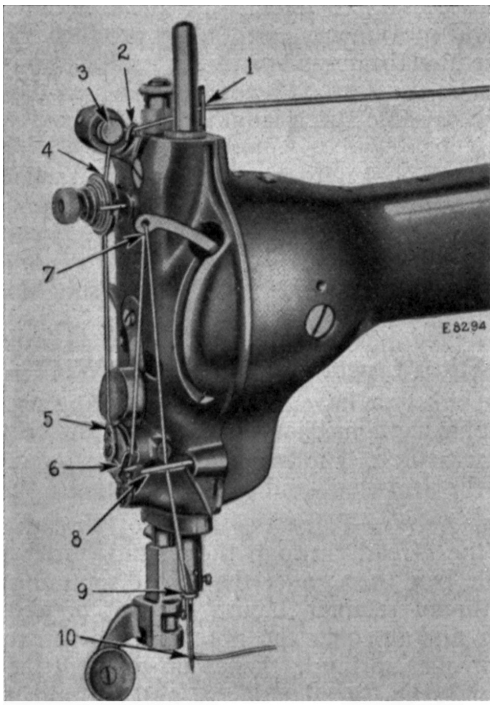


Figure 82. Threading the needle on a Singer 21W162 machine. The thread passes from left to right through the needle.

To Change the Length of Stitch—A lever on the right side of the machine is provided to vary stitch length; to shorten stitch, raise lever, to lengthen stitch lower lever.

The Pressure on the Material—To keep the material in contact with the feed during stitching a presser wheel tensioned by an adjustable spring is provided. The pressure should only be heavy enough to assure an even length of stitch and to prevent the work from rising with the needle; if too heavy it will make the machine run harder and may damage fine-grained leather. The edge of the presser wheel is milled. Various sizes of wheel are available to suit different types of work and stitching, *e.g.* a small wheel assists in stitching acute curves. The presser wheel can be raised by knee pressure against a knee plate, leaving both hands free to manipulate the work. A lever is also provided at the back of the machine to lift the presser wheel.

The Feed—The feed on this type of machine is a milled wheel, slightly projecting from the needle plate, which moves forward with the material one stitch length during the period of time the needle is above the work. When the needle descends the feed is stationary for the completion of the stitch; any forward movement at this time would obviously break the needle. The feed is therefore of an interrupted movement and although barely noticeable, a difference is seen and felt in comparison with the gear type of feed machines described later.

The Thread Controller—The function of the thread controller spring is to hold back the slack of the upper thread until the eye of the needle reaches the material in its descent.

The Take-up Lever—In forming a lock-stitch a considerable amount of thread is used to pass around the shuttle, consequently, after a stitch is formed, the take-up lever pulls back the slack thread to complete the stitch.

Fixed Stitch Length Flat Machine (110W124—SSMC)

This machine is fitted with a continuously moving wheel feed in combination with an oscillating needle feed; the material being stitched is therefore moving forward smoothly, even while the needle is below the needle plate. After ascending from the material the needle returns to its original position for the next stitch.

To Thread the Needle—Pass the thread from the spool holder, over from right to left through the upper hole, from left to right through the centre hole from right to left through the lower hole in the thread leader (1, Figure 83), at the front of the machine, down, under from right to left between tension discs (2). Pull thread up under the thread take-up spring (4), until it enters the retaining fork (3), then pass the thread up through the thread guide (5), and from right to left through the hole (6) in the end of the thread take-up lever, down through the thread guide (7), between the felt pad and felt pad retaining finger (8), into the thread nipper (9), down through the hole (10), at the lower end of the needle bar, and from left to right through the eye of the needle (11).

To Replace the Bobbin and Thread the Bobbin Case—Hold the bobbin between the thumb and forefinger of the right hand, the thread drawing on the bottom from left to right, and place it on the centre stud of the bobbin case, then push down the latch (D, Figure 84).

Draw the thread into the slot (1), under the back of the projection (2), leaving a loose end of thread about 2 in. long above the slide.

To Regulate the Tension—The tension on the needle thread is regulated by the thumb nut (2, Figure 83), at the front of the tension discs.To increase the tension, turn thumb nut to the right; to decrease the

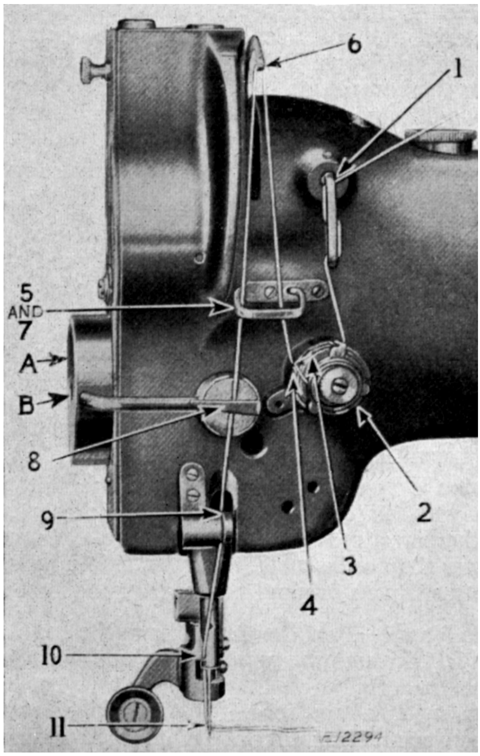


Figure 83. Threading the needle on a Singer 110W124 machine.

tension turn the thumb nut to the left. The tension of the bobbin thread is regulated by means of the screw nearest the centre of the tension spring on the outside of the bobbin case.

To Change the Length of Stitch—The continuous wheel feed is driven by gears, the sizes of which determine the length of stitch. The three pairs of feed gears are located at the left underneath the bed of the machine, each pair of gears making a different length of stitch. The location of the knurled collar (W2, Figure 85) on its shaft determines which pair of gears is engaged; *e.g.* when the knurled collar is at the outer end of the shaft the outermost pair of gears (A3) is engaged.

To change the length of stitch, raise the roller presser, then slide the knurled collar (W2) to the desired position on the shaft and turn it in either direction until the engaging latch (X2) enters the notch in the gear.

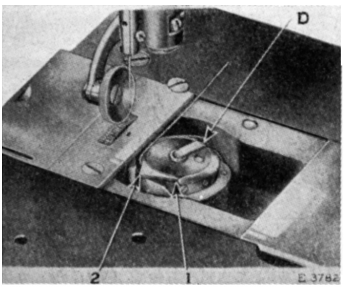


Figure 84. Threading the bobbin case on a Singer 110W124 machine.

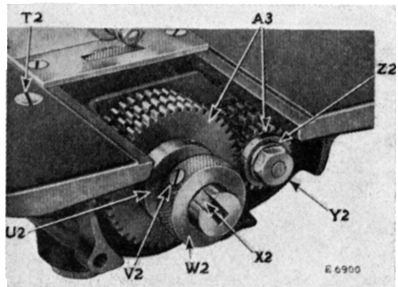


Figure 85. Changing the stitch length on a Singer 110W124 machine (gear machine)

Sets of gears are available for various lengths of stitch other than those normally supplied with the machine.

Many characteristics of this type of machine are the same as the variable stitch length type, and similar work is performed on both machines. The continuous gear feed with its attendant needle movement is an important variation which should be closely studied by the student.

The Under Edge Trimmer (110W128—SSMC)

This machine is essentially the same as the gear feed flat bed machine previously described, but it has the addition of a knife attachment, for trimming away the surplus lining around the top edge of the shoe during the stitching operation.

The knife attachment is mounted on, and is parallel to, the bed of the machine and works with an oscillating movement; adjustment is possible to the knife for trimming at varying distances from the stitching (Figure 86).

It is usual to stitch slightly away from the edge of the material and trim the lining very close to the stitching with the object of producing a neat appearance with the lining invisible.

The knife can be put out of action if desired, and normal stitching continued. It is important that the knife should be kept very sharp, otherwise the lining is left ragged and unsightly.

Two other knife attachments to the same machine are the vertical knife (Figure 87) which cuts square to the edge of the outer material, and the *oblique* knife, cutting at an angle and giving an undertrimmed effect.

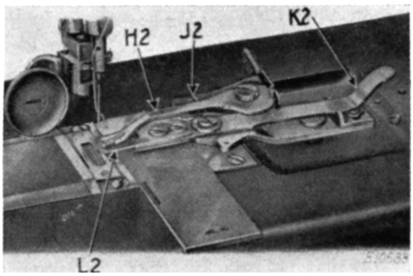


Figure 86

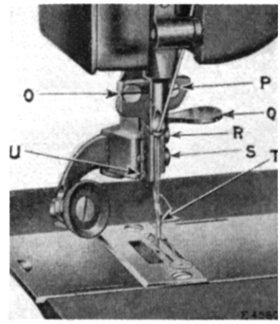


Figure 87

Figure 86. Horizontal undertrimmer on flat machine (gear). H2 = adjustable edge guide; J2 = screw holding edge guide; L2 = knife blade; K2 = disengaging handle.

Figure 87. Vertical trimmer flat machine (gear). O, P, R, S, U, = fixing and

The Twin Needle Flat Machine

This machine has two needles and two rotary hooks, and makes two parallel rows of lock-stitching. The width between the needles is variable, and can be supplied by the makers to produce close rows $\frac{1}{32}$ in. apart, to spaced rows $\frac{1}{4}$ in. apart.

For sections without any undue curvature excellent results are obtained by the twin machine, but for acute curves, it will be found the inside row has a shorter length of stitch.than the outer row.

This machine can be adapted for open stitching or rowing, and gives a uniform result not obtained by the use of a single needle machine. A small guide is attached to the machine to centralise the seam, and a roll of tape is fed from beneath the machine and guided over the feed.

When the seamed quarters are positioned correctly and stitching is commenced, the guide automatically keeps the rows central and the tape is also in position underneath.

An interesting point to be noticed in this type of machine is the feed, known as a step feed, or four motion feed, a serrated rectangular shape protruding from the base of the machine. The feed moves forward the stitch length, lowers beneath the surface, returns to the original position, and lifts above the plate to continue the next movement.

The Zigzag Machine

Another variation of a flat machine, the zigzag machine, producing the stitch described previously, has a needle bar that moves horizontally $\frac{3}{16}$ in. to the left and right for each stitch, which in conjunction with the usual feed gives a zigzag effect.

The Post Machine

The post bed machine is easily recognised in the closing room as its name adequately describes the upright pillar of some 7 in. height with a small working area of some 2 in. rising from the flat bed of the machine.

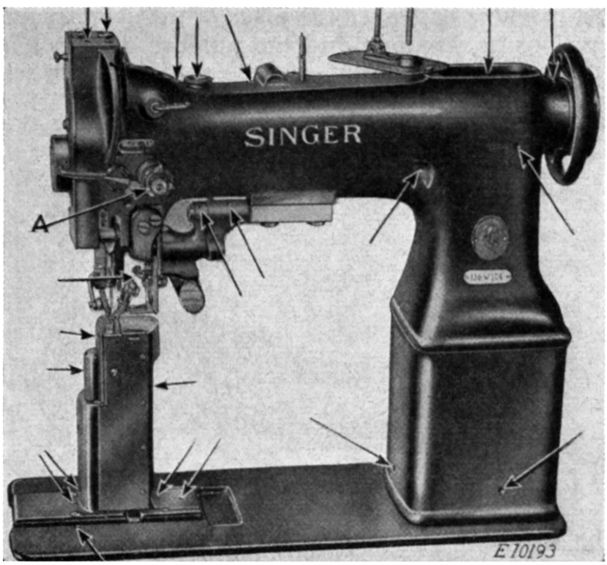


Figure 88. Post undertrimmer (gear feed). The arrows indicate oiling points.

The great advantage of this type of machine is the ease in which certain parts of the upper may be stitched compared with the flat machine; also the upper is kept in its true shape and distortion minimised.

Knife attachments are supplied with certain post machines for the purpose of under-edge trimming (Figure 88), and other operations such as galloon binding *etc*., and are of the horizontal knife, oblique knife, and vertical knife types, all of which can be thrown out of action and the stitching carried on normally.

Post machines will be found with gear-type feeds, and there are also many of the step feed type.

One other point of interest is the lack of a knee lifter, and the substitution of a treadle on certain machines. Also the stitch length changing device on some types is a knurled wheel set in the balance wheel. There is a notch in the hub of the balance wheel, and the number appearing in the notch shows the number of stitches per inch that the machine is ready to make.

The Cylinder Machine

This machine is often known as the golosh machine, and by that name it identifies the work for which it is very suitable. The cylinder or arm is horizontal and the machine can be obtained either with left or right arms. Most cylinder machines are of the step feed type (Figure 89), but a gear feed is available.

The post machine has taken the place of the cylinder machine for such operations as vamping and the number of arm machines at work at the present day is very small, compared with what it was when the Balmoral boot was popular years ago.

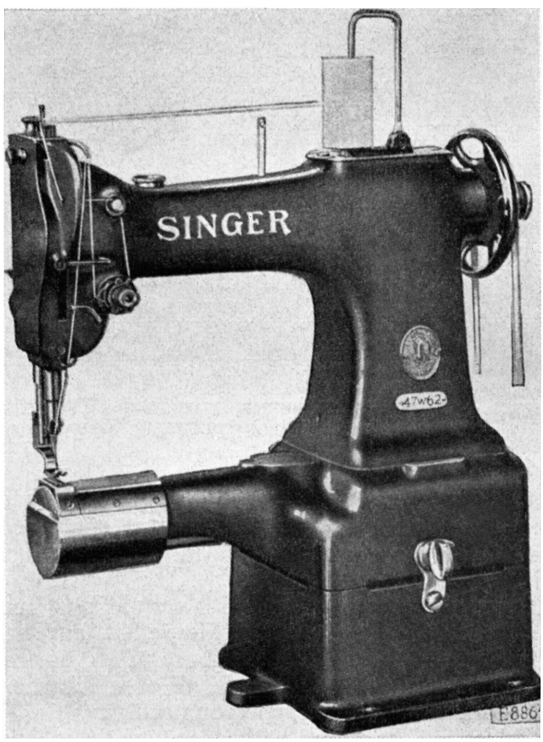


Figure 89. Cylinder machine.

The type of cylinder machine similar to the one shown in Figure 89 is used extensively for back-stripping; a wheel presser foot is supplied instead of the foot shown.

Wax Thread Machines

Heavier types of machines are available which are suitable for using the heavy linen thread often known as wax thread. A cylinder machine with left-hand arm is in general use for this work, and is very useful for such stitching as sides of Derbies.

Normal flat machines are often adapted to work heavy wax thread. The 'Puritan' machine is a heavy wax thread machine (the thread running through a waxpot), used for heavy service footwear, agricultural boots, *etc*. This machine produces a chain-stitch.

Special Machines

Many types of machines other than those described are used for special operations, such as the barring machine for stitching the tack across the facings of an Oxford, the welting machine for inserting the welt in a close seam, the button-hole machine, an elaborate machine which cuts the hole and stitches all round the cut in a matter of a few seconds, button and buckle sewing machines, oversewing machines used for lambswool *etc*., cording machines for inserting a cord and stitching a raised seam, *etc*.

SEQUENCE OF OPERATIONS

A description of the process of closing is given, together with a diagram showing the build-up of the style in question. For simplicity, only the absolute minimum number of operations is shown, but variations and additions will be described in the text. The basic styles are given, but it must always be remembered different firms have different methods to suit their particular trade, even in the basic types. The general principles however, hold good even if the details vary.

Oxford Shoe (Closed on the Flat)

The first point to consider after the preparatory operations of checking, identification marking, and skiving are completed is the breaking-up, or grouping of the various sections. We may decide one skiver will be responsible for the whole basket of work; alternatively, a less skilled operative will skive the linings and tongues. The breaking-up is usual after skiving if one person has skived the complete work.

The grouping is as follows:

(1) vamps and caps,
(2) tongues and tongue linings,
(3) quarter linings,
(4) quarters and back-strips,
(5) vamp linings.

Groups (2) and (3) may be kept together for one lining machinist, and group (5) (vamp lining), not being required until much later in the sequence, is kept near at hand for that late operation.

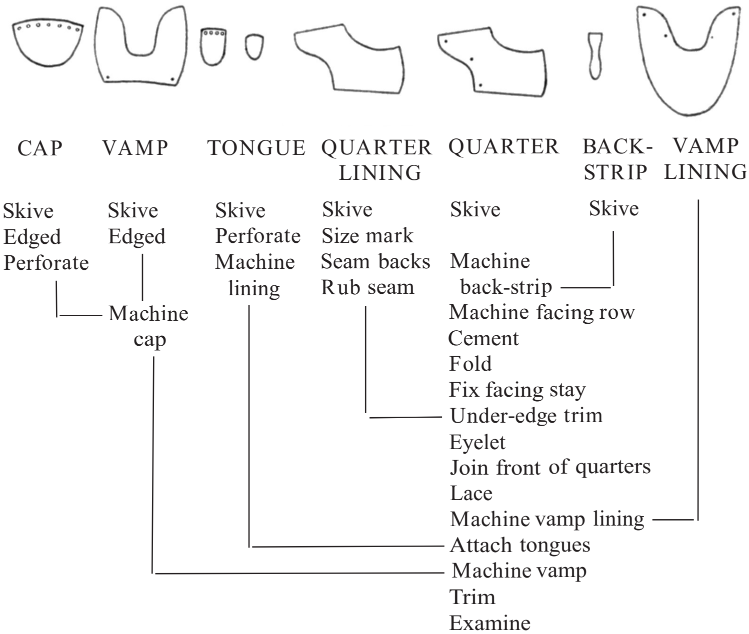


Figure 90. Sequence of operations for Oxford shoe (closed on the flat).

Description: Folded quarter, edged vamp and cap, perforated cap and tongue, leather quarter lining, fabric vamp lining.

(1) Vamps and caps, being edged, have the special skive for that purpose (at vamp throat and cap curve), and the vamp is skived for underlay at front edge. The two sections go to the edging machine, after which it is necessary to perforate the caps, possibly using the BUSMC 'Royal' Perforator. It is not essential that the caps should be parted from the vamps for this solitary operation, although a mistake can be made by the operator misreading the ticket instructions and perforating both sections. Therefore safety is achieved by sending caps only.

The complete caps are now ready for machining to the vamps, in this case, one row each side of the perforations; guiding marks are pierce holes or possibly marking lines. A fixed stitch length or as it is called, a gear machine, gives excellent results on caps. It is usual in cap machining for a swansdown or similar type toe joiner to be caught in the first row, forming a pocket for the puff at lasting.

The second row must not go through this joiner otherwise the puff will not reach the end of the cap; so after stitching the first row the joiner is pulled back out of reach of the next row.

Also at this stage the side lining can be attached either by means of a few stitches, stapling, or cementing. Some firms use the first cap row to hold the side lining, adding more responsibility to the machinist. Position is important; the front edge of the side lining should just overlap the puff, and in fact if a leather type is used the skive must meet the skive of the puff.

A vamp stay is usually cemented on the centre of the throat to give strength at this vital point, the junction of facings and vamp. It is normally a thin piece of leather about $\frac{3}{8}$ in. square.

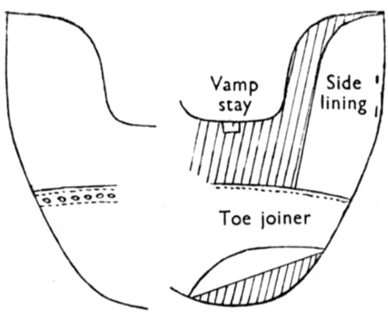


Figure 91. Front and back of Oxford vamp.

The complete vamp (Figure 91) is now ready for the next operation, which is, however, at a much later stage, in fact almost the last one; accordingly storage space is provided at a suitable position and the sections wait until required.

(2) The tongue will be skived, raw edge at the top and a fairly long skive at the bottom, the object being to avoid bulkiness. The tongue lining is skived all round (as raw edge) for uniformity. After perforating the top of the tongue, the lining is machined using a normal flat machine. Once again the complete section is stored for later use.

(3) The quarter lining is skived as raw edge along the top edge, down the back, and the front edge. Marking can be done at this stage, or alternatively may have been included during identification marking.

The back-seam is now made, a closed seam being stitched on a normal flat machine, following which seam rubbing is completed. Taping may be included either as a separate operation or combined with seam rubbing.

Different styles of lining will probably require some modification from this procedure; for instance if a back leather is included a closed seam is not necessarily used, but a lap seam is the more usual, hence rubbing down is omitted.

Also the machinist may be responsible for the whole of the fittings, that is lining making and tongue making.

Again, the quarter linings are stored for later use.

(4) While work has been proceeding on the sections just described the quarters are also receiving a considerable amount of attention.

First, the top edges are skived for a fold, and the front edges for underlay.

The backs are then zigzagged, care being taken to keep the top edges level.

The back-strip, which has been skived for raw edge at the sides and a long fold at the top, can now be machined to the quarters. Great care must be taken to secure a straight back-strip, central on the seam, a common fault being the excess curvature on one side and loss of shape on the opposite, causing distorted backs at lasting. It is possible to use either flat, post, or arm machines for this operation, the post or arm giving the better results, the curvature of the quarters being retained. The flat machine, in contrast, stitches with the quarters in a concave shape, and when turned to normal position later, a certain amount of fullness appears under the back-strip.

Next the facing rows are stitched on a flat machine to a mark previously made by the stitch marker, or to marks made by a blunt awl to a facing pattern.

The quarters are now ready for folding; first the top edges are cemented and, when in a suitably dry condition, are passed to the folder. In this sequence of operations it is necessary for the folder to turn the back-strip while attending to the quarters, and, unless some provision is made, a certain amount of bulky substance results from the two sections turning over. The pattern can be reduced at this position of the quarter, or alternatively a small piece can be trimmed out by scissors, giving a neater turn by the back-strip. If folding is done before the back-strip is stitched the top of the strip will need to be turned over by hand later.

Another modification is the addition of a tape to the ankle curve, either before folding, in which case the turn-in is over the tape and so gets caught in the top row of stitching, or after folding, when it is problematical if the advantage of stitching it in is accomplished. Taping is a machine operation, the BUSMC No. 3 Taping Machine giving good results.

A facing stay is now fixed to the quarters in a position to coincide with the eyelets (Figure 920). The reason for this additional substance, which can be swansdown or similar type of material, is to support or stiffen the uppers for the eyelets and prevent them from pulling out or distorting the shape of the facing. For invisible eyelets it is imperative to affix a stay, in this case on the lining, but for heavy leathers with outside eyelets a stay is not always necessary.

It is now time to collect our third sub-section, the quarter linings, and stitch them to the quarters, an operation called undertrimming. The row of stitching around the top edge through quarter and lining demands great skill from the machinist, not only to produce a good line of stitching but to position and keep the lining perfectly clear. It is obviously impossible to fit the two edges together perfectly for stitching so a margin is left on the lining, usually $\frac{1}{8}$ in., called the trimming allowance, and by means of a knife attachment fixed to the machine the surplus lining is trimmed away as stitching proceeds (Figure 92*b*). This knife is positioned relative to the needle, and when stitching is placed slightly away from the edge of the quarter; the knife trimming the lining cuts under that edge giving a neat effect and so producing the name undertrimming. Although it was usual to fit by hand the quarter to the lining it is now the practice to hold the sections, the machinist placing the quarter on the lining showing the trim allowance and commencing to stitch, at the same time keeping the lining taut and so retaining the tightness required to allow for the later insertion of the stiffener.

Both flat and post undertrimmer are available for this operation.

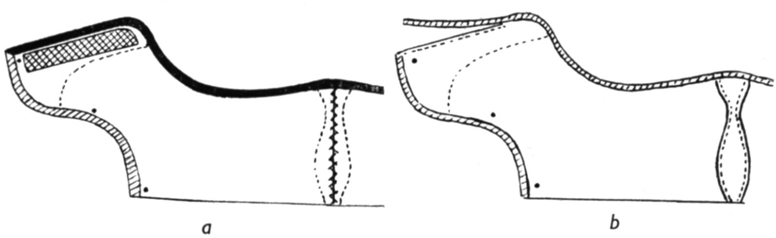


Figure 92. Oxford quarter: *a* (inside view) prepared for undertrimming; *b* (outside view) partially undertrimmed

Eyeletting follows, care being required to space correctly and match each side. Several machines are available including the BUSMC ‘Epoch’ No. 3 for both outside and invisible eyelets, and the BUSMC ‘Duplex’ which does two quarters together for outside eyelets.

Up to the present the quarters are in a ‘flat’ position and we now have to bring the nose or front parts together. It is an advantage to butt the two edges together for flatness, remembering a considerable number of thicknesses will eventually be at this position, a point on the lower instep of the foot easily made uncomfortable. A machine called a barring or tacking machine will stitch in a butted position, the needle placing several stitches from side to side, and finishing with several stitches at right-angles across the centre. The position of the barring can be either at the tip of the quarters, or at a point immediately above the vamp position, in which case the one bar also serves the purpose of staying the quarters.

Another method of attaching the quarter fronts is to close seam for approximately $\frac{1}{4}$ in., stitching very close to the edge. If the seam is wide the danger of a bulky upper at the vamp point is possible.

Although the quarters are now in a position to allow stitching of vamp linings and vamps, a certain amount of movement pivoting on the barring will make the operation difficult. Therefore it is advisable now to lace the eyelets which will make the section firmer.

Lacing is a temporary means of controlling the position of the quarters and upper for manufacturing and is achieved on the BUSMC Model 'A' Lacing Machine, by threading the eyelets on to needles; then, by a movement of the machine, a series of threads lace each pair of eyelets independently to any pre-determined spacing, from zero to about $\frac{3}{4}$ in.

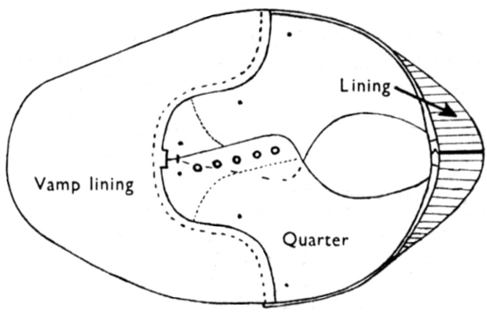


Figure 93. Oxford shoe (closed 'flat') ready for vamping.

(5) The section which, until now, has been of little trouble to anyone, the vamp lining, is next stitched to the quarter lining, the edge of which is protruding $\frac{1}{8}$ in. beyond the quarter (Figure 93).

The shape of the front edge of the quarter lining may vary considerably for economy, or other reasons, but the greater the variation from the type mentioned above, the greater the difficulty in stitching the vamp lining. It is important that the vamp lining should be positioned correctly, and it is usual to either have pierce holes or marks for underlay allowance. Flat or post machines are quite suitable for this operation, stitching either one or two spaced rows.

The tongues are next stitched in, with a row of machining along the bottom edge through the quarter and quarter lining. This operation is often incorporated with the previous vamp lining attaching, using flat or post machines.

Vamping follows and is a skilled operation, and unless attention is paid to careful positioning and stitching a number of troubles can develop later in lasting.

To 'hold on' the vamps it is essential to have clear underlay allowance marks, preferably by stitch marker, on the quarters and also a central point mark in the throat of the vamp, which must be, when stitched, at the correct position, the centre of the two quarters facings. Three types of machines are used for vamping, the flat, post, and arm or cylinder.

The flat machine will produce an upper, bearing in mind the stitching is right through quarter and lining, which bears little resemblance to the rounder curves of the last; in fact the vamp tends to curve slightly the reverse way. This is to be expected when the backs of the quarters are partially turned inside out to allow the underlay portion to lie flat for the vamp stitching.

In contrast the post machine allows the upper to retain its rounded effect, the working area being so small, the only difficulty being the extra skill required in holding the sections, there being no support as on a flat bed type.

The arm or cylinder machine originally intended for goloshes and often called by that name is excellent for vamping, the upper literally circling the arm as stitching progresses.

One important point to watch in vamping by the 'held on' method is the 'growing' of the vamp; the section can be very easily pulled and the throat shape distorted, causing extra material to develop by the end of stitching; hence the need for the central marking point. If this trouble is allowed to continue it will be impossible to last the upper straight, caps will be down on one side, and backs will go round to the side.

After vamping, the uppers are trimmed of cotton ends or any other surplus pieces of lining, *etc*. Vamp linings which have been stitched to one side and may be short on the other, or pieces of vamp that have 'grown' and lap beyond their normal position, should not be trimmed away.

All that now remains is the examination for faults, following up for the lasting room, and tying up or perhaps hanging on suitable frames.

This method of closing is widely used for men's work and is quite an efficient and satisfactory system. It will be found that some firms fit the vamps before machining, while others may fit the quarters to the linings before undertrimming; in fact variations in some detail or other exist with every closing room.

Derby Shoe (Closed on the Flat)

The Derby shoe processes shown in Figure 94 are equivalent in details to the Oxford previously described, although it will be seen the sequence of operations does vary considerably. The chief difference is the greater amount of work involved in the fronts which are in fact a complete unit, and eventually meet the complete quarter unit at the last stitching operation.

The sequence of operations for the quarter is the same as for the Oxford, so no problems arise from this direction, but it is the tongue and tongue lining and the method of assembling which will cause modifications to the original system and affect the labour grouping.

The methods of cutting the tongue and its lining are many, and usually call for a different sequence of stitching but once again a simple type has been chosen for our diagram.

CAP VAMP TONGUE LINING VAMP LINING TONGUE QUARTER BACK-STRIP QUARTER LINING

CAP: Skive, Edge, Perforate — Machine cap

VAMP: Skive — Machine cap

TONGUE LINING: Skive — Machine tongue lining

VAMP LINING: Machine tongue lining — Machine tongue

TONGUE: Skive, Perforate — Machine tongue — Machine vamp to tongue

QUARTER: Skive, Machine back-strip, Machine facing row, Cement, Fold, Fix facing stay, Under edge trim, Eyelet, Machine sides, Trim, Lace, Examine

BACK-STRIP: Skive — Machine back-strip

QUARTER LINING: Skive, Mark, Seam back, Rub seam — Under edge trim

Figure 94. Sequence of operations for Derby shoe (closed in the flat).

Description: folded quarters, edged and perforated cap, perforated tongue, leather quarter and tongue lining, fabric vamp lining.

Grouping of sections after skiving will be:
(1) vamp and cap,
(2) tongue, tongue lining and vamp lining,
(3) quarter lining,
(4) quarters and back-strip.
Once again groups (2) and (3) may go to one lining machinist.

(1) The caps are exactly as the Oxford: edge skived, edged, and perforated. The vamps will be skived for underlay at the front edge and at the wings, the amount of underlay quite possibly being different at the two places, and for raw edge at the centre of the vamp. Cap machining is carried out as before.

(2) The tongue lining is skived as raw edge all round, following which it is stitched along its bottom edge to the vamp lining (Figure 95*a*).

Meanwhile the tongue is skived raw edge at the top and sides, and for underlay at the bottom edge. Perforated along the top edge, it is now ready for stitching to the lining. This involves carefully placing in position, in this case the edge of the tongue to the edge of the lining, and a row is stitched $\frac{1}{8}$ in. inside the edge of the sides and under the perforating at the top leaving a margin of lining to be trimmed away (Figure 95*b*). This operation is better done if an undertrimming machine is used, ensuring a neatly trimmed lining.

The vamp is now placed on the underlay allowance marks on the tongue

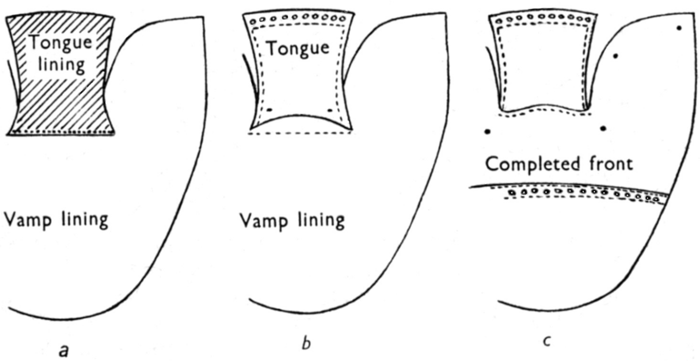


Figure 95. Derby shoe: *a* tongue lining stitched to vamp lining; *b* tongue stitched to lining; *c* completed front.

and a row of stitching machined in the throat, thereby closing the whole sub-section, vamp, vamp lining, tongue, and tongue lining, which can be stored until required (Figure 95*c*).

(3) The quarter lining follows the same procedure as in the Oxford shoe.

(4) The quarter is also in the same sequence as it is in the Oxford shoe, the lining meeting the quarter for undertrimming at the same stage, following which is eyeletting.

From now on a difference will be noticed; the vamps join the quarters and an operation known as stitching sides is performed. Skilled machinists are required for this, as sides are usually ‘held-together’; the vamps are inserted between the quarter and quarter lining to an underlay allowance marked on the vamps. To achieve this insertion of the vamp wings and to expose at the same time the throat of the vamp, it is necessary to slot the quarter lining from A to B (Figures 96, 97). This is sometimes done by the machinist,

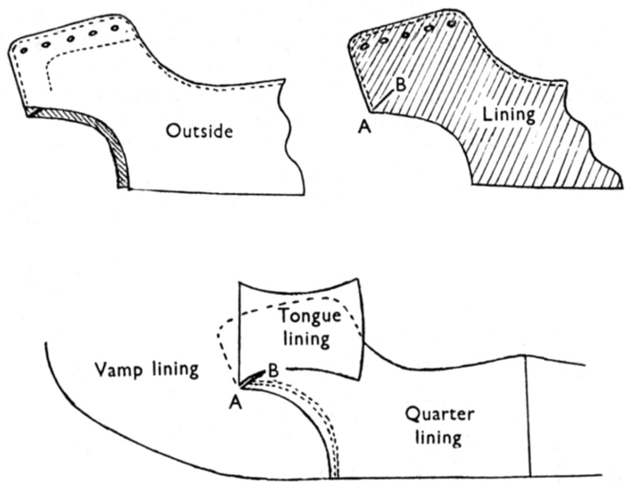


Figure 97. Front inserted between quarter and quarter lining showing position of slot AB.

or possibly cut by the clicker to his pattern. Considering its importance in the correct fitting of the side and especially the tab of the quarter, the haphazard way in which machinists can be seen slotting the lining with their scissors is surprising. If the cut is too long a long slash is visible when the shoe is closed, if too short, difficulty is experienced in making the tab of the quarter reach its mark. There is no doubt that the better method is to have the cut made by the clicker, provided all operations following, such as seaming of linings, undertrimming, *etc*., are carried out efficiently, otherwise the correct fit will be lost.

The first side is stitched, and at the same time a stay row, sometimes called a tab row, is made; the machine used can be a flat, or, to produce a better-shaped upper, a post. This is the easy side for the machinist as the quarter is still in an open form, but now the second side is brought round and placed in position and a tendency to open out will be experienced, making the operation quite difficult.

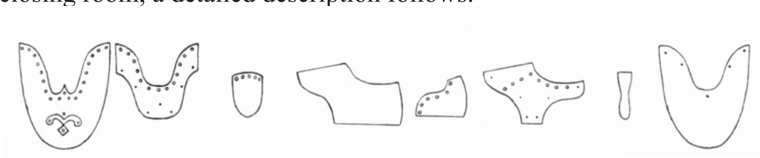
Whichever side is done first it will be realised that the machinist will commence from the edge of the lasting allowance on the left side of the shoe, and from the corner of the tab on the right side; consequently it is no unusual occurrence to find tabs at a tilt in the same directions on both shoes making pairing up difficult at lasting.

The upper is now trimmed of cotton ends and also the excess lining at the side rows.

Lacing follows and after examination the complete order is ready for the next department.

Brogue Shoe (Closed on the Flat)

In effect the brogue shoe is a basic Oxford type and the sequence of operations follows closely that style but with numerous additions; however, to give a clearer picture of the additional machinery and labour required, and the re-planning necessary to accommodate this design in a closing room, a detailed description follows.



CAP	VAMP	TONGUE	QUARTER LINING	COUNTER	INSERTION	BACK-STRIP	VAMP LINING
Skive Gimp Perforate Stain edges 'Centre' design Underlay 'centre'	Skive Gimp Perforate Stain edges Fit caps Machine caps	Skive Gimp Perforate Machine lining	Skive Marking Seam backs Rub seam	Skive Gimp Perforate Stain edges	Skive Cement Fold Mark facing Perforate Underlay perforation Machine facing Machine 2nd ankle row Machine counter Machine back-strip Turn top of back-strip Fix facing stay Under-edge trim Eyelet Join front of quarters Machine vamp lining Attach tongue Machine vamp Trim Examine	Skive	

Figure 98. Sequence of operations for Brogue shoe (closed on the flat).

Description: folded quarter; gimped and perforated wing cap, vamp, and counter; perforated quarter; gimped and perforated tongue; cap centre design; leather quarter lining; fabric vamp lining.

The break-up of sections is similar to the Oxford, but it will be noted that several parts go to the perforators before parting to their devious routes:

(1) vamps and caps,
(2) tongue and tongue lining,
(3) quarter lining,
(4) counter,
(5) insertion and back-strip,
(6) vamp linings.

(1) Caps and vamps are skived, gimped (or possibly *vice versa*) and perforated, and the gimped edges are now stained to improve the appearance. The centre design on the cap will be punched out on one of the press type of perforators described previously, and then follows the underlaying of the design by a backer of the adhesive type, or in some cases leather of similar shade. This not only adds to the appearance, especially in the case of large holes, but prevents the spewing out of the puff at the lasting operation.

The cap is now fitted to the vamp, care being taken to place accurately to the appropriate marks to be followed by the machinist. If caps (wing) are held on, a very experienced machinist is needed, as shape of the peak and general positioning are easily spoilt. Vamps are now complete and can be put aside for later use.

(2) The tongue and tongue lining are, with the addition of gimping, exactly the same as the Oxford.

(3) The quarter lining is also as the Oxford.

(4) Accompanying the vamps and caps will be the counters which are gimped, perforated, and stained, but from there they await alone to later join the insertion.

(5) The insertion which can be described as the ankle section of the Oxford quarter, varies considerably in its build-up and number of operations from that section.

After skiving, the top edge is cemented and folded (note: it is still a single section), following which the facing is marked; the 'Royal' Perforator punches not only the facing but along the ankle curve. Unless an underlay is placed behind the perforations the lining will show through, not a pleasant feature if a natural or tinted lining is used. A coloured tape is suitable and serves the double purpose of staying the top edges as well as being an underlay. Leather is sometimes used, and another well-known method is to stain the linings at the necessary positions.

One row of stitching is now placed each side of the facing punching, the bottom row continuing under the ankle perforations. It will be realised the top row at the ankle curve is the row for undertrimming, a later operation. Next the counter is brought along and the machinist places it to the allowance marking on the insertion and stitches one row on each side of the punching. The quarter has now assumed the same shape as the Oxford and procedure follows closely to the

Oxford method: zigzag, machining back-strip. Notice should be taken of the extra work involved in the brogue up to this point, in point of fact the zigzagging is second on the Oxford sequence but tenth on the brogue.

After back-stripping the top edge must be turned over by hand as folding of the insertions was carried out previously.

The rest of the operations follow exactly those of the Oxford shoe.

If a Freeman Perforating Machine or similar type is available the sequence is not altered, as cap, vamp and counter will all be perforated together, the only point being that skiving may follow this operation.

Variations of sequence in the early stages of the insertion and counter are possible, but the method shown allows easy perforating and stitching, the sections being ‘flat’.

Oxford Shoe (Closed on the Round or Loose Lined)

The term ‘closed on the round’ is used when the sequence of operations is arranged for a style to be closed, after preliminary operations, in a rounded or natural shape. This is achieved by closing the outsides and closing the linings as two separate units, fitting together and then undertrimming, producing a better-shaped upper and linings free from any through-stitching.

For ease of comparison, the same type of Oxford as was previously shown in ‘flat closing’ is again chosen for description. Although sections are shown in different order in the diagram the grouping is exactly the same for the early operations:

(1) vamp and caps,
(2) quarters and back-strips,
(3) tongue and tongue lining,
(4) quarter lining,
(5) vamp linings.

(1) Vamps and caps follow procedure as before.

(2) Quarters and back-strips follow normal procedure until facing stays are fixed, at which stage the front ends of the quarters are brought together and joined, either by barring or a few stitches. The vamp is then brought along and vamping takes place, producing the completed outside.

(3) Tongues and tongue linings are treated in the normal manner and await inclusion in the upper at a later stage.

(4) Quarter linings are prepared as usual up to seam rubbing, after which the front parts are brought together and seamed for approximately $\frac{1}{2}$ in. similar to the quarter.

(5) The vamp lining is next stitched to the quarter linings completing the lining section.

Linings and outsides are assembled for undertrimming, a post machine with the trimming attachment being used for this operation; the small working area of this type of machine allows the stitching to be completed without any undue distortion of an upper from its normal shape. It is important to position correctly the lining in the outsides; the back-seams of both sections should be placed to coincide, a check being made to ensure the front seams are also together.

CAP
Skive
Edge
Perforate

VAMP
Skive
Edge
Machine cap

QUARTER
Skive
Zigzag
Machine back-strip
Mark facing row
Machine row
Cement
Fold
Fix facing stay
Join fronts of quarter
Machine vamp

BACK-STRIP
Skive

QUARTER LINING
Skive
Mark
Seam backs
Rub seam
Join fronts of linings
Machine vamp lining

VAMP LINING

TONGUE
Skive
Perforate
Machine lining

Under-edge trim
Eyelet
Attach tongue
Bar bottom of facing
Lace
Trim
Examine

Figure 99. Sequence of operations for Oxford shoe (closed on the round).

Description: folded quarters; edged vamps and caps; perforated caps and tongues; leather quarter linings; fabric vamp linings.

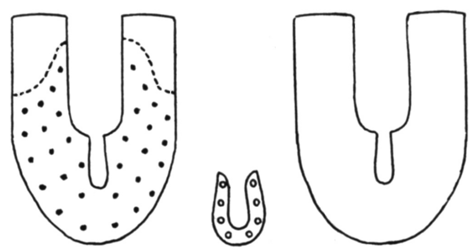
Eyeletting follows next, after which the tongue is stitched to the front of the quarter lining, the vamp being pulled back out of harm's way. A bar or tack can be stitched at the bottom of the facing to prevent opening at that point, and the remaining operations are lacing, trimming and examining.

Closing by the round method is certainly superior to flat closing but is unfortunately more costly, especially with Derby or tab styles. Women's styles are usually closed on the round for several reasons, an important one being the need for a loose lining to allow the insertions of long stiffeners; in addition, intricate styles lend themselves to this method, added to which a very clear and neat lining is possible. It is quite understandable therefore that departments wholly on women's styles are planned for round closing, against which men's styles are usually planned for flat closing.

Uppers such as courts, whole-cut styles, golosh shoes, etc., are obviously types for closing on the round

Woman's Whole·cut Shoe (Perforated through Lining)

Certain styles are designed for the perforations to go through the linings, which may be of a light substance leather, or a fabric if the risk of stranding of threads is not great. To make up the upper in the conventional way is not always convenient, as spot perforatmg



GOLOSH	FACING	LINING
Skive	Skive	
Cement	Machine binding	
Fold	Turn binding	
Fit facing		
Machine facing		
Fit lining		
Machine counter row		
Perforate		
Seam lining		
Rub seam		
Seam quarter		
Rub seam		
Re-bead at back-seam		
Under trim		
Eyelet		
Lace		
Trim		
Examine		

Figure 100. Sequence of operations for woman's whole-cut shoe (perforated through linings).

Description: folded quarters; French bound throat; perforated facing and golosh through lining; leather through lining.

on the ‘Royal’ Perforator can be tedious and a long job with intricate and numerous holes, and so a press-type shape containing the complete design is constructed necessitating a flat upper.

Therefore a different sequence of operations is needed. The diagram shown is of a simple nature but the method employed can be adapted to suit the needs of more intricate styles.

The three sections are:

(l) lining,

(2) facing,

(3) golosh.

(l) The lining preparation is merely skiving and marking.

(2) The facing is skived, French binding stitched in the throat and the binding turned.

(3) After skiving, the golosh or body shape is solutioned at the ankle curves and then folded, leaving the end at the back not turned down. The facing is now fitted to its marks and machined.

The linings are also fitted, care being taken to position exactly and also to solution thoroughly the area of punching. It may be advisable to machine the facing through the lining at this stage.

Stitching of the imitation counter row follows, the reason for machining through the lining being that the lasting strains may move the lining from the outside, with dire results to the perforation. Consequently, any rows stitched through relieve this possibility.

Perforating is now proceeded with on the golosh and facing. We now have to return to operations carried out quite early in the conventional types: seaming lining, rubbing seam, seaming quarter, rubbing seam. The fold at the top of the back seam must be adjusted, as, it will be remembered, it was left up at folding.

Subsequent operations follow the normal course: under-edge trimming, eyeletting, lacing, trimming and examining.

The responsibility for planning the sequence of operations of any styles lies with the supervisor, who must work in very close relationship with the designer and pattern cutter.

This is of particular importance with the introduction `of new samples which must be considered relative to bulk production. It is usual to have a section of operatives, which may vary from a machinist and a fitter, to a number of each plus other specialists, according to the size of production, to form a sample team.

Excellent results may be obtained from this team due to their skill, but before bulk production is commenced it is a wise procedure to try a sample dozen or more through the normal run of the department, when difficulties and troubles are more likely to be seen.

Considerable experience is necessary to judge styles and their effect on the machinery available, and of course on the labour position. It is useless to give an opinion that a certain number of a particular style can be accommodated unless it is known what quantity of other types will also be expected at the same time.

It will be appreciated after studying the diagrams of various styles that to keep work flowing smoothly in a forward direction is no mean achievement especially if the types vary considerably; also it must be realised, descriptions given were of very simple and straight-forward basic styles but very extravagant variations are made regularly.

13

CLOSING ROOM MANAGEMENT

THE LAY-OUT AND PLANNING OF A CLOSING DEPARTMENT

MANY FACTORS MUST BE considered when planning a new department or re-planning an inefficient old one. Such factors are:

(1) size of the room available;
(2) facilities available in the room (lighting, power, etc.);
(3) position of preceding and following departments;
(4) type of work to be produced;
(5) possibilities of periodic changes of types of production.

(l) The size of the department is usually predetermined by the size of the building, but should any latitude in shape or area be available it is recommended that a rectangular shape be used to allow short benches to be set across the room and a central gangway to give easy access to the machines for supplying with work.

(2) The building construction may dictate the natural lighting, but an overhead north light is superior to side window lighting and avoids sun glare at certain periods of the day, a rather serious matter when the sun reflects on plated machine parts.

Side window lighting will give satisfactory results with the system of benching described in (1) but will obviously be inferior in the centre benches compared with the window benches. Heights of ceilings and colour of decorating will affect intensity of light and reflection.

Artificial lighting has progressed enormously of late years and fluorescent tubes are now to be found in most departments. Positions of lights are scientifically arranged to avoid shadows and provide uniform light intensity without causing glare at work level, or even normal eye level.

It is usual to provide each machine with a ‘needle light’, a small adjustable lamp, well shaded, to concentrate illumination on the working area.

Power arrangements will be governed chiefly by the method of benching adopted.

If short lengths of four or five benches are placed transversely across the room a motor coupled to a shaft can drive the complete number of machines on each bench. The motor may be mounted on the floor in which case guarding is necessary for the length of the bench, or alternatively the mounting may be directly under the bench and shafting enclosed, so leaving clear space beneath the bench and adding to the cleanliness of the department.

Another method is to have an individual motor for each machine, producing a saving of power as machines are only switched on when actually in use, and also, being free of shafting, *etc*., cleanliness is again achieved.

Single benches powered by small individual motors are installed in some closing rooms, and although the area necessary for a given number of machines will be greater than the old system of rows of benches it will be found that the ease of changing from a certain style sequence of operations to another is greatly improved. One regularly sees rows or benches carrying machines which are rarely used, but left in place`should an order call for their use. In contrast the single bench can be disconnected from its power supply and moved to store in a matter of moments and re-planning of the section is quickly completed. The single bench is ideal for placing in line for conveyor systems and also lends itself for the doubling up necessary in the case of bottle-necks.

Banks of machines can be arranged to allow team work for separate styles or types, and the feeding of sections is facilitated.

(3) The object of any planning of a department should be to keep movement of work to a minimum, and also if possible in a forward direction. The last qualification is made very difficult if a number of different types of uppers is being produced.

The position of the department feeding the room, the clicking room in this case, will affect the positioning of the machines. The ideal of course is to receive work one end of the room and dispose of it at the opposite end, but unfortunately many departments have only one entrance which leaves the alternatives of planning the work to move round the room and out at the place of receiving, or to start one end and finish the opposite end and carry the completed product back through the room for disposal.

(4) The sales policy of the firm will affect the planning of the closing room considerably; two extreme examples will explain this simply. One factory produces for direct stocking of its own retail stores; its plans are made for styles to cover several months ahead; planning of a department is therefore eased, preparations to absorb given amounts of certain shoes being put in hand immediately.

A second factory produces for the small individual retailer who may order in dozens; advanced planning is difficult as certain shoes may be popular for a short period and then suddenly the demand may peter out, others of completely differing types taking their place. Machines and whole sections are often heavily taxed one week and unused the following week. .

(5) The last factor is to some extent bound up with the fourth; at various seasons of the year new ranges of styles are often put into production and it is naturally of some concern to the closing department when changes of sequence, additional labour for some operations and redundant labour for other operations must be considered and action taken.

Other points to consider in the lay-out of the department are adequate gangways—not only as a general thoroughfare for the personnel, but the gangways for the benches to facilitate feeding of the machinists without disturbing the operatives—and provision for assembly tables at suitable positions.

The plan for a closing department given in Figure 101 is a simple

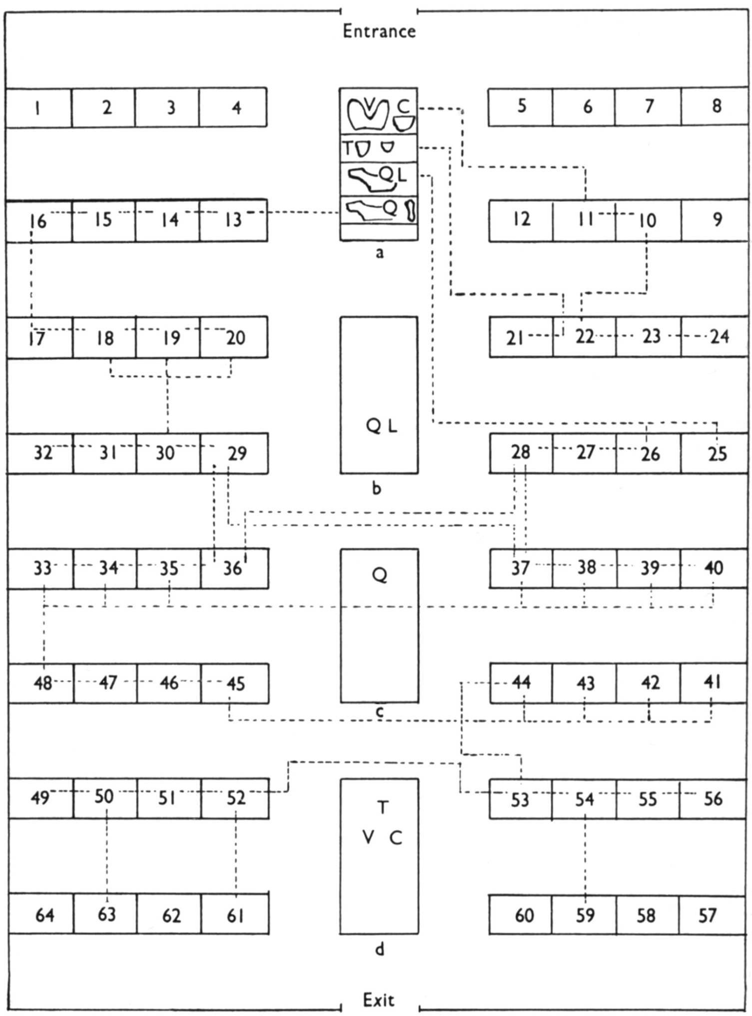


Figure 101. suggested lay-out for a closing department.

and straightforward sequence for producing an Oxford shoe, with specification as for the shoe previously described (Figure 90). Single width benching is used. An output of up to 1,000 pairs per day is suggested but it should not be implied that the number of machines in each section is capable of that output exactly. Variations in quantity occur from person to person; spare machines or partly employed machines are included; some machines may be dual purpose to cope with certain sections. Neither is it suggested that the number of benches (64) means that number of operatives.

Centre benches are for distribution and storage *e.g*. bench ‘a’ will be the distribution bench after skiving, and progress is followed for each section by dotted lines. The dotted lines are drawn as a continuing sequence of operations, but in actual fact the storage benches ‘b’, ‘c’ and ‘d’ are in use to absorb the varying quantities held at each stage; it will also be seen some parts of the upper are completed early in the room (*e.g*. vamps and caps at 23 and 24), these are stored on an appropriate bench ready for the next operation; in this case vamps and caps are transferred to ‘d’.

The key to benches is as follows:

1. Opening
2. Identification marking
3. Stitch marking
4. Lining stamping
5, 6, 7, 8, 12. Skivers
9, 10. Edging machine
11. Edging skiver
13, 14. Zigzag machines
15, 16, 17, 18, 19, 20. Flat machines for back-strips and facings
21. Flat machine for tongue linings
22. Perforator
23, 24. Flat machine for caps
25, 26. Flat machines for seaming linings
27. Seam rubbing
28. Seam taping
29, 3l, 32. Folders
30. Cementing machine
33, 34, 35, 38, 39, 40. Undertrimmers
36, 37. Benches for fixing facing stays and fellowing linings to quarters
41, 42, 43, 44. Flat machines for vamp lining
45. Lacing
46. Tacking
47, 48. Eyeletting
49, 50, 51, 52, 54, 55, 56. Vamping
53. Attaching tongues
59, 61, 63. Trimming and examining benches (double benches)

Problems to be faced with the introduction of further styles will be readily appreciated by the study of Figures 90, 94, 98, 99, 100. The variations of sequence and the extra machines needed must be considered and allowed for; then comparison made with the specimen lay-out just described.

A certain amount of compromise is necessary to ensure that a department will work smoothly and efficiently with varying types of upper, and it is the supervisor’s responsibility to be constantly looking for means of improving the flow of work as changes of style develop.

CONTROL OF QUALITY AND QUANTITY

It is always a debatable point whether quality and quantity can be merged together especially if quantity is the result of piece-work, but under modern mass production methods it is essential for a balanced output and quantity assumes a high degree of importance. Details have been previously discussed relative to the effect of changes of styles upon the closing room and the importance of this point in maintaining a regular quantity of work and preventing serious bottle-necks is stressed once again.

The responsibility of maintaining the flow of work or quantity and also controlling the quality rests with:

(1) *Supervisory staff.* The number involved will of course vary with the size of the production unit; one forewoman may be quite adequate for a small room but for larger departments it may be necessary to divide the responsibility into two or more sections with assistants in charge of each, and also feeders to distribute work to sub-sections. The supervisor of a large department is often found to be a man as against the usual forewoman for smaller rooms, the heavier responsibility to be carried and lack of suitable women willing to bear the burden making the choice of a male essential.

(2) A *planning system* to ensure full use of machinery available and to use efficiently the labour employed. The intelligent planning of types and styles with careful consideration of key machines will assist the supervisors in controlling the flow of work.

(3) An efficient *training system* to make full use of all labour employed, to adapt labour to varying operations and to counteract changing styles, irregular hours of work and the high rate of sickness and absenteeism.

To sum up, the quality is entirely dependent upon the supervision of the department by the enforcement of strict inspections and standards, and adequate training of labour. Piece-work or any incentive method advantageous regarding total must be carefully watched from a quality standard; prices for higher grade work are sometimes increased to allow for more detail work, and it is the supervisor’s responsibility to see that the standard is upheld.

TRAINING OF LABOUR

The labour problems in the closing rooms have, since the second world war, been very acute, and, with the return of intricate styles from the more austere types, the work involved has increased considerably. Improvements in certain machines *e.g.* for perforating, have certainly made a great saving of labour, but stitching is still a problem that cannot be solved without an adequate supply of young girls and a long period of training. A number of years is often necessary to produce a skilled machinist capable of taking over a key operation efficiently, and unfortunately it is now increasingly difficult to persuade operatives to progress from a fairly simple operation, which may pay a fair wage, to a more responsible and difficult one even if it is more profitable.

A study of the sequence of operations and variations necessary for differing styles, described earlier in this section, will plainly show that the labour force must be flexible or capable of transfer to alternative operations to secure an efficient and balanced output. This is even more desirable when part, or broken time is prevalent, and also absenteeism is very high, two disadvantages to be faced unfortunately by most closing room supervisors under present conditions.

The progressive training of the machinist is helped by the fact that several minor operations are available in most styles which do not demand quality stitching, although exactness is still most important, and when competent the trainee can transfer to other sections of greater importance. There is used, however, a considerable number of machines other than stitching machines, and the training of labour in this case is less efficient and often more costly, but it should always be the aim of the management to have labour trained and organised for any emergency, be it sickness or changing of production.

The method employed for training of labour will vary with the individual firm, the smaller type usually absorbing the new entrant into the department under the direct supervision of the forewoman. In the larger output factories it is becoming increasingly popular to establish a section or small department solely for training under a training supervisor, who must obviously not only have qualities of being an excellent all-round operative but also have patience and ability to transfer knowledge to the trainee.

The capabilities of a newcomer are quickly judged by an experienced person and adjustments to suit the individual can be made with a minimum waste of time and teaching. Although it may appear to be an expensive method, including cost of equipment and staff *etc*., it must be considered from many angles.

(1) Labour is efficiently trained by one method, as against a few minutes' tuition by a busy forewoman and advice from all and sundry sitting around the trainee.

(2) Production of the main department is not affected, anything produced by the training section having been carefully checked, either complete uppers or sections only.

(3) If the system results in an efficient and productive closing department then it must effect an economy as the rest of the factory can work efficiently.

METHODS OF DEALING WITH SAMPLES, SPECIALS AND REPAIRS

Comments have been made previously regarding the organisation frequently used for the production of samples, *i.e.* the team system, usually of highly skilled personnel. This method achieves excellent results but often of a much higher quality than can be expected from general production. This fact must always be borne in mind when considering bulk production and should always be used as a standard to achieve during production.

If it is desired to produce samples by general bulk methods, or in other words to send them around the room, someone in authority must constantly inspect results at various stages to ensure fit and workmanship and so obtain data for later production. A certain amount of specialised work will be performed by normal operators even in the team system (eyeletting, *etc*.), and it will be found many firms do compromise, that is, they use partly room work, partly sample hands such as flat machinists and fitters.

Specials are dealt with on similar lines to samples, if quantities are small, often in conjunction with them. Room facilities may be used rather more than in the case of samples.

Repairs are a continual source of irritation especially in the case of lasting and factory repairs. Obviously wanted quickly to prevent a serious hold up, the repair can be a long job for the closing room. In some cases the complete upper needs dissembling, many operators are inconvenienced by having to change their machines, and even if one machinist is solely kept for repairs, delays can occur frequently. Also after re-closing, one can never be completely satisfied as to the quality of the upper. The room's internal repairs can also cause serious hold-up of work and to keep the flow even, it is necessary for a good service of re-cuts from the clicking room. According to output it is good practice to have labour available with priority on repairs.

THE PURCHASE, STORAGE AND RECORDING OF USE OF FINDINGS AND GRINDERY

The number of items used in the closing of uppers is surprisingly large; needles and threads may appear to the casual observer as the only ones, but such items as tapes, bindings, eyelets, buttons, buckles, cements, stains, beadings, *etc*., in differing colours, widths and grades are only a few of the necessary findings required. They are usually known as grindery and findings.

The supervisor must work in co-operation with the central buying authority and also the planning office to ensure future commitments are provided for.

It is usual for a central stores to hold the main stocks of materials, and responsibility for accurate recording of issues and stocks held will rest with that department.

A small departmental store ordering daily or weekly according to size and type of production supplies the needs of the room and should be the responsibility of an assistant to the forewoman. On the basis of weekly issues, cost can be assessed by division of the total production for that period. This average cost is quite satisfactory in most cases but occasionally certain expensive items may be used, *e.g*. elaborate and costly buckles, in which case the uppers in question should bear this cost.

MACHINE MAINTENANCE

To maintain the efficiency and to control the output of the closing room adequate servicing of machines is necessary. Nothing is worse than having a breakdown of a key machine and finding that spare parts are unobtainable or that the mechanic is not available for hours.

The larger establishments usually employ a staff of mechanics, but in the case of small firms, the general engineer, while capable of small repairs, cannot be expected to be a specialist and obviously is not always available at a moment's notice. The machine firms give an excellent service for repairs, but once again it is not always possible to supply a mechanic immediately.

Spare machines are of great value especially when, in the case of sewing machines, the faulty one can be taken from the bench and another one put down in a matter of a few minutes. Where individual benches are used replacement of any type of machine is facilitated provided, of course, that spares are kept in readiness.

The sewing machine is a very finely adjusted and intricate machine running at a very fast speed and in consequence requires regular oiling. Operators are usually fairly generous with the oil—can but one serious fault is prevalent; to assist in clearing cotton fluff from the bobbin mechanism, *etc*. paraffin is used in liberal quantities and then the machine is run at speed. This will cause undue wear and, unless controlled, serious troubles will follow.

SUPERVISION

The person controlling the closing department, probably the most difficult from a supervisory point of view of the whole factory, must be possessed of many qualities and qualifications.

A few of the difficulties which are to be expected and probably encountered should be considered.

The staff is usually completely female or at least has a very high percentage of females; the work to be produced is often intricate and requires highly skilled and specialised operators; the styles are often changed causing frequent reorganisation. Added to this one must consider conditions existing post-war: a serious shortage of labour, a high degree of labour turnover, a heavy rate of absenteeism especially with married women, broken time working, *etc*.

Discipline is of great importance to maintain control of the department. The supervisor must be fair in his or her dealings with the operators, must command respect, be tactful, and be able to explain clearly an order.

A complete knowledge of all systems of closing, the implications of changing types of uppers, the limitations of sub-sections, and a fair knowledge of all the machines employed in the department are necessary qualifications for the supervisor.

He or she should be able to maintain good relations with other foremen of departments, and a reasonable knowledge of the work of these departments will assist in understanding any problems which may arise.

The teaching of labour assumes greater importance than ever and the supervisor must take steps to arrange a suitable scheme to coach the new labour, and improve the work of the semi-skilled.

PART V

BOTTOM STOCK

G. B. AGUTTER

14

CUTTING BOTTOM STOCK

THE NAME 'BOTTOM STOCK' or 'roughstuff' is given to the department of the shoe factory in which all the bottoming parts—soles, heels, insoles, *etc*.—are cut from the appropriate leather or other material and then prepared ready to meet the uppers in the lasting department.

The most important and the most difficult operation in the bottom stock department is the actual cutting from bends, bellies and shoulders of the various sections in the most economic and suitable manner. The cutting of crepe, composition, resin-rubbers and fibre-boards is not so difficult since these do not vary in quality and substance (thickness) over a sheet.

The hide of a cow when stripped from the animal and laid out flat is as shown in Figure 102. Before tanning it is cut or 'rounded' into the various sections shown—a pair of *bends,* a pair of *bellies*, the *shoulder* and *cheeks*; these are tanned separately and differently according to the purpose for which they are most suitable. The bends are used for soles and top-pieces (the part of the heel which rests on

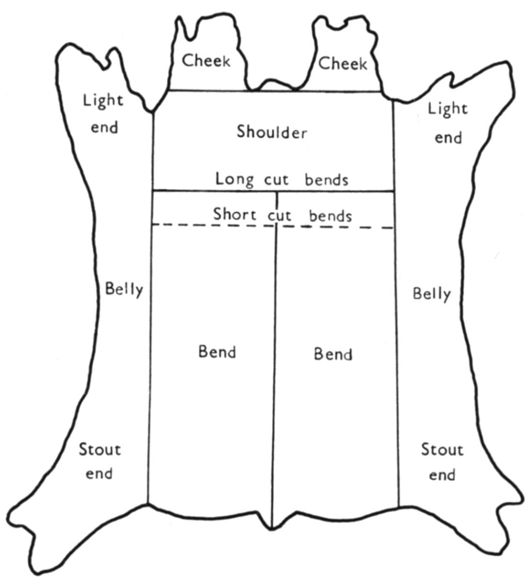


Figure 102. Cattle hide laid out flat showing divisions.

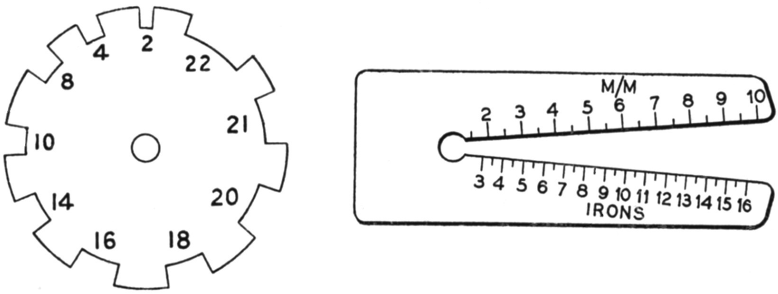


Figure 103. Circular and rectangular substance hand gauges.

the ground); the bellies for insoles, throughs, middles, lifts (heel); the shoulders for insoles, some light soles, and welts; the cheeks for lifts.

The sections are baled and sold by weight; thus, a bale of bends may contain from twenty-five to fifty, the heavier bends usually being in bales of twenty-five while the lighter ones are baled in proportionally larger numbers. The bends themselves are classified according to quality and weight, the latter being stated as, for example, 8 to 10 lb. bend or 10 to 12 lb. bend. Bellies and shoulders are baled in a similar proportion the average bale being about 3 cwt.

The unit of measurement used to describe the substance or thickness of bottom stock material is known as an ‘iron’.

1 iron = $\frac{1}{48}$ in., 12 irons = $\frac{1}{4}$ in.

A gauge (Figure 103) is used for testing accuracy of substance.

THE PRESS

Bottom stock cutting is invariably carried out on some type of *press*. Briefly, the operation consists of placing the material to be cut on a block of wood or fibre consisting of separate sections clamped together with an iron band; a press knife of the desired shape, some 4 in. high and sharpened on the lower edge, is placed in the desired position on the material and then, by depressing a pedal, a buffer descends and pushes the knife with considerable force through the material and a little way into the surface of the block. The cut portion passes up inside the knife and is removed when several more have been cut.

There are several types of press in use but by far the most widely used one is the BUSMC ‘Revolution’ Press. The advantage of this type of press is the large cutting area available, the block measuring 7 ft. × 14 in. wide; when new it is 10 in. deep. A safety device is fitted which prevents the upper beam or buffer from descending again until the foot pedal is returned to its original position and again depressed. It will be seen that the cutter is able to move about at will and make several cuts without having to move the material but only the knife. This is a great advantage when cutting bends as the operator is able to cut along the full length of the material with the knife for one foot, right or left, and then return with the opposite foot. This gives both speed and close cutting.

Another type of press uses only a small round block on which the material and knife are placed in position and then all three are pushed over a metal table under the circular buffer which is either brought into operation with a foot pedal, or else is moving up and down continually. A variety of this press has buffers at each end of the shaft so that two operators can use it at the same time.

Still another variety resembles a pair of clicking presses (see p. 130) placed at each end of the long rectangular block, but the arms do not swing sideways as they do for clicking; they almost touch each other so that either can be depressed by the hand release according to the position of the knife on the material.

INSOLE CUTTING

Systematic Cutting of Insoles from Bellies

As the first components required are insoles, these will be considered first.

The majority of welted insoles are cut from bellies which are specially tanned for this purpose and are close in fibre and flexible.
One end of the belly, the butt or tail end, will be found to be much thicker than the other and will be referred to as the stout end; the opposite. end is termed the light end. Care should be taken when cutting bellies to see that insoles cut from these respective ends are ‘fellowed’, *i.e.* made into pairs.

Prime leather is found only in the centre of the belly. In Figure 104 the weaker parts have been shaded; these should be avoided as much as possible but they can, within limits, be used providing they are in the seat (or heel end) of the insole and also for inferior sections as described below.

The flow of the grain of the leather is of course longitudinal. It is most important to observe this ‘flow’; the direction of stretch is at

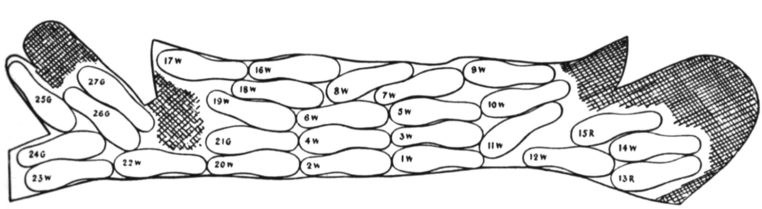


Figure 104., Cutting insoles from bellies. The weaker parts are shaded.

right-angles to it and under no circumstances must an insole be cut across the 'flow' as it will distort badly when graded and levelled later.

Insoles are cut with knives made to a pre-determined caster shape (see p. 94) from which it should be possible to round all the various shapes to fit the lasts in use.

The example chosen is a second quality, 7 to 9 iron welting belly to be cut into men's insoles; a second quality belly has the weaker parts more prominent and the various points can be more clearly illustrated.

It is often argued that no set system can be applied in the cutting of insoles from bellies; this is not so. A system can be used providing it is sufficiently elastic in its application to cover the wide variation in length, width and shape of the welting belly. To cut straight along with the knife for one foot and back again with the other is a method often used but the only point in its favour is that it makes little waste. A large percentage of the insoles so cut will be weak at the toe and will be classed as suitable only for riveted work or as requiring reinforcing by the 'gemming' method (see p. 230) thereby losing considerable value.

The system outlined below has the following features:

(l) no insole will be weak at the toe;

(2) a proportion of the poorer parts of the belly can be cut into welted insoles because the weaker portions will be found in the seats—a point that has a marked effect in the completed stock sheet (see p. 228);

(3) the insoles follow the flow of the grain producing an even substance and quality. This will show to advantage when grading and sorting; the grade will show very little split and the sorter will find no insoles with only one half fit for welted work and which therefore have to be reduced in substance for gemming.

Cutting (Figure 104) is commenced at the prime leather in the centre. The cuts are numbered in sequence and insoles suitable for welted work are marked W, those requiring gemming are marked G, while those suitable only for riveted work are marked R.

Most bellies are folded across the centre; this particular one was not and such an exception is a great advantage to the pressman. If the belly has a fold, the first cut is made with the toe to the fold in the sequence as shown. Some bellies will take four rows, some five, a very narrow one only three; the one chosen has between four and five.

To overcome the waste if the normal lock were used, cut 7 is made as shown; this allows the seat of the knife for the next cut to lock in with little waste. This disposes of the belly centre.

Next, the piece on the right is taken (in this case it is the stout end); it is turned round and cuts 9, 10 and 11 are made, all with the toe towards what was the centre, 9 and l0 left, and 11 right. Cuts 12 and 13 are made with the left foot knife taking care to avoid the hard part near the edge, and cuts 14 and 15 are cut with the right foot knife as shown, following the flow of the grain. Cut 15 is not always possible as most bellies are poor quality at this point but in actual fact the belly chosen produced a good riveted insole here; the remainder was too stout for anything other than piece-soles or heel-lifts.

Now the light end must be considered. This again is turned round and cuts 16, 17 and 18 made with the left knife, 16 and 18 with toe to centre and 17 reversed. This is done to allow more room for cut 18, the substance being even at this point. (The seat of cut 19 in the actual cutting was weak but was passed for welted.) Cut 20 is made next with the leather turned back to its original position, cuts 21, 22 and 23 straight along, 24 locked in, then 25 right up the side of the fore flank. This last one is also not always possible. Cuts 26 and 27 complete the insoles. It will be noticed how the last three cuts follow the flow of the grain. They were all actually good quality 5 to $5\frac{1}{2}$ iron 'gemmed' insoles of even substance, the weaker parts again being in the seat.

The remainder is cut into slip-middles, piece-soles and lifts, the belly having produced ten pairs of welted insoles, two and a-half pairs of gemmed insoles and one pair of riveted insoles. The advantage of the system outlined is shown in the high proportion of welted insoles obtained by it.

Ladies' insoles are cut in much the same way, but usually from a 5 to 7 iron belly. If some of the factory's output is made machine-sewn or cemented (see pp. 325, 348) most of the belly will be cut into insoles varying from 4 to 6 irons; if this is not so, then a larger proportion of slip-middles will be cut from the 4 iron material. It will be found that many more rows of insoles will be cut than with the men's knife but this need not alter the system; always follow the flow of grain and where variation of quality of substance occurs make sure that the best or stoutest material is in the toe.

Insoles from Shoulders

Many firms, who, for various reasons, require a large number of insoles and few lifts, buy a specially dressed shoulder for the purpose. These shoulders have been squared, *i.e.* the cheeks or faces have been removed, the grain well buffed and a larger proportion of fat introduced to give greater flexibility. These produce quite a good insole, not so close in fibre or as flexible as a belly and somewhat hard towards the centre, but quite sound. If the insoles are cut in rows (heel to toe) straight across the shoulder it will be found that some will be very hard at the toe, and consequently difficult to channel (the hard portions are shaded in Figure 105).

The method advised is shown in Figure 105; it takes a little longer as it involves more changing of knives but only two insoles will be hard, and these hard all over. The two insoles cut on either side of the centre will also be on the hard side, but are again the same all over; this is far better than having one hard area near the toe as it makes for a more consistent channel. These insoles can be avoided if so desired by cutting one or two rows of lifts. It will be seen that the same number of insoles is produced from approximately the same area of leather; also the insoles are more uniform in substance and quality, making for far better work all round.

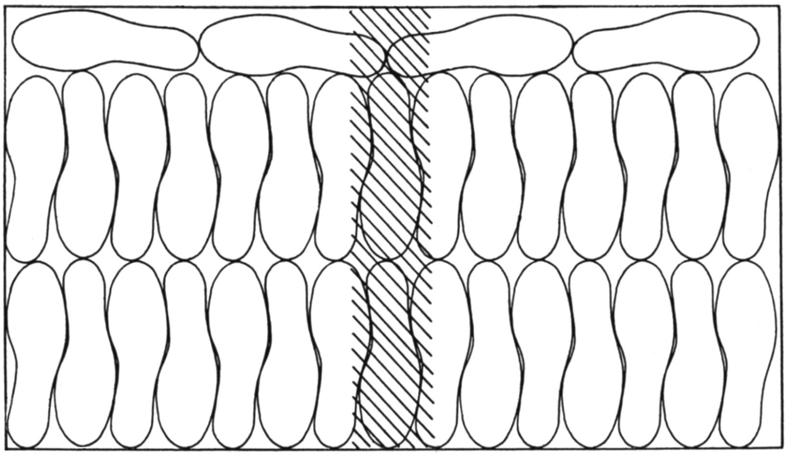


Figure 105. Cutting insoles from shoulders. The hard portions are shaded.

Shoulders are not, of course, as uniform in shape as the diagram shows, but the principle is the same whatever the shape of the shoulder. Waste is reduced to a minimum and very few lifts cut.

SOLE CUTTING

Sole leather is a very valuable material; the cutting of soles is, therefore, a serious operation calling for great skill in cutting as closely as possible, and making the utmost use of the material, by fitting small cuts and flaws into that part of the sole covered by the heel. Every ounce of leather saved represents a considerable saving of money and so close cutting is vital. This is dealt with in detail in the section on good pressmanship in Chapter l7, so now only the various systems when cutting soles will be considered.

Most soles are cut with what is called the three-quarter knife; this cheapens the sole considerably, the cutter obtains more soles from a given area, and the piece-sole necessary to complete the through-sole can be cut from the offal left after the soles are cut, or from stout bellies or shoulders. Many factors must be taken into consideration when cutting soles from bends, and the procedure varies with the type of bend.

Short Cut Bend

The easiest is the short cut bend and this will be considered first.

By short cut, it is meant that the shoulder end has been cut away, leaving a much shorter bend with considerably less variation in substance than its longer brother. For all practical purposes, the variations in substance and quality in a bend are almost identical, with the possible exception of the extreme belly edge where the quality deteriorates rapidly.

Cutting is always begun on prime leather; therefore the belly edge will be away from the operator. The first row of soles must be cut in a straight line; this is most important as any mistake in the first row is repeated in all subsequent rows and much waste is made. Commence with the toe of the knife at the shoulder end (this applies in general to short cuts only) and cut the first row, using the edge of the press block as a guide to keep in a straight line, and taking care to see there is no waste between toe and seat. If the bend has a very pronounced curve, some little waste is made in keeping to a straight line, but nothing compared to that made if the contour of the bend is followed; then, waste will occur on almost every cut across the whole width of the bend. Proceed as far along the bend as possible, four soles being about average.

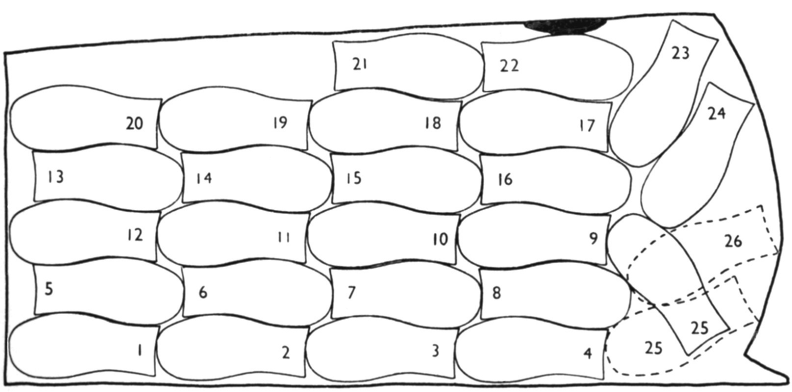


Figure 106. Cutting soles from a short cut bend. A soft spot usually occurs in the area shaded black.

This row is the only one cut with the toe of the knife pointing opposite the direction of travel. Now, take the opposite foot and lock in as shown in Figure 106, taking care to keep the inside corner of the knife as close as possible; if this is not done, the outside corner will project and spoil the lock on the next row; take care too that the inside forepart locks in close to the outside waist of the first row. Continue across the bend in that order; if a flaw is encountered and it is impossible to cut it in the extreme seat end of the sole where it will be covered by the heel, miss one sole completely and so preserve the lock.

The normal bend takes from five to six rows, the one illustrated in Figure 106, between five and six; soles numbered 21 and 22 were considered good enough though very close to the belly edge. The pressman should be on the look-out for a soft spot in the area shaded black; this is present in most bends, is easily missed and is the cause of many soles being rejected.

The butt end is always a problem and no set rules can be laid down as to the best method of cutting. The quality and substance deteriorate rapidly in the direction of the rounded end and an effort should be made to cut all soles from this part with the seat to the edge. Two soles numbered 25 have been shown; the one in dotted lines is not always possible owing to various markings made by the tanner at this point, and the alternative 25 is more usual, but if the dotted sole 25 is possible, then 26 is possible.

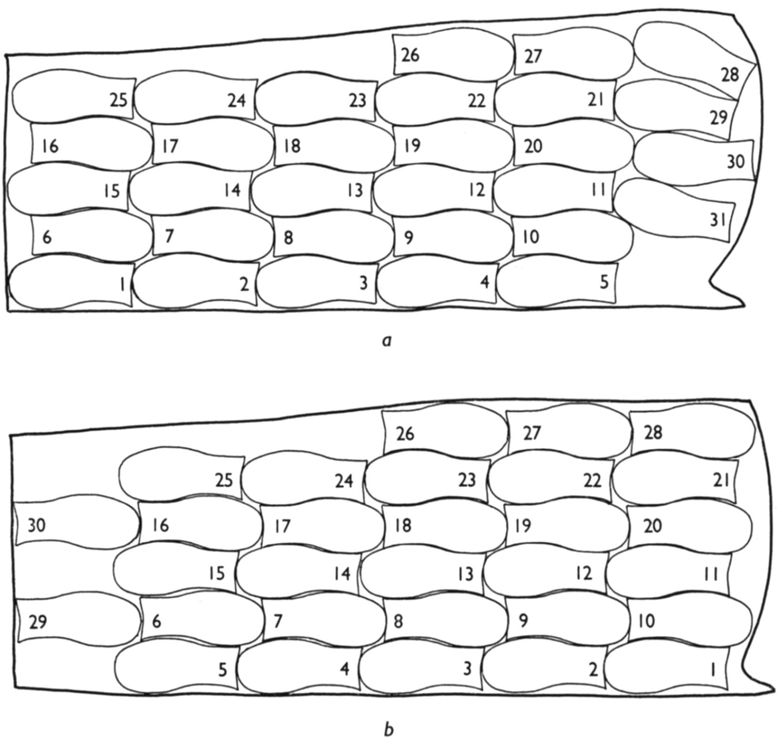


Figure 107. Two methods of cutting soles from a long cut bend.

The short strip left on the belly side can be cut into smaller size soles; a youths' or boys' knife is very useful for this purpose. The few portions left will cut a few top-pieces and piece—soles; there is very little offal on a short cut bend.

Long Cut Bend

When cutting a full length bend there are two alternative methods, the use of which will all depend upon the particular bend being cut. If the shoulder end is reasonably good, we can commence in the manner as for a short cut (see Figure l07*a*). These will be a risk however that soles numbered 1, 15 and 25 will be considered too weak at the toe and rejected.

The other alternative is shown in Figure l07*b*. In this we start with the seat of the knife as close as possible to the butt end, and proceed along the bend in the sequence shown. In this method we make the most use of the substance, the area uncut being at the shoulder end where cuts 29 and 30 are made with the toe away from the edge. This method should always be used on bends carrying a lot of shoulder with its heavy growth marks and poor grain. The portion left at the butt end can be cut into top-pieces, the rest into throughs, top-pieces, and lifts.

CUTTING OTHER SECTIONS

Through-Soles

In cutting through-soles much the same system is used. The lock, however, is much easier, one row following another evenly across the bend. An effort should be made to keep as many flaws as possible into the seat of the sole; this can be done to a much greater extent than when using a three-quarter knife.

Before we leave bend cutting, the use of the material left after all soles have been cut, must be discussed. First, all large top-pieces should be cut using the curve of the breast of the knife to ht closely to any round edge where a sole has been cut, thus saving scrap; follow with the piece-sole knife and cut all rough leather of sufficient substance, and lastly, the remaining small pieces into ladies' top-pieces. If all cutting has been close, the scrap will be about 10 to 12 per cent of the weight of the bend. All material should be weighed as it leaves the cutter and entered on the stock sheet in the appropriate places. This serves as a double check as material sorted can be checked against weight, and the cutter can be assured that he is credited with all cut stuff. Scrap is also entered along with scrap allowance, the percentage allowed, and the gain or loss on scrap, the cutter being allowed ld. or 2d. per lb. on all scrap saved.

Half-Soles

The best method of cutting half-soles is to cut a whole bend into one foot at a time (Figure 108). Always commence at the light end, the toe of the knife facing the butt. Cut one row, then lock the second row in, in the same direction but commence about two—thirds of the way along the first half-sole; this will leave a piece large enough to cut a top-piece, but will make the minimum of waste along the row. The third row will cut as the first and fourth as the second. As the substance at the butt falls off rapidly, do not cut through to the end, but, reverse the knife

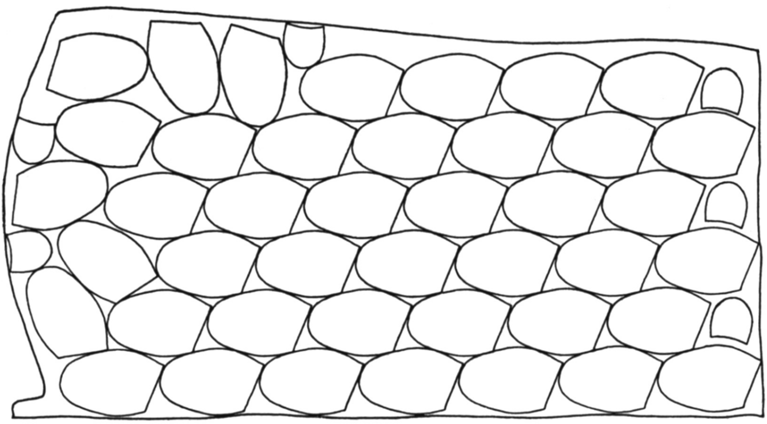


Figure 108. Cutting half-soles from a bend.

where possible, so that the maximum substance will always be in the toe. Bends usually pair up fairly well, so for the opposite foot, take the opposite bend and work from left to right.

Top-Pieces

When cutting top-pieces, cut with the round part of the knife in the direction of travel; for instance, when cutting from left to right, the breast of the knife will face your left hand. When the row is completed, return in the opposite direction with the breast towards the right hand. When leather of the substance of top-pieces is cut on the press, that part of the leather as yet uncut, exerts considerable pressure on the knife, forcing it away towards that part already cut, and, owing to the absence of resistance, there is always a tendency to slide in this direction, resulting in small pieces off here and there. If the method suggested is used, any error in cutting due to the above causes will occur in the breast, and will be removed when the heel is breasted, but if cut any other way, is likely to occur anywhere, and cause uneven slugging when the top-piece is attached.

The only time the side-by-side method is used is when cutting quarter-tip top-pieces as shown in Figure 109. Then, starting with the left knife, cut from right to left with the breast towards you and cut one complete row; next start the second row above the first cut of the first row, with the same knife reversed, that is the breast away from you and cut another row. Then cut the next two rows with the other foot starting of course from the left. This is the only practical method; if any other is used there is always a tendency to lose the lock and make considerable waste.

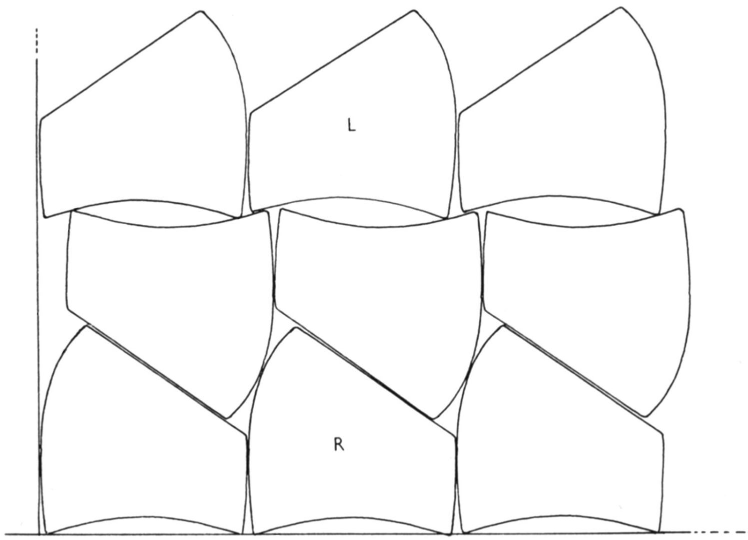


Figure 109. Cutting quarter-tip top pieces.

Seat Lifts

These lifts are attached to the seat of the shoe in such a way as to continue the line of the welt round the heel (see p. 298). They are required to be from material 5 to 6 irons in substance and of good solid texture; they can be run in along with other lifts from a good welting belly, but it is more usual to cut them from a 4 to 6 iron shoulder. For a stitched or extended seat, it is usual to use a whole lift, but for all close seat work a skeleton lift is cut. This reduces the cost of the lift by some 25 per cent.

The cutting of the skeleton lift involves the most intricate of all locks. The method shown in Figure 110 is by far the most economical providing one has a long enough area to cut. The difficulty is, that the second row does not lock in squarely with the first. The knife is moved some 3 in. to the left. The third row, however, moves back $1\frac{1}{2}$ in., and the fourth row locks in perfectly again; small ordinary lifts can be cut from the portions left.

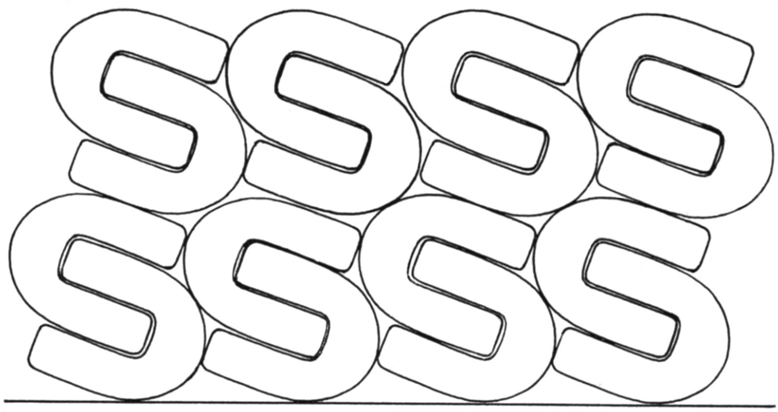


Figure 110. Method of cutting skeleton lifts.

As when cutting leather and fabric in the clicking room (see pp. 118-29), the pair of locked patterns may be placed in other positions according to the size and shape of the material available and to run in with other patterns.

15
PREPARATION OF SOLES AND INSOLES

Sole and Piece-sole Beveling

Before grading, the three-quarter length soles must be skived at the seat. This is done on a guillotine-type machine which cuts a stunt scarf, and as the piece-soles are skived on the same machine a perfect join is possible.

Evening and Grading

The next operation after bevelling is grading, which is performed on the 'Nichols' Evening and Grading Machine manufactured by the B.U.S.M. Co. This is a vital operation and well repays the care and attention that should always be taken to ensure that the machine is in good condition and properly adjusted. By means of spring- loaded rollers, this machine finds the thinnest part of the article being graded, stamps the substance in irons and levels to that substance. It can also be set to split at any desired substance; for instance, men's insoles are usually graded up to 8 iron and all above are split to that substance. An additional stamp wheel is fitted and can be used to stamp the sizes, or a number that denotes a particular tannage. The spring loading on the front roller is variable and should be adjusted to suit the type of material being graded. A belly insole will offer much less resistance than a bend sole, and pressure should be reduced for the insole and increased for the soles; it this is not done the sole will not be level and not up to the substance stamped and the insole may show a whole split.

It is possible to grade pieces to be level all over and middles, lifts, top-pieces and piece-soles are graded this way, but it is not economical or necessary to grade soles and insoles like this. Consequently, an adjustment is provided so that we may grade from any desired point. This point is usually about l in. behind the joint. To set the trip which controls this, place the insole or sole with the seat facing the direction of travel through the machine, with the joint level with the mark on the casing immediately above the first roller; now adjust the trip, which is on a rod lying between the twin-feed chain, so that it is level with the leading end of the insole. The effect is then as follows: if a sole is correctly cut, it will, if there is any variation in substance, be stout at the toe and light at the seat. As it passes through the machine the rack which registers the substance will continue to rise until the trip is raised; the substance is held at this point, stamped and all surplus levelled off. lf a sole measures 8 irons in the seat and 10 irons in the toe it will grade at 9 irons; the fact that the waist and seat will be under substance is not really important—a whole iron is saved and this represents a considerable economy; this applies also to insoles, though of course the sorter must decide if the waist is too light. If, however, the substance falls off toward the toe, then the rack is allowed to slide back until about 2 in. of the sole remains between the rollers and the substance is set at this point. If the sole is the reverse of the previous one and measures 10 irons in the seat and 8 irons in the toe then it will be graded at 8 irons. Should one wish to grade level all over, the trip is placed as near the first rollers as possible.

The accuracy of bottom stock costing depends entirely upon the work of this machine; we cost, particularly in the case of soles, by the number of irons, so incorrect setting may result in a $\frac{1}{2}$ iron reduction on every sole graded, and consequently, a serious loss will be shown on the stock sheets. Pressure should be carefully adjusted so that all materials are reasonably level with the minimum amount of skive. If the machine is carefully maintained a large amount of work can be done accurately and speedily. Great care should be taken of the knife; it should be carefully honed at least once a day. A machine is provided which ensures accuracy, but it can be done quite well by hand. The extreme edges should receive extra grinding to compensate for lack of wear as even the widest soles do not cover the whole knife. Any trace of wire edges due to over-grinding, should be removed with a hand-stone. The brass stops against which the knife rests should be removed when they become slotted, or the knife may possibly foul the rollers. As the knife wears, a tendency will be noticed for the material to be over substance; an adjustment is provided on the head of the machine which will raise or lower the top rollers the equivalent of half an iron which is normally all that is required to compensate for wear. When a new knife is fitted this adjustment should be at its highest point, it can then be lowered gradually as wear takes place. Providing these adjustments are carefully carried out, grading accurate to half an iron or even less is possible.

Surface Scouring

From grading, the insoles pass to the surface scourer which removes the surface of the grain leaving it cleaner and much more flexible; it also helps considerably to minimise the risk of the grain cracking during wear. All throughs and middles are scoured, mainly to obtain better adhesion where rubber solution or latex is applied for sole laying purposes.

INSOLES

Sorting

The ideal sorter is a man with many years of experience of cutting and preparation. The necessary knowledge is acquired only by the constant handling of leather in all stages. Without this experience it is extremely difficult to distinguish between the variations of fibre found in a welting belly.

Fibres are spoken of as being long or short, of horizontal or vertical weave; these terms tend to mislead and the author prefers to speak of them as being tight or loose. If they are too loose, the channel will be weak and *pull* away when the welt is sewn in; if too tight, the insole is difficult to channel and open, and the lips tend to break away during sewing. The ideal insole is sufficiently loose to channel and open easily, yet sufficiently tight to stand the strains of staple side-lasting and welt sewing. It should be cleanly fleshed but not too deeply; an insole with no flesh is difficult to channel, the knives bite deeply, produce a stout lip that is difficult to open, and frequently leave a ridge on the grain, a ridge which is unsightly in the finished shoe and causes the edge of the insole to curl up in wear. An excess of flesh produces weak channel lips which either stretch badly in sewing resulting in wide waists where the strains of side lasting have proved too great, or they fail completely, and the shoe has to be remade.

It is usual to sort into six qualities in the case of men's insoles: handsewn, No. 1 welted, No. 2 welted, gemmed, riveted, and machine-sewn. The sorter must use his judgement quickly and decide for which purpose the insole is most suited. For handsewn, select those slightly on the loose side preferably with the flesh on; if fleshed it is difficult for the sewer to penetrate with his awl.

The best of the 7 to $7\frac{1}{2}$ iron insoles are selected for No. 1 welted; any with excess flesh are taken down an iron on the splitter and sorted again with the 6 iron. Those too hard for welted are placed in the riveted class.

The 6 iron are then sorted, the prime into No. 2 welted, those too hard or too loose into machine-sewn and, again, those that are firm but with too much flesh are reduced an iron and sorted again with the 5 to $5\frac{1}{2}$ iron. These are usually gemmed, and only those too weak for this purpose are rejected and used, sometimes with a leather and sometimes with a cardboard backer, for cheap riveted work. They are all counted, and entered on a sheet.

A sorter must observe all these points: he must look for flesh flaws, any weak spots other than in the seat, and any bad grain blemishes, as the welted shoe has only a seat sock; he should also refer to his foreman regarding the standard of sorting as any variation has a marked effect on the completed stock sheet. The best method of testing an insole is to hold it by the seat, flesh uppermost in the right hand, place the thumb of the left hand above and the fingers below, and draw the left hand along the insole, pressing down with the thumb and up with the fingers, holding the hand at such an angle as to cause the insole to flex; the varying resistance will give the sorter an indication of quality, and, if the fibres are loose, they will lift and show small or large corrugations according to the degree of looseness. It is by observing the length of these corrugations that the sorter decides upon the best use for which the insole is suited.

The same procedure is observed with ladies' work except that the best are 6 to $6\frac{1}{2}$ iron, the second $5\frac{1}{2}$, and the 5 and best of the $4\frac{1}{2}$ are gemmed, the rest being machine sewn.

It is of great assistance when sorting to use a 'cub'* with six or eight partitions, as is used on the grading machine. By placing the sorted insoles in the correct partition much time is saved as they can be placed there quickly, they stay there and do not fall over as so often happens otherwise. When the particular size is completed they can be easily removed, counted and placed in the appropriate cubs for fitting up.

To complete the stock, the sorter must examine and count all throughs and middles, count all piece—soles and enter the weight of lifts *etc*. He then forwards the completed sheet to the foreman for examination, who in turn returns it to the pressman for him to check, after which it goes to the office for wages and costing.

Fitting-up

The fitter—up takes the insoles from the cubs in which they have been placed by the sorter and counts them out in the sizes required by the work ticket. In most cases the quality required is plainly marked, according to the grade of the shoe, but the good fitter uses his judgement, and, if the shoe is a heavy grain he will use a heavy insole and *vice-versa*; he will be on the look-out for flaws missed by the sorter and group his work as far as possible, that is to say, if he has a number of tickets of the same last, fitting, and quality, he will get them out together, so helping the rounder considerably as he will not have to change his pattern so often; he will mark all sizes plainly, also ticket and plan numbers.

It is of great advantage to production, if work can be issued in half-gross lots; much time is saved and the insoles can be finally divided into twelve or twenty-four pairs after preparation has been completed, or, as is preferable, after lip cutting and scouring, operations that are performed later.

Rounding

Here again, good work can only be done if the machine, the BUSMC 'Planet' Rounder, is maintained in good condition. In this machine the caster insole is clamped on a wooden template made to the exact shape required and a knife then follows round this template cutting off surplus material.

Great care should be taken of the knife, it should always be held in the holder supplied, and ground with the stone held flat. The flat side of the knife must not be touched apart from removing a wire edge, the result of too much grinding on the hollow-ground side. Replacement is usually necessary after 10,000 pairs. The knife holder

* 'Cub' is a trade name for any cupboard, shelf, or other receptacle in which cut parts, *etc.* are stored.

on this machine pivots on a small pin, and is subject to considerable pressure; this should be lubricated twice a day and as soon as any appreciable play develop the pin and the two bushes should be renewed. The guards or shims which hold the knife block the required distance from the pattern also wear and should be replaced periodically. These guards are from $\frac{1}{64}$ in. To $\frac{1}{8}$ in. thick and can be used to leave any desired allowance over and above the $\frac{1}{64}$ in. which is usual.

Channelling

In this operation which prepares the insole to receive the welt seam, as in most machine operations in which knives are used, the maintenance and setting-up are of major importance. Only if the knives are correctly ground and set can accurate work be done. The original angle of the cutting edge of the knives must be maintained; this is square to the direction of the cut. The points of the knives always wear more rapidly than any other parts and the area unworn must be ground away to compensate for this wear and so retain the original angle of cut; if this is not done an uneven lip will result at the toe and joints where the insole is turned quickly. This grinding is best done with a fine file, holding the knife while doing so in the special tool supplied for this purpose. The edge should be finally set with an oilstone.

Setting-up the Knives—The angle of the outside knife is fixed but it can be adjusted vertically. It is usual to set this to cut a lip one-third of the substance of the insole. Having done this, the inside knife should be set with the point $\frac{3}{16}$ in. from that of the outer for men's work, $\frac{1}{32}$ in. less for ladies', and as near level as possible. One may safely set it a little higher, but under no circumstances should it be lower or trouble will be experienced with insoles ridging on the inside of the shoe and curling up at the edge during wear. This inside knife can be adjusted to a wide variety of angles, but the best results are obtained with it cutting as flat as possible; great care should be taken when grinding this knife, and both faces should receive equal attention; many operatives having a tendency to neglect the vertical one. There are many other adjustments, but these are covered in the handbook supplied with the machine and need not be mentioned here.

The width of the outer lip is varied to make allowances for stiffeners and toe-puffs and the particular style of shoe being made. For a medium weight man's shoe the following measurements are satisfactory: waist $\frac{9}{32}$ in., joint $\frac{5}{32}$ in. and toe $\frac{7}{32}$ in.

The position of the change of distance is determined by the style of the shoe which is stated on the work ticket. This may be channel waist, square outside, square waist, blind welt, *etc*. An example is shown in Figure 111. The change from one distance to another should be done gradually; approximately l in. of travel should take

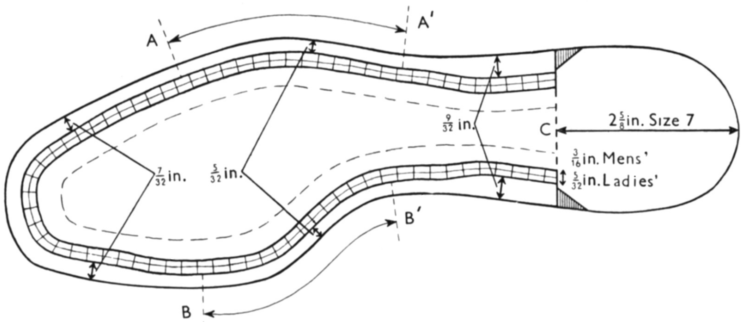


Figure 111. Square waist insole. The outside lip is slashed from A to A′ and B to B′. Score marks are shown at C, and the triangular shaded portions indicate where a wedge-shaped section is removed from the outside lip.

place when passing from one to another, and if done correctly the finished shoe will show an even feather line all round.

There are many variations of the above measurements brought about by such things as upper and lining substance and the type of welt to be used, but in all cases they should be decided upon in close co-operation with the head of the making department.

The B.U.S.M.Co. have recently developed a new channelling machine, the No. 2 'Universal', which changes distance by an arrangement of cams; this reduces the possibility of human error to a minimum. A device is also fitted which nicks both the inner and outer channel lips. When this machine is used, the double lip turner is fitted with a convex table, the result being almost the equivalent of a moulded insole. The feather edge, being turned down slightly, fits closely to the last and lessens the risk of the edge being swept up by the bed laster.

Handsewn—For this work, a satisfactory method is to take out the inner knife and cut a single outer lip; this will open quite well on the double lip turner if the insole is first wetted on the flesh side and the plough and inner tool of the double lip turner raised the equivalent of the substance of the outer lip.

After opening, the insoles should be carefully stacked to allow them to dry before they are placed in their respective cubs.

Gemming

There are two main methods of gemming, the 'Gimson' method, and the BUSMC 'Economy' method.

Gimson Method—Of the many methods which can be used for preparing felt insoles for welted work, gemming by the 'Gimson' method gives the best results. The same procedure is followed with leather insoles, except of course that the machines have to be adjusted to take the lighter materials.

This method cuts a flat square inside lip which, when gemmed, has proved much stronger than a double one. Felt insoles are usually cut on the clicking press with knives made to the shape of the last; they can be cut by hand using a pattern prepared as for clicking, but it is difficult to maintain a square edge owing to the flexing of the knife. They can also be rounded on the older type 'Planet' Sole Rounding Machine providing the material is cut into ranges of the correct length; if the range is placed on the platform behind the machine, and turned over after rounding each one, it will be found to be very economical.

For men's work, felt $\frac{1}{4}$ in. thick should be used. The channel lip should be one-third of the total substance and should show the following measurements: waist $\frac{10}{32}$ in. joint $\frac{6}{32}$ in. and toe $\frac{8}{32}$ in; this is $\frac{1}{32}$ in. more than for leather and is necessary to compensate for stretch when the welt is sewn in.

It is impossible to stamp the size, so this is marked in crayon; the lips are cut on the lip cutting and scoring machine by special knives which sever the inside channel only. Four cuts are then made in the lip one at each joint and two in the toe to assist opening; the lip is then opened and a coating of latex applied to the inside. When this has dried, a strip of adhesive tape $\frac{7}{16}$ in. wide is pressed into the angle formed by the lip and insole, then, the whole is covered to the top of the lip in the usual way by a gemming canvas care being taken when bedding in to keep the lip as upright as possible. Any surplus is then trimmed off on another machine which beds in the canvas firmly to the insole at the same time.

All that remains to be done is to reinforce the seat with a light but firm board of $\frac{1}{32}$ in. substance cut to shape on the press; this not only stiffens the seat but provides a base for the seat-lasting tacks to obtain a firm hold; it is attached by ordinary rubber solution.

Economy Method—The 'Economy' method consists of cutting a double channel similar to that for ordinary welted, except that it is done on a special machine which cuts a series of nicks on the edge of the inner lip; the between substance is less than for ordinary welted varying from $\frac{1}{8}$ in. for ladies' to $\frac{5}{32}$ in. for men's. Two small wedges are then cut from the inside channel at the toe, the lips are cut, the insole scored and size stamped and then passed through a machine which deposits a layer of latex all over. After being allowed to dry the lips are opened and it is then covered by the 'gem' canvas which is bedded in and trimmed

This method is very rapid and efficient, but needs an insole of at least 5 to $5\frac{1}{2}$ irons in order to leave a reasonable substance on the feather edge. It is the ability of the 'Gimson' to channel insoles of $4\frac{1}{2}$ irons that gives it an advantage over the 'Economy' method; its disadvantage is that it is much slower.

Lip Cutting and Scoring

In this operation the chief points to observe are: (l) the size should be plainly stamped; (2) the score marks should be prominent; this is important because it serves as a guide for the welt sewer to commence and finish this seam, accuracy here is important as any variation results in bad work on subsequent operations as they too rely on the same scale of measurement; (3) the lips should be cut deep enough to sever cleanly, but not more, or the insole will be weakened.

An improvement in this operation is the provision of special knives which cut a wedge-shaped portion from the outer lip, behind the score marks; this avoids the tendency for this part of the channel to be swept back when lasting, so causing a variation in the line of the seat (Figure 111).

Double Lip Turning

The purpose of this operation is to raise both lips to an upright position. It is to these lips that the upper and the welt are sewn.

For this operation to be successful a layer of good quality latex must be evenly applied to the surface of both lips. Care must be taken to avoid getting any latex on the insole beyond the lips, or great difficulty will be experienced in opening them at all. The tools of the double lip turner have a wide range of movement and care in setting will be well repaid as the machine runs for long periods with only slight adjustment to compensate for wear.

Opinions vary, but in the opinion of the writer, the best results are obtained with both lips standing as upright as possible having been pressed together tightly at the top and showing no pressure at the base thus leaving a small cavity between the base of the lips.

The machine is fitted with three pedals of which the centre one depresses the table, and opens the tools to allow the insole to be inserted. The one on the right operates a reduction gear which slows the drive and should be used on all pointed and square toes. The third operates a knife which slashes the outer lip; this should be done for about $1\frac{1}{2}$ in. each side of both joints; these cuts open when the insole is attached to the last, and this lessens the tendency for the lips to part.

All that remains now to be done to the insoles is a final check to see that all is correct; then they are tied together, not too tightly or the channels will be damaged, and they go to numbered cubs (see p. 248) to await the uppers from the closing room.

Preparation of Insoles for the Machine-sewn Methods

Insoles for the machine-sewn methods of attachment (see p. 325) can be, and are, cut from many leather substitutes but the only point in their favour is cheapness. The ideal insole is leather, light in substance and flexible. For ladies' work $4\frac{1}{2}$ irons is most suitable, and for men's from 5 to 6 irons.

These insoles are rounded on the 'Planet' Rounder, and for ladies' work are then flexed by passing them through a machine which makes a series of cuts across the insole from the joint forward, in which area flexibility is most desired.

The edges of the insoles are then bevelled on both sides of the waist; this bevel should be $\frac{3}{16}$ in. wide and the edge reduced to 2 irons.

When the shoe is designed to carry a heel 2 in. or more, it becomes necessary to reinforce the waist of the insole. This is done with light board, cut or rounded to shape and attached to the insole before moulding with a suitable adhesive.

The insoles are then moulded on the Twin Sole Moulder care being taken to see that the machine is adjusted to mould correctly so that a perfect lit is obtained.

For men's work the same procedure is followed except that for Littleway 5 to $5\frac{1}{2}$ irons is stout enough, for riveted, sewn and stitched 6 to $6\frac{1}{2}$ irons, and for screwed 7 to 8 irons.

All have the size stamped clearly in the centre of the seat and are shaped on moulds giving a rather exaggerated form to the insole which ensures the edge fitting close to the last.

SOLES

Sorting

To describe sole sorting on paper is difficult. Whereas, with an insole, one flexes and grades to some extent by feel and vision, with sole sorting it is almost entirely visual; one only flexes the sole in extreme cases particularly when handling men's soles; with ladies', the substance is less, and flexing being easier, is used more often.

To commence, one lays the graded soles in a row on the bench with the flesh side towards the sorter. This enables him, as he picks up each sole in turn, to see any flesh flaws; these are mainly flay marks caused by the fleshing knife; then, turning the sole over he looks for any warble holes, brands or bad scratches. These are obvious and require no great skill to detect but the sorting into three or four qualities is a different problem.

One infallible guide is colour. The prime leather in any bend is always lighter in colour, gradually shading darker towards the belly side and shoulder end. This combined with the appearance of growth marks as the shoulder end is approached, gives the sorter his clue as to which part of the bend the sole was cut from.

As stated in Chapter 14, quality and substance follow much the same line, but it does not follow that a 9 iron sole from one bend will be as good as another of the same substance cut from another bend from the same bale. Although the two bends may weigh the same, one may be much greater in area, and consequently will be lighter in substance, and a sole cut from exactly the same part of the bend may be lighter in substance by as much as 2 irons when compared with a sole cut from a smaller bend. This is where use is made of colour variation to determine quality, and substance is disregarded. Soles of poor colour are reserved for those shoes which are to have a black or dark stain bottom finish, which will cover many blemishes.

Only when sorting the lower irons does a sole sorter flex, and this time it is the grain he observes. It is not possible to flex a sole in the same way as an insole as the resistance is too great; instead, he holds the sole, grain up, firmly by the toe and seat and bends both ends in an upward direction. The quality is judged by the amount the grain lifts, the more lift the weaker the sole.

Those too weak are classed as throughs and used as through middles for welted, sewn and stitched, or riveted work. Any rejects are returned to the cutter who should cut them up immediately and return the cut stuff to the sorter.

Having completed the sole sorting the offal remains; this comprises top-pieces, lifts, and piece-soles. The latter are counted and entered on a stock sheet. Then the top-pieces are sorted in two or more qualities. It is possible to grade top-pieces on the 'Nichols' Evener and Grader without stamping the substance; this is desirable as the stamp disfigures the finished shoe. The operator sorts the various substances by watching a dial on the machine, placing each substance in a separate receptacle. Best top-pieces are sorted from those over 9 irons and second quality from 8 to 9 irons. Below this substance, everything is a lift, and is entered in pounds weight on the sheet along with those that are badly branded, or are rejected for other reasons. The sorting is entirely visual and colour is the best guide. All top-pieces are counted and entered on the stock sheet in qualities.

Having completed all sorting, total weight should be checked against weight issued and if correct the sheet passed on to the foreman.

Fitting up and Preparation of the Welted Sole

The work ticket usually shows the range of sizes and the number of pairs of each size, the shape and fitting of the last, the substance and quality of the sole required, the width of welt and total edge substance.

The edge substance on men's work can be anything from 11 irons for a dress shoe to 30 for a veldtschoen where the upper is included. There are many`ways of making up the edge substance; welts can be of 4, 5 or 6 irons, middles and throughs from 3 to 7 and soles from 6 to 12. Middles are not often used when the edge is 15 irons or less, but chiefly from 15 to 19 and throughs on anything from 18 to 24.

From the fitter the next operation is to reduce the substance of the sole in the waist. This is performed by a machine which takes one pair at a time and skives them by means of a matrix roller revolving over a splitting knife, the usual reduction being approximately one-third of the total substance. For a square outside waist edge, the inside waist only is reduced; for 'channel' waists (rounded edges), both sides are reduced. The correct length of skive is from immediately behind the joint to a point where it is estimated the breast of the heel will fit. The soles are then given a coating of heavy rubber solution, placed on racks, left for 24 hr. to dry thoroughly and then stacked away in numbered cubs.

There are two more minor items to be prepared—throughs and middles. Both are cut from the lighter parts of bellies and shoulders, are graded, surface-scoured to enable the solution to obtain a firm hold, and, in the case of middles, skived with a wide scarf so that the change from waist to forepart substance is gradual. Both are covered with latex or solution, and attached to the soles after wetting.

Preparation for the Machine-sewn Method

Before any operation can be performed, the soles must be correctly wetted. It is impossible to channel accurately unless they hold a uniform degree of moisture throughout. If the following rules are observed, good channelling will result and no trouble experienced with water stain.

Soles are first placed in the toast-rack type of holder; if made of metal, this must be painted as bare metal stains (unless it is brass, one of the aluminium alloys or stainless steel). These racks of soles are then immersed in clear water, and left in 1 min. for every iron of sole substance*. After this period, they are withdrawn, and placed on draining boards, still in their racks for all surplus water to drain away; this only takes a few minutes, and more soles can be placed in racks and wetted during the draining. They are then removed, still in the racks, and placed in a convenient spot and left until *all* surface moisture has disappeared; this is most important as any residual surface moisture will cause stain. This takes about 1 hr; the soles are then taken from the racks, stacked closely together, and placed in a mulling cabinet, or covered with damp sacks, a crude, but entirely satisfactory method, and left for 12 hr. usually overnight; this period is necessary to allow the fibres to absorb the moisture, which, up to that time, has only penetrated a small proportion of the entire substance. The soles, after this period, will have a uniform moisture content, and will, as a result, channel and mould easily, and will dry free from stain.

The soles are then rounded on the 'Planet' Sole Rounder and should be channelled immediately; this is done on the BUSMC 'Apex' Machine. There are two main types of channel, usually termed the English and American. Both are shown in Figure 112.

The former is cut into the grain of the sole at an angle, determined by the substance of the sole. It is an advantage to channel as deeply

*This 1 min. per iron immersion time is much shorter than that normally given, but the author has found it quite satisfactory in practice.

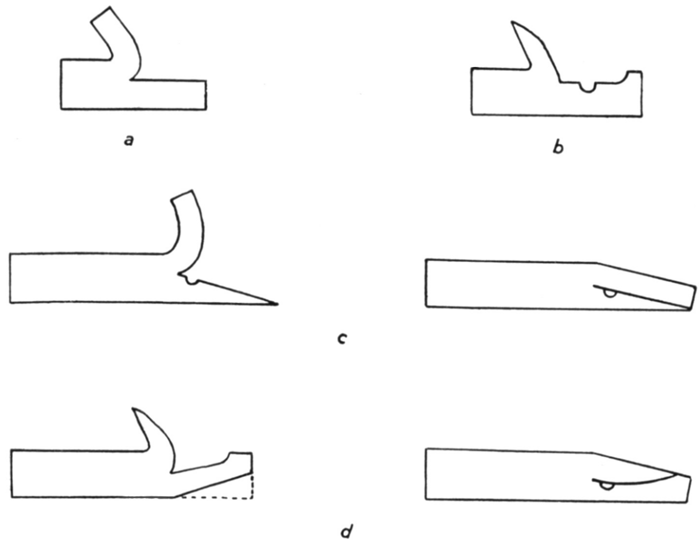


Figure 112. Channeling by Apex machine, for the machine-sewn method; *a* American split edge; *b* English with groove; *c* American, edge reduced (open and closed); *d* English, flesh side reduced (open and closed).

as possible as the stitches will then have a greater covering and as a result will not be exposed to wear so soon, but the channel must not be so deep as would materially weaken the sole beneath the stitches; therefore the lighter the sole, the more shallow must be the channel.

There are many types of knife supplied, each giving a different cut. It is also possible to tip the knife in the holder and obtain further variation. The width of cut is $\frac{1}{4}$ in. and the cut should commence $\frac{1}{32}$ in. from the edge for close work, and more for wheeled welt, according to the width of wheel desired. This distance is varied by moving the head carrying the knife away from the guide wheel, against which the edge of the sole is held during the operation. This wheel can also be moved inwards by depressing a pedal; this is done in both waists, when it is the usual practice to sew in slightly. The pedal should be depressed slowly to obtain a gradual change, the amount of change being varied by simple adjustment.

In addition to the channel, a groove is cut near the base of the lip to allow the sewing to bed in; this should not be so deep as to weaken the sole, but sufficiently deep to allow the lip to be closed after sewing without showing the imprint of the thread. The knife should be set to cut the groove $\frac{1}{32}$ in. away from the channel base; this will allow the operator to sew flat, and avoid the ballooning effect on the sole which happens when the sewer tips the shoe to enable him to sew in a groove cut too far in.

The other channel, the American, or split edge, is also shown in Figure 112. This cuts a horizontal lip from the edge of the sole. It is used for very light shoes, as the bottom lip can be bevelled, leaving an edge, after closing, the substance only of the upper lip. This channel is often used in conjunction with the English one. When this is done the forepart is channelled English and the waist American; the result shows a pleasing variation and adds considerably to the shoe's appearance.

After channelling, the soles are slightly bevelled on the flesh side, removing about 1 iron from the forepart; this leaves a clean edge for finishing. In the case of the English channel, the waist is reduced in the same operation by depressing a pedal which alters the angle of the knife. The amount of travel is determined by an adjustable stop, and the edge can be reduced to any desired substance, within reasonable limits.

If the sole fitted is of 7 irons, the prepared edge can be 6 iron forepart and 4 iron waist, *etc*. This should be plainly marked on the work ticket.

The point at which the bevelling of the waist should commence coincides with the sewing-in variation of the channel. Again the depression of the pedal must be gradual or the effect will be completely lost.

After bevelling the soles should be moulded at once. Sufficient pressure should be applied to mould the sole permanently without undue bruising of the fibres. Care should be taken to see that the machine is set correctly and that the mould coincides with that of the insole. The metal fingers holding the sole in position should fit closely otherwise the mould will be out of alignment.

If possible the soles should be solutioned and passed direct to the making room where they are placed in a mulling cabinet and used as soon as possible, preferably the same day; this saves a second wetting and the possibility of discoloured soles. If this is not possible they should be placed in racks and left to dry, or mould will develop.

Preparation of Cemented Soles

Soles for this work, cut from flexible bend, are prepared dry. All flesh is removed, and after rounding, the flesh side is roughed up to a width of approximately the same as that of the lasted-in portion of the upper (see p. 350). This is done by a machine fitted with a wire brush. Cement is applied to the roughed part by machine and the soles are left to dry, before being placed in cubs. Most of the cement used today is of the cellulose variety (see p. 348).

Preparation of Sewn and Stitched, Riveted and Stitched, and Screwed and Stitched Soles

Soles, throughs and middles are all wetted then rounded; the throughs are moulded and the middles, if any, attached by solution or wire-grip tacker. The soles are grooved on the 'Apex' machine in much the same way as a machine-sewn sole is channeled. The centre of the groove should measure $\frac{3}{16}$ in. to $\frac{1}{4}$ in from the edge of the sole, varying according to the width of the welt. After grooving they are moulded, left to dry and placed in cubs with their fellow throughs and middles.

16

LIFTS, WELTS AND HEELS

SEAT LIFTS

THERE ARE TWO KINDS of seat lifts—skeleton and whole. The former are used for close seat work, are cut from the firm parts of bellies or from firm light shoulders. They are levelled to 5 or 6 irons and the ends skived to match up with the angle of skive on the welt butting machine. Solid lifts which are used for all stitched and extended seat work should be cut to the shape shown in Figure 113. These are levelled and the whole of the breast skived. This is possible on the BUSMC No. 2 Skiving Machine. The advantage of this shape is that, when correctly fitted, the recessed part fits snugly over the bevel of the shank, leaving a level seat, whereas, if an ordinary lift is used, as it so often is, a bump is created where the lift passes over the shank; not only is this unsightly, but it throws the heel out of pitch.

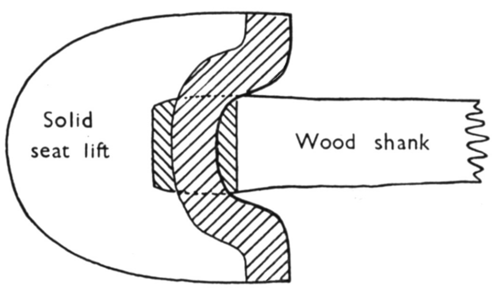


Figure 113. Shape of lifts for stitched and extended seat work. The shaded area is skived.

WELTS

The manufacture of welts is today largely in the hands of a number of firms who specialise in this production.

Shoulders are bought rough tanned; they are then trimmed, the faces and coarse parts that are unsuitable being removed. They are then placed in water vats to be broken down and when soft they are split to the substance required and drummed. During drumming a larger proportion of fat than is found in most leather is introduced; the reason for this is that the welt not only has to resist water during wear, but must stand up to one or more additional rows of stitching when the shoe is repaired. The extra fat helps to preserve the leather and so prolongs the life of the shoe. After drumming, the shoulder is passed through a setting-out machine, which rolls and stretches the leather, and removes a lot of the growth marks that are so prominent in a shoulder. After setting they are hung to dry for two or three days and then rolled to break them down to a mellow condition:

They are then coloured either by cellulose or water-bound pigment. If the former is used the grain is lightly buffed before the colour is applied. With the latter the grain is left on, and the pigment, which is usually mixed with a fixing or sealing agent to prevent the colour from 'running' when the welt is wetted, applied by brush.

The shoulders are ranged into the lengths required, and the welts cut to the desired width on a multi-knife machine which cuts six pairs at once. They are then bevelled, grooved and split to substance all in the same operation. The extent of the bevel, and the position of the groove is shown in Figure 114. The bevel is cut on the grain side on the edge which lies

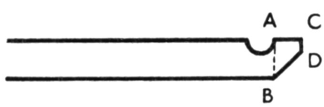


Figure 114. Bevel and groove of a welt: AB is perpendicular; AC= $\frac{1}{8}$ in.; CD = $\frac{1}{16}$ in. For lighter welts CD is proportionately less.

next to the upper when sewn in. The groove is on the flesh side, and its purpose is to receive the thread of the seam so that it beds down and does not project above the level of the welt. This in conjunction with the bevel, allows the welt to be beaten out at right—angles to the upper after the surplus leather has been trimmed from the seam.

Welts are made in all colours and in substance from $2\frac{1}{2}$ to 7 iron or even more in some special types. There are many variations of the ordinary welt, the most popular being the storm welt. This has a raised bead on the grain side, so placed that when sewn in it rests tightly in the feather line and helps to prevent the ingress of water; hence its name. This bead is obtained by splitting the edge of the welt, then doubling the grain upwards to form the bead. The surplus created by this operation is trimmed off, the bead being held in position by rubber solution. There are several variations of the storm; the two most popular are the top-notch, in which the bead is notched at intervals, and the double-deck, in which a row of stitching is run through the bead the effect on the finished shoe being that of a double welt.

All these welts can be bought cut in lengths or in coils of 50 yd. These coils are made by skiving the ends of the ranges, one on the grain, the other on the flesh, joining them together and cutting a continuous welt.

HEELS

In heel building there are three main factors that must be considered, height, pitch, and coupling.

Height—The height of heel is determined by the style of last; in the case of men's work the casual type may require a heel giving an overall height of only $\frac{7}{8}$ in.; at the other extreme some lasts need a heel of $1\frac{1}{4}$ in. to give a correct stance. Also, a shoe with a middle needs a higher heel to compensate. The correct height of a heel is that which gives from $\frac{1}{4}$ in. to $\frac{5}{16}$ in. toe spring. If the amount of toe spring is reduced, the angle of pitch is increased and vice versa, therefore the correct amount of toe spring must be decided first and from that the angle of pitch is obtained and the heel made accordingly.

Pitch—Pitch may be defined as the angle of the seat base in relation to the base line after the correct toe spring has been ascertained. On some lasts this angle is almost non~existent and the heel requires the minimum of

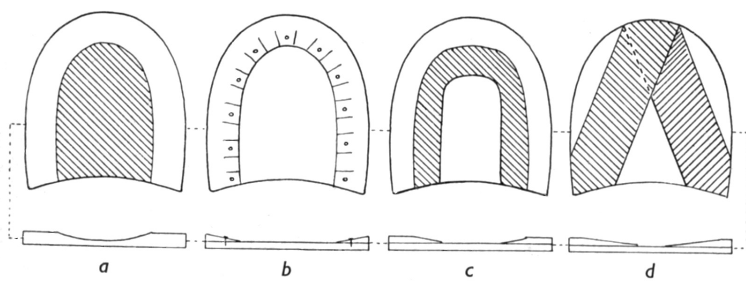


Figure 115. Four types of seat lift: *a* gouged; *b* rand; *c* skived skeleton; *d* half lifts. The shaded portions are skived.

pitch and on others the reverse is true. With the former the small amount of pitch is easily obtained on the heel compressor but in acute cases it is necessary to use a lift skived across the breast with as wide a scarf as possible to form a wedge in order to obtain sufficient variation between the height of the breast and back.

Coupling—The seat of a last is slightly convex; it follows therefore, that to obtain a close fit a heel base must be concave. This is known as coupling and is obtained in various ways: see Figure 115.

(l) by taking an 8 or 9 iron lift and 'gouging' out an area in the centre of the lift, (Figure 1150) thereby reducing the centre of the breast to about 4 irons: this method is efficient if sufficient lifts of good substance are available but is extremely wasteful as the portion gouged away is of no use;

(2) by tacking or stitching a skived rand round the edge of the lift (Figure 115*b*);
(3) by using a skeleton lift, skived on its inner edge (Figure 115*c*);
(4) by using a skived half-lift (Figure 115*d*).

The last is by far the cheapest method and there do not appear to be any disadvantages in its use.

The half-lift is cut from pieces of leather that would otherwise be wasted and, like the rand can be attached to a lift of any substance, and can be guaranteed to give the same amount of coupling if they are accurately prepared.

Preparation of Materials

All lifts should be graded; only by so doing can a level, solid heel, be made. The size should be stamped at the time of grading and the lifts stored in cubs handy to the heel builders. Lifts are numbered according to size, the smallest being size 0, the next size l, up to size 30, this being a complete range. Half-lifts are levelled at 5 irons and skived with a scarf of such width, that, when placed on a lift of the same size, the join matches up with no increase in edge substance (see Figure 115*d*). They are attached to the lift by the No. 4 Rand Tacker (BUSMC) with the randing mechanism removed.

Building Men's Heels

The majority of heels for men's work are built and compressed by what is known as a two-gauge method, that is, only two sizes of lift are used. This builds an almost square heel. The average height for a man's heel when finished is $1\frac{1}{8}$ in., the necessary height being obtained in this way. Suppose we require a substance of 54 irons (48 irons = l in.). Assume that the welt is of 5 irons and seat lift to match, the sole and piece-sole 9 irons and the top-piece 10 irons; we require another 30 irons, $\frac{30}{48}$ in. or a $\frac{5}{8}$ in. heel. (5 + 9 + 10 + 30 = 54.)

To help us in building the heel, we shall require a tool known as a gauge. This is a piece of light metal about 4 to 5 in. long and $1\frac{1}{2}$ in. wide, fitted with a wooden handle. The metal is slotted; for a $\frac{5}{8}$ in. heel the slot measures $\frac{3}{4}$ in. at the open end and $\frac{5}{8}$ in. at the closed.

The heel is built up, using a base lift with half-lifts, rand, or skeleton lift attached, and one or more lifts to make up approximately 15 irons; then, as many lifts of one size smaller are added to make up another 15, making 30 irons in all. Having assembled the lifts the height is tested by pressing them into the slot in the gauge; if the height is correct it should be just possible to force them through to the closed end; if too loose a fit, a stouter lift is substituted, if too tight a lighter one. It is always better to err on the tight side when building, as the heel compressor can take care of a little excess, but if the heel is built too low, it will be loose, finish badly, and will open up in wear.

As they are built, the heels are placed in trays and passed to the next operation, that of fastening the lifts together. One method is to place the lifts in a machine which holds them in a mould and drives three or more rivets of correct length through the centre and clenches them firmly together. The disadvantage of this method is that the rivets frequently turn when being driven through the lifts. If they do, then there is a chance that they may foul the heel pins when the heel is attached, causing broken drivers and a serious hold-up. Sometimes the pins are turned so that they are near the edge of the heel and in this position are liable to foul the knives in the heel trimmer. The preferable method is to hold the lifts together by hand and insert seven tacks on the wire-grip tacker (see p. 334). These should be equally spaced and should not be nearer the breast than $\frac{1}{2}$ in.; a little more is safer and there will be no danger of fouling the knife when the heel is breasted. When the heel is compressed the wire tacks clench on both sides, holding the lifts firmly together, and no trouble is ever experienced with broken drivers when the heel is attached, as the wire does not deflect the heel pins.

Compressing—After pinning, the heels are compressed. The compressing machine brings enormous pressure to bear on the heel from all directions, moulding it into shape and stamping the size and shape. The heel is placed in a mould fitted in the machine, a heel built with size 18 base and 17 top-lifts will be compressed into a 16 mould (*Note*: there is $\frac{1}{16}$ in. difference in width between one 'number' and the next). As the machine is put in motion, the sides of the mould

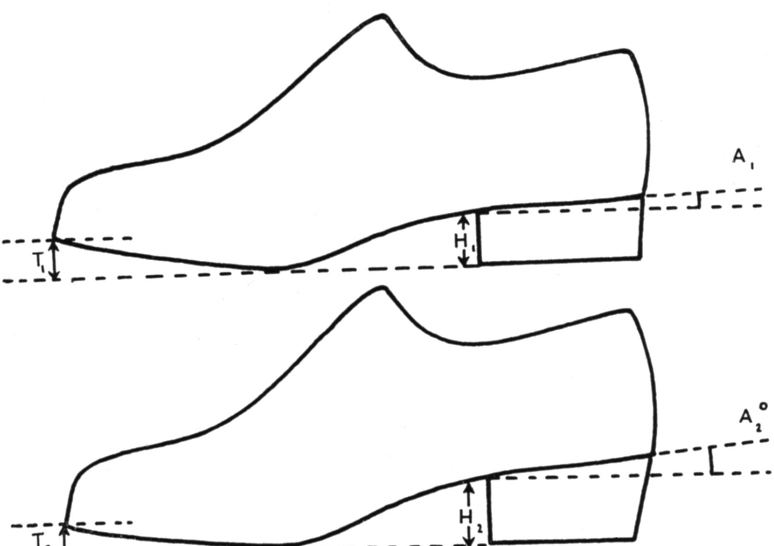


Figure 116. Increasing heel height H and angle of pitch A by reducing toe spring T.

close in, rising at the same time and pressing the heel against the follower which is fixed above and is stationary.

This follower is important, because its shape imparts the degree of pitch and coupling required and several variations of the same size of follower can be used to obtain different results. Figure 116 shows how, by reducing the toe spring the heel height and the angle of pitch are increased. To obtain the increased pitch the follower would need to be thicker at the breast, thereby compressing the heel lower at this point; to keep this a lift skived along the breast is built into the heel as there is a limit to the amount that can be obtained by compressing alone.

The amount of pressure brought to bear on the heel is regulated by adding or taking away compression plates. These plates which vary in substance from $\frac{1}{64}$ in. to $\frac{1}{2}$ in. are placed under the smooth top-plate and reduce or increase the distance between the top-plate and follower thereby raising or lowering the compression. The height of the heel can be varied by the use of these plates alone but it is not good practice as excessive pressure can stall or even break the machine and too little produces a poor heel.

Top-pieces are compressed in the same way, using a flat follower with a milled surface on which the size is cut, leaving a raised print on the flesh side. Heels for outside attaching are sent to the heeler with top-pieces unattached and are breasted after, but heels for inside attaching have the top-pieces attached by various kinds of slugging wires varying from fine round brass to steel wire having cross-sections that may be square, oblong, wedge, or round. These are driven in near the edge of the top-piece in a variety of patterns. Cutlan nails of different sizes are also used for heavy work. Care should be taken to see that they penetrate well into the heel or there will be a tendency for the top-pieces to lift; they should be near the edge to secure maximum wear, but not too near it or it will break away (see p. 389).

lt is an advantage to compress the heels again after slugging as this checks any tendency for the top-pieces to lift and makes a very solid heel. After this the front of the heel is trimmed on the breasting machine (see p. 392), and then scoured; that completes its preparation.

If a sheet rubber top-piece is used, this is first stuck on and then attached by small cutlan nails on the loose nailing machine (see p. 340). Moulded rubber top-pieces are attached on a similar machine by driving one large-headed nail at a time through the holes in the top-pieces.

Building Ladies' Heels

In building heels for ladies' work, much the same principle is followed. For a low-heeled walking shoe, the only difference is size, but, as the height is increased, more curvature is introduced. To build a typical $1\frac{1}{4}$ in. heel we use 6 gauges, or sizes, each of 9 irons, and a top-piece also of approximately 9 irons; this totals up to 54 irons in lifts, but this is reduced to 48 when compressed. 9 iron lifts, or any combination of lifts adding up to 9 irons may be used for each gauge; a little variation either way is permissible but must not be overdone or the contour of the heel will be spoilt.

After building, the heels are pinned with five l in. pins and then tightly compressed. The pins must be carefully spaced in such a way that they will not foul the other pins when the heel is attached, but at the same time must not be too near the centre or the lifts will be loose at the edges and finish badly. Many variations are possible on the machine used for this purpose, and the best should be decided on in co-operation with those responsible for heel attaching.

After compressing, the top-piece is attached, usually by fine pin wire, and the heel compressed again after removing the necessary compression plate to compensate for the added top-piece. This time it is compressed one size lower than before; this makes a very tight heel and removes all signs of steps caused by the different sizes of lifts. It is not often necessary to use a wedge lift in a $1\frac{1}{4}$ in. heel but if it is required it should be inserted in the second gauge from the base. As the heel height is increased, another wedge lift becomes necessary; these lifts are skived with a scarf of at least half the length of the heel and reduced to whatever substance is necessary to obtain the pitch required but it should not be below 3 irons.

After compressing, the heels are breasted; care should be taken to see that the cut is straight and at right-angles to the top-pieces. Trouble in this operation is usually the result of the knife being ground with a faulty bevel; a special grinding machine is made, and should be used, in which the knife is ground correctly. If possible the breast should be scoured before the heel is attached; not only is it easier and quicker to do so, but a much cleaner line at the heel base is obtained.

Fitting-up

To fit heels accurately to a wide variety of shapes and styles, it is necessary to make use of a chart on which all particulars are entered. In addition to height, pitch and coupling one must contend with variation of seat width in different lasts, the type of seat, which may be close, wheeled, extended, or stitched, and the fitting of such things as outside counters, all of which call for a variation in heel size. All heels should be tested when samples are produced and particulars entered ready for bulk work. A shape we will call X, size 7 men's, requires a close seat; this will need a heel size 16, but the same shoe with wheeled seat will require a heel size 19, and for an extended seat size 20, *etc*. One man, fully conversant with his job, does not need a chart, but the human body is not infallible and should this man fall ill, the chart will prove invaluable.

It follows that a large number of cubs are required for heel storage, and full allowance for this should be made when planning the layout of a department.

17

THE MANAGEMENT OF THE BOTTOM STOCK DEPARTMENT

DEPARTMENTAL LAY-OUT

In planning the lay-out of a department one must keep in mind the following essentials:

(1) There *must* be sufficient room for ample movement of operatives and materials.

(2) Work must flow through the department and under no circumstances should it have to move back for another operation.

(3) At each operation, or group of operations, there should be sufficient bench room to hold a reservoir of work (the larger the reserve the smoother the flow). This is necessary to counteract the effect of the many hold-ups that take place from time to time such as illness, accident, machine trouble, difficult work *etc*. If a half-day's work can be kept in reserve, one has a breathing space in which to overcome the difficulty, and so keep production moving. This is most essential when dealing with piece-work operations.

The lay-out of any department depends on the shape of the area available, but the principle now suggested can be applied to any shape. We will take for our example a department producing 7,000 to 8,000 pairs of men's and ladies' mixed work.

For this we will need a floor space of 3,600 sq. ft. This should be sufficient for all purposes including cub space for several days' completed work. An actual department measuring 120 ft. × 30 ft. is planned as follows:

A 4-ft. passage runs throughout the length of the department. This is one of the feed-ways from the warehouse to the presses which are so set out that leather is fed to them, and cut stuff taken away, without disturbing the operative (a good point when one considers the nature of the job). There is ample room near the presses for two racks and several baskets to receive cut stuff.

The presses are set out in pairs, back to back, the operators facing one another, and the feed-ways immediately behind. This saves space and makes for efficient lighting which, if fluorescent, has one tube between each pair of presses at buffer level, (this provides efficient back light for both machines with no shadow from the buffer and, being in a reflector trough, no eyestrain) and one tube per press immediately behind the operator's head; this provides all the light one could wish for, casts no shadows, and gives off no heat.

There is another feed-way behind the second row of presses, connected with the first by a passage which leads direct to the warehouse. Along the passage walls and behind the pressmen, are the cubs holding the press knives; they are therefore within easy reach of any one of them. .

After leaving the presses, the cut stuff must be weighed, so the scales must be in the most convenient position. These, if they are of the platform type, should be let into the floor, so that a rack full of soles can be weighed with little effort. The piece-sole and sole beveller is close by, and all soles and piece-soles are bevelled before grading, the soles passing to the first grader and the piece-soles to the second as do the lifts, which, when graded, are placed in the cubs ready for heel building. The piece-soles too, when graded, are placed in cubs in size and iron at the far end of the department near the making room. The soles after grading, move only a matter of feet to the sole sorter whose cubs are immediately behind him. The insoles when graded are placed on racks and pushed across to the surface scourer and from there to the sorter whose cubs are, again, behind him.

Opposite the end of the bench and close to the insole sorter is a ‘Summit’ Splitter; this he uses frequently to remove loose flesh from insoles, and is also used by the sole sorter.

The cubs holding the sorted material may be of any design to suit the type of work, but usually hold, in the case of insoles, a full range of sizes and three or four qualities. With soles one must have a full range of sizes and irons; the usual method is for sizes to run from left to right and irons from the bottom to top. These cubs extend over the full width of the department. Nearby is a cylinder knife skiver for skiving the middles and also half-lifts.

The fitting-up bench runs parallel with the sorting bench on the opposite side of the cubs, the sole fitter being opposite the sole sorter. By this arrangement there is no passing and re-passing in the cubs.

The soles being fitted-up to the ticket requirements pass to the sole-stamper, then to the waist-reducer and from there to large steel fixtures, each holding one day’s work; these are drawn from as required, clearing one day’s work at a time. The soles are solutioned, placed in racks and left one day to dry completely; then they are taken from the racks, placed together, and put into numbered cubs.

The insoles pass to the ‘Planet’ Rounder from the fitter-up (again with the minimum of movement), who places them on the top of cubs 3 ft. high and 15 in. wide which hold all rounding blocks and surround on three sides the two rounding machines; a considerable amount of work can be placed on these. After rounding, the insoles are placed on a bench across the passage, 3 ft. high and 3 ft. wide, into which the three channelling machines are fitted. These benches are extended on the left-hand side of each machine to reduce the distance of travel from bench to machine when operating, thus saving time. If driven by overhead shaft the bench will need to be slotted to receive the driving belts. The purpose of this large bench is to hold a reserve of work for each machine, one for men’s work, one for ladies' work and one for gemmed. The operator in each case has only to lean forward and he can draw any line of work to him without leaving the machine.

After channelling, the operator turns and places the work on a bench on which is placed the lip cutting and scoring machine; from here the work moves to the left to the machine which applies the latex to the insole lips. From here they are placed on a bench in 'toast' racks to dry, from which they are taken by the operator of the double-lip turning machine, who in turn places them on a mobile rack after completion. Between all these operations there is again the minimum of movement.

The work to be gemmed passes to the right after lip cutting and scoring and so round the opposite way to the same rack: when full, the rack is taken to the bench in the main passage where the insoles are examined, checked for size and number of pairs, then tied up and placed in cubs at the end of the department to await the uppers.

These cubs extend across the department, are ten in number and are numbered 0 to 9. All tickets ending in any one number are placed in the same cub; this greatly simplifies the finding of any one lot and saves much time, for instance, if a ticket number were 2678 then it would be placed in the cub marked 8 and so on. The same procedure is followed with the soles, which, when the solution is thoroughly dry, are placed in similar cubs.

In the heel building department, the builders sit at a bench, behind which are the cubs holding the full range of graded lifts. Gouged lifts, or those with half lifts or rands attached, are fed to the builder from the rand tacker in baskets. When built the heels are placed in trays and pass to the wire-grip tacker or heel pinning machine; after pinning, the heels are placed in baskets and the trays returned to the builders. From pinning the heels pass to the compressor, then those for inside attaching pass to the slugger to have the top-piece attached and from there to the breasting machine and so to the cubs. All these machines should be placed, so that work may pass easily from one to another in sequence, at the same time space must be provided for a reserve of work at each operation.

The cubs holding the heels and top-pieces should be placed in line with the department and will then be accessible to those filling them and to the fitter-up, whose bench should be placed across the department. Heels are fitted up in trays holding twelve or twenty-four pairs of heels and top-pieces, and are taken to the heeling department on a rack designed to carry eight trays, and are there placed in cubs numbered in the same manner as those for soles and insoles.

There the department ends; the lay-out described ensures that work does indeed *flow* and is not obstructed at any time; the result must be an increase in production. The lay-out can be adapted for overhead or independent drive of machines with very little modification.

GOOD PRESSMANSHIP

With leather at present day prices, a good pressman is a valuable asset. Every pound of scrap saved, every iron gained by intelligent cutting represents a considerable saving. The good pressman is usually of above average intelligence; he, like a chess or draughts player, must develop the ability to see several moves or cuts ahead. He must be a good judge of leather, have a good eye for substance, and above all keep a level surface to his press block. This last item will be dealt with first.

Very few pressmen acquire the knack of keeping a level block, though it is of the utmost importance that they do so. If the block is not level, whether it has a ridge down the centre, or along the front edge, or if the ends are high he cannot cut his material cleanly and evenly, a slope in any direction causing the knife to slide; the result is an undercut on one side and the reverse on the other. He will find some of his cut stuff returned by the sorter to be cut down and bits taken off here and there, all because his knife has moved at the moment of cutting as a result of an uneven cutting surface. The result is a loss all round—the firm's material, trouble in the making room with undercut soles, and his own time which affects *his* pocket. How then can he best keep a level block?

First of all, his knives must be all of the same height to maintain the same degree of penetration into the block. He must look after his knives to ensure a good cutting edge; at least three types of file should be kept handy, to touch up the edge when, as so often happens, it comes into contact with another knife, or part of machine.

Then the block itself. This should be kept bolted up as tight as possible, block dressing can be used to reduce the amount of dust but the writer prefers not to use it as it loosens the surface.

The method of cutting described below reduces wear to a minimum and makes little dust; by adopting it, the same block (a BUSMC fibre block) has been used five and a half days per week for a period of eight years before being discarded.

The block must be securely bolted to the bed and pushed as far back as it will go, as this makes it easier to cut on the front edge and brings the knives more under the centre of the upper beam. When cutting, work over a width of 8 to 9 in. of the full width (14 in.); this will bring the knives a little over the centre and leave a rather narrow cutting surface when the block is turned; this soon becomes level and, providing the block is turned in time (once a fortnight is enough), will cause no inconvenience and will avoid the centre ridge. When cutting up and down, try to move about the block as much as possible; cut one row near the front, the next one 1 in. or so back and so on and work over the whole area. If there are any signs of a ridge forming along the front, remove it with the BUSMC Block Plane, an old Fortuna skiving knife, or a wood rasp. Do not let it develop.

Now for the ends of the block. These should be used for the cutting of all small stuff; only insoles, soles, *etc*., should be cut in the centre and it should be a golden rule never to use the centre if the end will do.

Grade the knives in sizes, insole or sole in the centre then middles, men's lifts, ladies' lifts, half-lifts, *etc*., so that the small knives are all at one end. After cutting the prime material with the large knives move along, taking the material to the next knife and so on, until the smallest knife is used on the end of the block.

This method has advantages other than the keeping of a level block; it makes for speed. The operator has no need to look for any particular knife, it will always be in the same spot, he can pick it up without looking down and in the meantime he is able to concentrate on his leather and decide what cuts to make. The saving in time is surprising, and of course results in increased production, and benefits the cutter financially.

In time it will be found that the end in use is wearing low, and the knives are not cutting clear; now transfer all knives to the other end in the reverse order and work until that, too, is down to the same level, then raise the bed. The usual method of raising the block is by revolving the adjustable wheel one half-turn; this is too much, and causes too deep a penetration into the block which breaks up the surface and causes considerable block wear, and, of course, dust. If a piece of strong cord is tied securely to the side of the press and from there to one of the spokes of the adjusting wheel it will be found possible to raise the bed by one-sixth of a revolution instead of a half; this is enough to obtain a clean cut without disturbing the surface block. The advantages are obvious—little wear, next to no dust from the block, and very little strain on the machine; consequently, mechanical failures are almost unknown.

Safety First

The press is considered to be the most dangerous machine in the trade. Admittedly, the element of danger is always present but the majority of accidents are the result of carelessness, lack of proper training, or neglect of the machine.

A good pressman rarely has an accident, and here are a few rules that he always obeys:

(l) Never pick up a knife by placing the hand over the top.

(2) Always pick up with the same grip as when cutting; if too heavy use both hands.

(3) The same rule applies to removing the knife after cutting. As the foot is placed on the pedal to make the cut the second and third and fourth fingers should be raised clear of the knife in a horizontal position, at the same time pressing down firmly with the thumb and first finger of both hands, then even if the press repeats, or the knife tips, the hands are out of harm's way. It is often necessary to feel around the lower edge of the knife with the fourth fingers, and many

a finger has been lost when doing so but, if the above practice is observed and persevered with, it becomes a habit and involves no loss of time or efficiency, and reduces risk to a minimum.

(4) Never tip a knife. Always keep it level when placing under the beam, or taking away.

(5) Always raise the safety catch when not using the machine or when making an adjustment.

(6) Keep the press clean, and oil regularly, but not excessively.

(7) Every week, examine the plunger that returns the trip to its position after every revolution; if the spring appears to be at all weak remove plunger and examine spring for possible breakage; most repeats are caused by the failure of this spring.

Press Knives

Many attempts have been made to reduce the danger of press cutting. Press knives are made in various forms, but probably the best and safest knife to handle is that with four or five horizontal corrugations into which the fingers and thumbs fit naturally. This knife is popular with pressmen because it is easy to grip and there is no danger of the fingers sliding up or down as the surface wears smooth, after constant use. Other styles have thick leather or rubber bands around the top edge of the knife; others have a wide fiat band of rubber projecting 1 in. or more over the fingers but these are clumsy to handle and are not popular owing to the rubber getting in the path of any projecting piece of leather, and they take up too much room on the knife tray in front of the press.

PART VI

MAKING

W. MOORE

Chapter 18 by G. Lewin

Chapter 19 by F. Bending

METHODS OF CONSTRUCTION

Chart showing sequence of operations of lasting and making for welted, staple welted, screwed and stitched, McKay sewn and cemented footwear.

WELTED

Insole attaching
Insole heel seat bevelling
Back tacking
Pulling over
Side lasting
Bed lasting
Seat lasting
Upper trimming
Welt sewing
Tack pulling
Inseam trimming

Welt beating
Tack pulling
Welt butting
Bottom filling and shanking
Wire tacking
Bottom solutioning
Sole laying
Rounding and channeling
Channel opening
Sole stitching
Seat nailing
Seat rounding
Channel closing
Stitch separating
Welt wheeling
Sole levelling
Heel attaching
Slugging

STAPLE WELTED

MACHINE SEWN

Insole attaching
Insole heel seat bevelling
Back tacking
Pulling over
'Consol' lasting
Seat lasting
Pounding

Bottom filling and shanking

SCREWED and STITCHED

Mid-sole attaching
Last removing
Loose nailing
Sole levelling
Sole attaching
Sole stitching
Piece-sole attaching
Screwing
Seat rounding
Stitch separating
Sole levelling (off last)
Heel attaching (off last)

Temporary sole attaching
Last removing
Sole sewing
Channel closing

BUILT HEELS

Seat nailing
Sole levelling
Heel attaching

CEMENTED

Upper roughing
Bottom filling and shanking
Sole attaching (cement)
Last removing

WOOD HEELS

Seat fitting
Heel attaching

FITTED HEELS

Top-piece attaching
Top-piece trimming

LOUIS HEELS

Joint rasping
Breast roughing
Flap solutioning
Flap closing
Top-piece attaching
Top-piece trimming
Side trimming

18

HAND LASTING

IN GENERAL, LASTING MACHINERY as described in subsequent chapters of this section has attempted to reproduce hand methods and the various hand pincer twists and pulls have been copied in the machines. This tendency is gradually disappearing with the advent of automatic machinery and heat-shrinkage methods of leather moulding for some of the newer types of construction such as the slip-lasted method. Hand lasting still survives, however, and merits study both in its own right and because it is the foundation of machine methods; for surgical and bespoke work it is still the normal method since each shoe can receive the individual special treatment not possible by machine.

Preparation

The first stage in hand lasting is preparation of the component parts. The insoles for machine and handsewn attachments are prepared quite differently; the former have already been described in Part V (p. 226) and the latter will be dealt with in the next chapter (p. 260). These differences do not affect the hand laster, however, as he is concerned with the manipulation of the upper and merely uses the insole of whatever type as a base to which to secure the upper after he has moulded it into the required shape.

The first operation is tying-over, or temporarily lacing the tabs. This must be done correctly or it will have a detrimental effect on the completed shoe. If the lacing is too loose it will cause the vamp line to be lasted away in the waist, the bottom of the tabs will fall below the instep point making the shoe smaller in fitting and the back of the shoe will sink lower than is intended by the designer because resistance is taken away from the instep.

If on the other hand the tying-over is too tight then the reverse effects will take place. It is generally recommended that for Oxford shoes a $\frac{1}{8}$ in. space should be left between the tabs and the knot tied securely. This will allow the wearer eventually to lace tight over the instep and obtain a good fit round the ankle.

It must be pointed out, however, that with bespoke work the tying-over will vary according to the foot measurements.

When using uppers with open tabs and a blocked front, such as a Derby boot, it is usual to tie-over to the fourth eyelet up from the bottom. If the front is not blocked it is advisable to leave the bottom eyelets unlaced and then lace up three. This will allow the laster to clear the vamp in the drafting operation: unblocked fronts have a tendency to wrinkle between the tabs if the bottom eyelets are tied-over.

The next operation is *stiffener insertion*. For hand lasting it is best to use leather stiffeners and their preparation will be governed by the type of shoe being made. For ‘sewn seats’ (see p. 266), a $\frac{5}{8}$ in. skive is given to the curved top line of the stiffener only; for tacked seats, the $\frac{5}{8}$ in. skive is put all round.

The stiffener should come behind the breast of the heel to give solidity to that part of the shoe during wear. The skive (or ‘scarf’) should end in a fine edge so that the stiffener is not visible in the finished shoe. The stiffener is pasted and inserted between the quarter lining and the upper to a position $\frac{1}{16}$ in. below the edge of the upper (which is upside-down). The linings are then cleared of any wrinkles and sprinkled with French chalk to allow easy exit of the last later on.

The *toe-puff* is then prepared and inserted. For handsewn work, a leather toe-puff is normal and this is skived all round.

Drafting

The insole, either for hand or machine work, being in position on the last, the next stage in hand lasting is known as *drafting*.
This means taking the initial stretch out of the upper and giving it the approximate shape of the last in preparation for the actual lasting itself. Drafting is done with a series of pulls taken with the hand pincers in different directions according to the shape of the last in such a way that uniform tension is set up and the moulding is balanced so that when the shoe is eventually slipped from the last it will retain during its life the shape which has been given to it.

Drafting the upper on to the last by hand, therefore, is a very important operation. The ‘hoisted method’ is used; the prepared upper is placed loosely over the last and then both are turned upside down and the last is placed in position on the peg of a lasting stand or ‘jack’. The upper is then adjusted so that bottom edge of the back is $\frac{3}{4}$ in. below the seat of the last.

(Note: Some confusion of terms arises here as the upper and last are both upside down; the term ‘bottom edge’, however, means the bottom edge of the upper as it appears in the actual shoe, right way up.)

The strains are then taken with the lasting pincers in the order shown in Figure 117, beginning at the toe end.

Taking the outside, lining and toe-puff in the pincers the three are pulled over together $\frac{1}{2}$ in. beyond the edge of the insole (this amount varies according to the type of work). A lasting rivet is then driven through the lasted margin into the feather or shoulder of the insole. This pull is usually called the longitudinal strain as it sets up tension from heel to toe.

The upper is then held in a central position to bring the toe-cap and throat of the vamp in the correct place and the next strain is taken on the inside of the cap line (2, Figure 117). This is followed by 3 on the outside of the cap line.

It is now necessary to take the shoe from the last jack and turn it over to see if the cap line is straight. If it is not it is usually a simple matter to adjust it. The upper now being in the correct position with the cap line straight and securely fixed at the front, the back is hoisted or pulled up and over the seat of the last.

If sewn seats are specified a rivet is driven into the upper (outside), stiffener, lining and feather of the insole. It is not driven right home as it

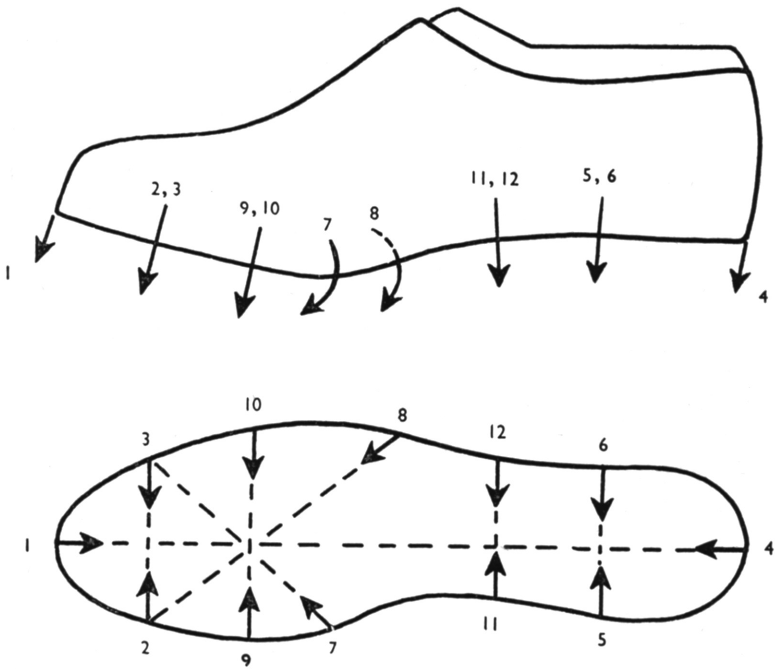


Figure 117. Direction and order of hand drafting strains.

will have to be taken out after sewing. If, on the other hand, the shoe is to have a tacked seat, a tack is driven right through to clench on the insole.

This strain increases the longitudinal tension set up by the first pull because the last has been forced into the upper by a wedge action.

The next strain, 5, is taken at the corner of the seat, again on the insole, and a rivet is driven in. This is followed by 6, at the opposite corner. Care should be taken at these places to clear the linings and pull the stiffeners into position and secure them, otherwise the linings will be loose at the heel and a bulging seat will be formed.

The next strains are taken, 7 just below the inside joint pulling the upper towards 3, and 8 just below the outside joint pulling towards 2. The straining forward takes surplus material away from the waist.

To ensure that the vamps are tight down to the last, pull 9 is now taken on the inside midway between 2 and 7, and then 10 at the corresponding position on the outside. These strains are not always taken but it is considered that they are very important as they produce a much better lasted upper and reduce the amount of tension required later during side-lasting.

Finally, strains 11 and 12 are taken at the inside and outside of the waist respectively, being careful not to disturb what is usually called the 'top-line' of the upper—the tops of the quarters.

The drafting now being completed it is advisable to examine the shoe for any faults. The cap should be straight, the upper tight on to the last, the linings clear, the back-seam central and straight, the top line tight and the gap between the tabs in line with the centre of the toe.

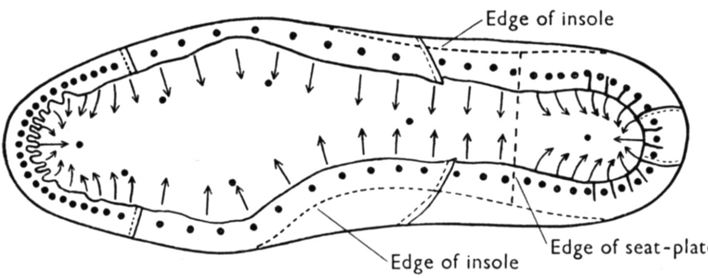


Figure 118. Directions of strains in hand lasting.

Lasting (for Welted Work)

Now follows the actual lasting of the upper. It is best to commence at the inside waist and in order to give the very strong pull required at this point it is advisable to use the tool known as a 'waist drag', the upper being levered into position before the securing rivet is driven in. Continuing with the inside waist a series of pulls is taken at about $\frac{1}{2}$ in. intervals, rivets being inserted for each.

Next the outside waist is lasted but without the 'waist drag' as there is less curvature on the last.

The forepart (excluding the toe) is now lasted, first the inside and then the outside. The tension used in these strains should be just sufficient to make the upper fit tightly to the last without disturbing the lines of the pattern. Then follows lasting of the seat, again without too much straining. The upper here is taken in the pincers and twisted towards the back as shown in Figure 118, held over the insole with the thumb and tacked down. The tacks should be driven through outside, stiffener and lining to ensure a sound seat; they should be approximately $\frac{3}{8}$ in. from the feather of the insole to allow room for the piece-sole rivets which will be inserted later. Care should be taken to tighten the corners of the seat to prevent what is termed ‘fish-tailing’.

The toe is the most difficult part of the shoe to last because of the sharper curves and the excess of material to be cleared. Starting from the end of the toe and working round to the cap line, first the inside and then the outside, the upper is gripped with the pincers, pulled and twisted into small pleats and secured by rivets driven through into the shoulder of the insole (Figure 118).

All the side strains are turned towards the toe end.

Having now completed the lasting, a beater or ‘jigger’ is used to beat the shoulder just below the rivets so as to give the hand welt sewer a distinct feather line on which to work. The upper is then trimmed off almost level with the rivets and the shoe is ready for the sewer.

19

HAND WELTING

THE CAREFUL SELECTION OF materials for a handsewn shoe is a very important contributory factor to the ultimate comfort, flexibility and durability of this type of footwear. Oak-bark tanned leather is still preferred by the handsewn maker but, as already described in Part V, a factory including handsewn shoes in its production may require other tannages to be used for such work.

Preparation of Bottom Leather

The various bottoming sections may be cut as already described, but the handsewn man will undoubtedly prefer to do the whole of his own cutting and preparation so that he can select every section and give it the individual attention which a handsewn shoe merits.

The tempering of the sections is extremely important for this work as the hand sewer can only produce the best results if his materials are in the correct condition. The wetting is best carried out in a wooden bowl or an earthenware bowl or sink and not in an iron bucket which may produce black iron stains. In any case it is advisable to cover the vessel to prevent rivets dropping in and again producing stains where they touch the leather. Iron stains are extremely difficult to remove and it is impossible to get a good finish on the bottom or keep the insoles white unless special care is taken. After a period of an hour or two according to the substance and quality of the materials, the insoles, stiifeners, lifts and toe-puffs may be removed from the water. The insoles should be drained toe downwards so that any stain left at the toe will be trimmed out in the rounding operation or hidden by the toe of the shoe when finished.

Soles are removed from the water after a longer period again depending on the substance and firmness of the leather. They should be drained with the seat downwards so that any residual stain will be covered by the heel.

After the sections have been well drained they are wrapped in a piece of cloth or sacking to mellow for several hours and are then ready for use.

Blocking Insoles

The insole used by the handsewn maker is prepared in quite a different way from that intended for machine work and described on pp. 226-33. A rectangular piece of leather (shoulder) large enough to cover the bottom of the last is mellowed and placed on a skiving board—a piece of wood about 18 in. × 6 in. × $\frac{1}{2}$ in.; the grain is then taken off with a buff-knife. This is simply a steel blade 4 in. × 2 in. with one of the longer edges sharpened and then blunted with an old sewing awl. The insole is then dusted well on the grain side with French chalk to keep it clean.

It is now placed on the bottom of the last, grain side to the wood and the blocking is commenced, fine 1 in. rivets being used to secure the leather to the last. Three rivets are first driven into the side of the seat, at positions A, B and C in Figure 119. These stop the insole shifting from side to side. They are followed by rivets 1 to 9 as shown. 1 and 2 are inserted in the last wall at the inside and outside front of heel, 3 at the centre of the inside waist and 4 at the centre of the outside waist. 5 is at the top of the inside waist, 6 at the outside joint, 7 at the middle of the inside forepart and 8 at the corresponding position on the outside. The final one is 9 which is inserted about $\frac{1}{2}$ in. from the end of the toe. With the exception of this

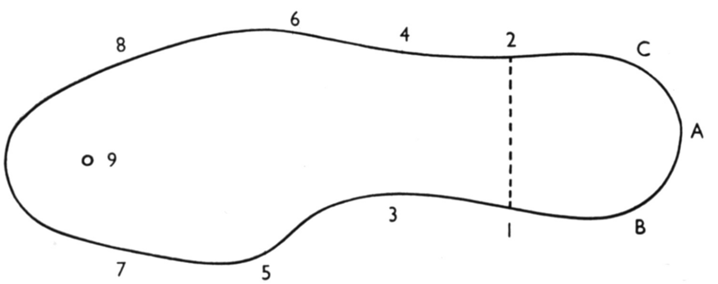


Figure 119. Positions of rivets for blocked insole. All except 9 are driven into the wall of the last.

final one, all rivets are driven into the wall of the last just above the feather (or bottom) edge. Rivet 9 is driven into the bottom to prevent damage to the toe of the last and a piece of leather is held under the hammer of the pincers to prevent damage to the sides of the last.

The directions of the strains on the insole in order to block it must be towards the toe for 9 and transverse for 1 to 8. The tension at 3, 5 and 7 must be greater than at the other positions in order to get the leather down into the arched waist of the last.

Rounding and Feathering

After the blocked insole has dried out it is ready for rounding. Five rivets are put in a straight line down the centre from heel to toe and equally spaced. The top third of each rivet is bent over towards the toe to keep the insole flat to the last.

The blocking rivets are then removed and holding the last in the left hand with the insole downwards, a sharp knife is used to trim the leather with clean sweeping cuts to the shape of the last bottom, remembering that different types of footwear require different lengths of heel, waist or forepart. For example, a man's dress shoe has a shorter and lower heel and a walking shoe a higher and longer one.

After the insole has been rounded as required, the next operation is to mark the lengths of heel, waist and forepart. For an ordinary walking shoe, the heel is marked at a quarter of the length of the bottom (see Figure 120) and is followed by a mark about $\frac{1}{8}$ in. all round the seat. The edge mark is continued slightly further in, about $\frac{3}{16}$ in., up the inside waist to the toe. Round the toe it is still further in, about $\frac{1}{4}$ in., to allow for the thickness of the toe-puff and then continued at $\frac{3}{16}$ in. to the outside joint. At the outside joint, the width is reduced to $\frac{1}{8}$ in. so as to make the welt wider at that point, and from the outside joint down the waist to the front of the heel it is $\frac{3}{16}$ in. If the waist is to be bevelled the distance is $\frac{1}{4}$ in. This outside line is called the *outside feather*.

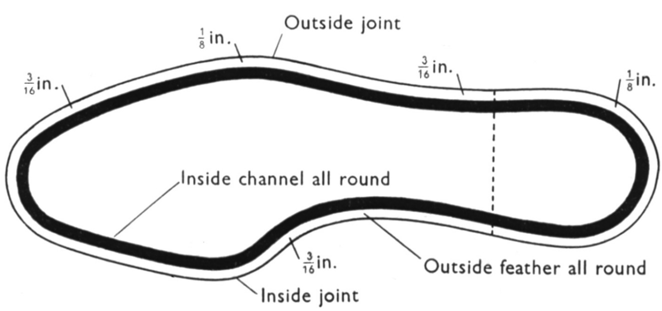


Figure 120. Insole, showing position of heel ($\frac{1}{4}$ *SL* from seat). The portion shaded black is the holdfast which is $\frac{3}{16}$ in. wide all round.

A further mark is now made $\frac{3}{16}$ in. in from the first one and carried all the way round the insole. This is called the *inside feather* and the space between the two lines is known as the *holdfast*.

A sharp pointed knife is then held between the thumb and fingers like a pencil and a cut is made on the outside and feather marks, the depth of the cuts being about one—third of the thickness (substance) of the leather and slanting outwards.

The bottom of the insole is then wetted and the cuts are opened out into channels as shown in Figure 121*a*.

A steel feather 'plough' is now used to cut away the inside and outside feathers by a pushing action and leaves the insole as shown in Figure 121*b*. Approximately one-third of the substance is taken away in this operation leaving the 'holdfast' standing above the general level as shown.

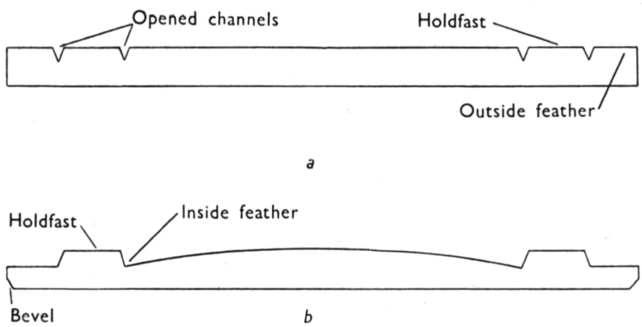


Figure 121. Cross-sections of insole: *a* showing channels opened after cutting; *b* after ploughing. The bevel is cut to prevent curling.

Holing

The next operation is to hole the insole with a sewing awl; this has a curved blade about $3\frac{1}{2}$ to 4 in. long and well sharpened at the tip but not at the sides. If this were not so the holes would be too large for the thread and the shoe would lose some of its watertight character.

In holing or piercing the holdfast of the insole, the awl is held in the right hand and the point is put into the bottom of the inside channel of the holdfast. The right elbow is then lifted and the awl is pushed through the holdfast into the outside feather in a half-circle or swing-boat motion. The hole so made is oval in cross-section. It is usual to make three per inch for a sewn seat and four per inch for the welt sewing in the case of men's work; ladies' shoes may have five or six per inch according to the type.

Figure 122 shows the directions of the holes, these varying at different points on the insole.

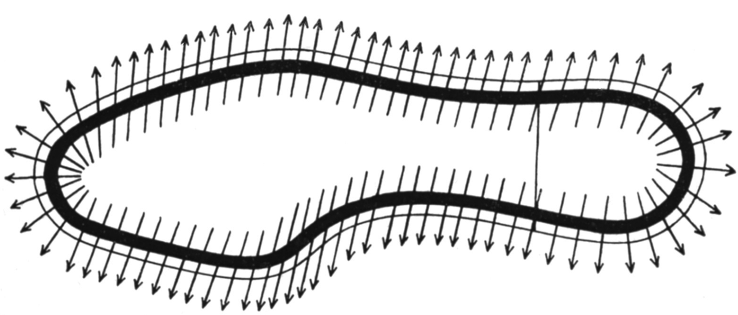


Figure 122. Directions of holes made by awl.

When the insoles have been holed the point of a sharp knife is used to remove the sharp upstanding edge of the grain side of the insole. Some handsewn makers do this immediately after rounding; this does not matter as long as it is done before lasting. It occurs when the insole is being rounded in a mellow condition and must be removed as when it dries it turns in at the edge and will hurt the bottom of the foot in wear.

Next follow the preparation of the toe-puff and stiffener and their insertion in the upper prior to lasting. These operations and also the lasting itself have been described in detail in Chapter 18 and so are not dealt with further here. It should be emphasised, however, that in some bespoke and surgical shoemaking one has often to depart from the orthodox order of drafting strains as the shoes may be of an entirely different shape from the normal.

Making the Thread

In making the thread for welt-sewing, the main point to be considered is the weight of the boot or shoe to be sewn. For example, a heavy shooting boot with a 24 iron edge would require a thread consisting of about fourteen strands of no. 15 hemp, whereas for a shoe with a 15 iron edge a nine or ten-cord thread would be sufficient. In every case each hole must be completely filled with thread to ensure watertightness.

The hemp should be kept in a small round tin large enough to take a 4 oz. ball and with a small hole in the centre of the lid through which the hemp can pass. The lid keeps the hemp clean and also helps to preserve it by keeping away the air.

A welt·sewing thread when complete is about 11 ft. long. It is prepared by ‘casting’ in the following manner. The hemp in its tin is placed on the floor on the right with the end of the ball coming through the hole. This taken by the left hand, led over the right knee and the first point is made by rolling the right hand along the right knee away from the body with 5 to 6 in. of the hemp between the two hands. This will cause it to unravel and break leaving a fine point.

About 9 ft. of hemp is now pulled out of the tin with the left hand letting it slip through the right, then it is grasped by the left hand about 7 in. from the right and is again rolled and broken with the palm of the right hand as before.

To make up a thread of the required number of strands (or cords), the operation is repeated, each successive strand being broken off $\frac{1}{2}$ to 1 in. shorter or longer than the one before.

Next follows the *waxing*, the wax being either black or brown and made by heating together pitch, Russian fat and resin. During the summer more resin is put in while in the colder weather extra fat keeps the mixture pliable. It is essential to use a good wax as it fulfils several purposes, *e.g*. it keeps the strands together, reduces friction and consequently fraying during sewing, ensures that the holes are completely filled and gives a positive adhesion between thread and leather even after the loops may have worn away.

The wax is applied as follows. The thread, consisting of the separate strands placed together, is twisted round the left hand about 3 ft. from the right end so as to get a firm grip; the wax is taken in the right hand and rubbed into the strands close up to the left hand and then pulled along firmly to the point. All the strands should be waxed as evenly as possible and after the first section is done the long portion remaining in the left hand should be treated similarly.

The thread is next *twiste*d by taking the middle of it round a nail driven into a bench or a hook placed to the left of the sewer. One of the points, usually the one furthest away, is then rolled on the right knee with the palm of the right hand while the left hand supports the two halves of the thread and prevents their untwisting again. A similar operation is then carried out on the other point (nearer the sewer). A piece of upper leather is rubbed up and down the thread to smooth it, it is removed from the supporting nail and the portion which had passed round this support is also twisted.

After twisting, the thread is again well waxed and is then ready for the bristles to be put on. The bristles that have been used for centuries come from the wild boar but today, nylon ones are becoming increasingly popular. To attach the bristle, the point of the thread is taken between the left finger and thumb while the bristle, waxed to within 2 in. of the thick end, is taken between the right finger and thumb. The fine end of the thread is put on the waxed portion of bristle and the two are rolled or twisted away from the person spreading the thread finely down and round the bristle until about $\frac{1}{2}$ in. away from the end. Then, with a fine round awl a hole is pierced through the thread itself about l in. from the tail end of the bristle and the bristle itself is threaded through this and the whole is straightened out. The end of the bristle is now sharpened into a point by gently rubbing it with emery paper and after another bristle has been attached in a similar way at the other end, the thread is ready for use.

Sewing in the Welt

The size of sewing awl is very important; the thickness of its blade must be less than that of the thread, and it must be curved to pass through the holdfast at seat and toe as a straight awl gives wide seams. The shoe is held between the knees with a *stirrup*, an endless leather belt about l in. wide which passes over the shoe and under the left foot; a *hand-leather* or old glove with the fingers removed is worn on the left hand to protect it.

The bristle is taken in the left fingers and the awl in the right and a hole is made through the holdfast from the inside to the outside at the left front corner of the seat (*note*: seats are always sewn in first) so that the point of the awl protrudes about $\frac{1}{8}$ to $\frac{1}{4}$ in. As the awl is withdrawn its point is followed through the holdfast by the bristle and thread. The two ends of the thread are then placed together and the thread pulled through until there is an equal amount on either side of the holdfast.

The left thumb is now kept pressed against the upper to prevent its being pushed away from the last and the awl is passed through the second hole and upper as before. Again it is followed back by the bristle and thread entering from the left and then the right bristle is inserted from the right-hand side. To make a lock, the thread is ‘overcast’ by taking the thread from the last stitch over the bristle that is coming out on the outside of the upper. The two ends are then pulled evenly across the body and as tightly as possible with a little more pressure on the right than on the left. This process is then continued round the seat, there being about three stitches per inch

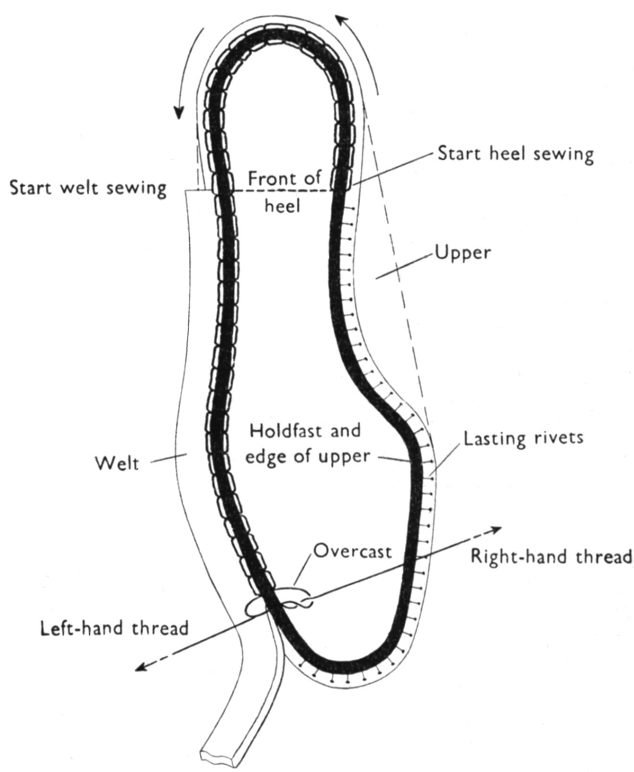


Figure 123. Sewing in the welt. The portion shaded black consists of the holdfast and the edge of the upper.

When going round the back of the seat the stirrup should be between the legs with the heel end of the shoe resting on the left knee. The heel is then gradually turned away from the person as sewing continues. Lasting tacks should be removed about $\frac{1}{2}$ in. before they are reached.

The reason for overcasting on the outside in sewn seats is to prevent the thread from being pulled through the upper; in addition the stitch should lie on the outside to enable the heel awl to pick it up when the heel is sewn on.

Now comes the most important operation of all—that of sewing in the welt itself (Figure 123). The tempered welt should first be bevelled at an angle of 45°; this is done by putting the welt flesh side downwards on a skiving board across the knees and pulling it with the left hand past the knife held in the right hand and with the right forefinger acting as a guide. The end of the welt is then skived to a width of $\frac{3}{8}$ in.

The shoe is now positioned on the knees, toe towards the sewer and the stirrup over the heel, each side of the left leg and under the left foot. The welt is then placed with its bevelled edge close to the feather edge of the lasted upper and the first hole is made next to the last seat stitch on the left-hand side of the shoe, the awl passing through the holdfast, upper and bevel of welt. It is essential to hold the welt close to the upper with the left thumb and fingers while the awl is being passed through, otherwise it is pushed away rather than pierced.

The left bristle is then put through the hole following the awl as this is withdrawn and then the right bristle from the opposite direction nearer to the sewer. The stitch is 'overcast' (see below) and tightened by pulling on the threads, using hand-leather and awl haft to get more pressure, and pulling more on the right thread so as to keep the welt and upper tight to the holdfast. This stitch must come over the end of the welt skive.

Sewing then continues round the shoe, the welt being continually pulled between the left thumb and forefinger so as to prevent looseness showing after sewing. Four stitches per inch is usual and each one is 'overcast' on the inside of the holdfast, the method of doing this varying with the locality. One method of making this 'overcast' is as follows: when the right·hand bristle has been passed through the hole from the right it is transferred to the left hand and passed under the inside loop of thread (lying on the insole) and up through it making an ordinary overhand knot. The two ends of thread are then pulled tight as described.

In the case of a bevel waist, the welt is sewn in flat in the waist with the welt skived to half substance on the grain side; when the joints are reached sewing continues in the normal way.

It will be seen from the above description that welt sewing is continued towards the operator; this means that the stirrup is altered from time to time and when the toe is reached the shoe is gradually turned away so that in the end the seat is in the same position as it was when seat-sewing commenced, *i.e.* nearest the sewer.

When the last stitch has been made the five insole rivets are taken out and the welt is tapped into the feather with a small hammer. The welt and seam are then trimmed all round flat to the seam with a sharp knife. Then the welt is smoothed out flat from the shoe and beaten; this is done by using a ‘welt beater’—a piece of iron with $\frac{1}{2}$ in. turned over at right-angles—which is held in the left hand and pressed into the feather under the welt so as to act as a small table on to which the welt and seam can be beaten with a hammer in the right hand.

Sole Attaching

The welt is now trimmed to the required finished shape and then the cavity in the forepart and waist is filled with coarse tarred felt sold for the purpose. The piece to be inserted must be skived round the edge to the level of the welt seam. It should be left fairly flat in the forepart but may be rounded in the waist. (A shank is not normally put into a handsewn shoe; the curvature of the waist of the sole is sufficient.)

The tempered full-length sole is now prepared for attaching by first skiving out the waist on the flesh side, the amount removed depending on the type of shoe. Then a slight depression is cut in the flesh at the seat so as to fit snugly over the seat of the lasted shoe; the link stitches round the seat should just be visible so that they can easily be picked up when the heel is sewn on. If a three-quarter length sole is used, then the piece-sole must be treated in the same way.

The sole is now stuck on the bottom of the shoe with rubber solution and it is trimmed to within $\frac{1}{32}$ in. of the welt, this working allowance being necessary since in channel closing and bottom levelling the edges tend to be pushed in. Then follows *channelling* which is done by putting the point of the knife into the grain of the leather $\frac{1}{16}$ in. away from the sole edge and then pushing it at an angle of 45° into the leather towards the centre of the sole to a depth of one-third of the substance (thickness) of the sole; holding the shoe with the toe towards the operator the knife is pulled from its starting point on the right-hand side just beyond the eventual position of the heel front, and as the cutting continues right round to the other side, the shoe is slowly turned. lt is important that the channelling should be continuous and that the knife should not be taken out until it is complete so that a double cut is avoided.

The channel is then opened by a piece of bone or metal, spear pointed, and the sole is stitched on. Here a square-sectioned awl is used instead of the oval type used for welt sewing so that more stitches per inch are possible; otherwise the operation is similar. The ‘overcast’ is made in the channel. For a man’s l2 iron edge shoe, about twelve stitches per inch is suitable.

After stitching, the stitches themselves in the channel are rubbed level with a piece of bone, the channel is solutioned and closed and the bottom is levelled by hammering with a double-faced hammer.

Heel Attaching

First the sole seat is bevelled at 45° thus leaving it wider on the flesh side (next to the shoe) than on the grain. The grain is then roughened to a width of $\frac{5}{8}$ in. round the edge to receive the split-lift which is a wedge of leather shaped like a horseshoe $\frac{5}{8}$ in wide, $\frac{1}{8}$ in. thick round the outside edge and skived to a knife-edge on the inside edge; the purpose of this is to level the seat ready for the heel since the centre of the seat is raised. Adhesive is applied to the seat and the split-lift attached with a few short tacks. The top is then levelled, adhesive applied, and the first lift put on, this again being attached with a few tacks. A channel is then cut round this lift near the outside edge ready to receive the heel stitches.

A ten-cord thread about 9 ft. long is prepared as before and then the shoe is placed on its side under the stirrup on the left knee, toe pointing to the front and sole turned to the left. The heel awl is lubricated with soap or beeswax and then pushed with the right hand (forefinger on blade to steady it) under the first link-stitch, through the sole and split-lift and into the channel of the lift. As it is withdrawn it is followed by the bristle and the thread, again under the link-stitch, and is then pulled through and divided equally between the two sides by putting the two bristles together. Sewing then continues in exactly the same manner as for the welt, each stitch being overcast on the left-hand side. As before the right thread is pulled harder and the number of stitches will, of course, be the same as the number of link-stitches since one of these is taken into each heel-stitch.

After sewing all round, the channel is closed and the marks left by the awl on the seat of the upper round the sides are rubbed out with a bone. The edge of the sole next to the upper at the seat is beaten down (or ‘peened’) with a small hammer so as to cover up the link-stitches.

The top of the lift is then roughened with a rasp, an adhesive applied and the next lift put on and attached with $\frac{3}{4}$ in. nails. If the height is sufficient the top—piece is then fitted or it may be necessary to use more lifts according to requirements.

The seat line is now marked by drawing a stitching awl point round the side of the heel, thumb and finger resting on the top-piece, and the material below this line is cut away. Finally the seat of the heel close to the upper is closed with a ‘seat breaker’, an iron with a curved milled face and having a lip which follows the edge of the seat.

20

MACHINE LASTING FOR WELTED WORK

Insole Tacking

The insole is attached to the last using an insole tacking machine, or by hand; it is usual to insert the tacks commencing at the toe (Figure 124). If the insole has been accurately rounded it should be possible for the operator to locate the insole accurately on the last in the forepart and waist; the seat of an insole is cut fairly full chiefly to account for any variation in the bottom of the last. It is very desirable to specify the number of tacks as this enables the operator removing them to account for a precise number at a given place; these tacks should be as close as possible to the edge of the full substance left in the middle of the insole. The machines used are the ordinary single-tack machines such as the BUSMC No. 3 Insole Tacker or the Standard Engineering Co. Twin Raceway Machine Model 230.

The stapler is undesirable for this operation as it causes undue wear on the lasts with its double point. The tacks used are $\frac{7}{16}$ in. square shank machine tacks. Figure 125 shows the cross-section after insole tacking.

Insole Seat Rounding and Bevelling

This operation removes the fullness at the insole seat by trimming the insole level with the last so as to follow the curve of the seat. As each insole is 'fitted' in this way to its individual last it ensures the fitting of the stiffener to the back curve of the last. Such an operation is important to subsequent stages as it enables accurate piece-sole riveting on the extreme edge of the insole thus eliminating the opening of seats after heeling.

PREPARING THE UPPER FOR THE LAST

At this stage, having the insole and last ready, the upper must be prepared to meet them.

Stiffeners and their Insertion

Stiffeners are usually made of fibre-board already skived at the edges and moulded to the shape of the last they are designed to fit. It is a good idea as far as possible to standardise seats so that one or two moulds cater for a number of lasts; it is not possible to standardise the outside shape as this will vary with the type of upper. The action of moulding not only shapes the stiffener, but also compresses the board itself so that it is hardest where the stiffening effect is

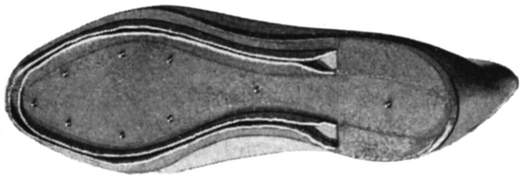


Figure 124. The insole after tacking.

most required, that is, from the edge of the lasted seat upwards until the skived portion at the top is left comparatively flexible.

Leather stiffeners may be, and often are, pre-moulded, the process being as for fibre; they are usually moulded damp and allowed to dry after moulding. The action of the stiffener moulder in making the seat, both on leather and fibre stiffeners, contributes greatly to the success of the seat laster but care must be taken in inserting them to ensure that the edge of the moulding corresponds with the upper edge of the insole; this is extremely important as the action of the wiper plates on the seat laster follow those of the stiffener moulder with considerably less pressure.

Some leather stiffeners are simply skived and conditioned, and inserted with no moulding at all; this is essential on hand-lasted work with the seats down. Their advantage, from a working point of view, is that their condition at the time they are inserted enables them to conform to the last and upper much better than fibre and their wearing qualities are indisputable; they are not however suitable for lasting on a seat laster and if lasted in this way a certain amount of pounding or seat hammering is essential.

The stiffener should either be dipped in a solution to make it stick, or pasted by hand. The composition of this solution is very important indeed; while it should, in its finished state, form an efficient adhesive it should remain tacky enough to allow the surfaces, lining and outside, to be moved about over its surface within a

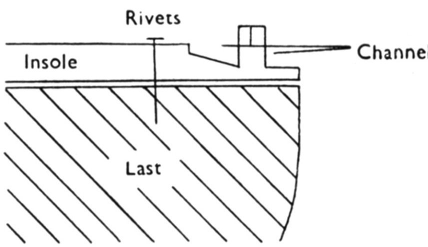


Figure 125. Cross-section of shoe after insole tacking.

reasonable time. When using pre-moulded stiffeners, the last should have been previously fitted, with an insole of the correct substance attached, as in these circumstances it is possible to see quite clearly whether the fit (or 'clip') at the top of the last is correct when the moulded portion is down to the wood. It is not enough, however, just to check the insole feather and the top fit, as if the moulded portion is not also down to the wood, the toe to heel tension of the pull-over will bring it down, thus springing out the top and making the stiffener extremely

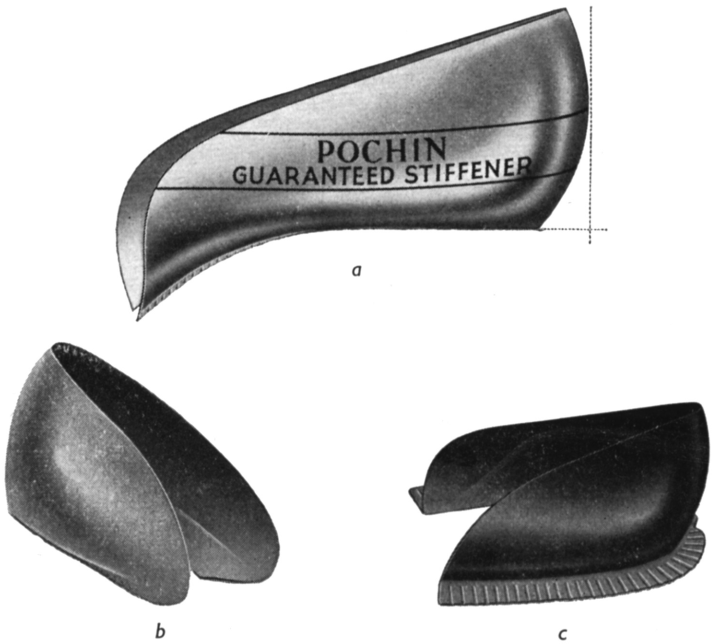


Figure 126. *A* Curved waist stiffener for ladies' work; *b* Standard type of stiffener; *c* Veldt stiffener.

prominent at the back of the finished shoe. This rule does not apply, of course, in the case of wetted leather, or celastic, or other stiffeners of this type which automatically mould themselves to the last on the operations of pulling over and side lasting.

Within the upper the stiffener should fit, and be inserted with its forward edge pressing *hard* against the seam of vamp and quarter lining, perhaps at this stage distorting the quarter lining slightly. This will be taken care of by the pull-over in the toe to heel strain and ensures that the skived end of the stiffener shall be right up to the seam.

In the case of ladies' work, where a completely loose lining (that is the lining being independent of the outside at this point) is used, the stiffener is very much longer and the mould used follows the shape of the last, in some cases almost to the joint. Even more accurate fitting to the last is then required and the operation of insertion calls for much more accurate location at the back, although appearing easier. It is always desirable to use lefts and rights when using moulded stiffeners; with ladies' work it is absolutely necessary. The stiffeners are moulded with the usual lasting allowance and the feather (the moulded edge) should be inserted within about $\frac{1}{2}$ in. of the edge of the upper; when lasted, the upper, having a wider arc, should be just behind the edge of the stiffener, the latter just showing beyond the upper. It is of paramount importance that the mould fits accurately the edge of the insole.

The height of the stiffener in relation to the back and depth of quarter, is a subject of some difference of opinion; in ladies' work it is higher in proportion to the total height and keeps its height further down the quarter than in men's (see Figure 126).

A dipping tank with a vertical moving grid is supplied by various machinery companies. This is very much quicker for moulded stiffeners when using a fluid adhesive; paste, however, must be applied by hand. Celastic and similar stiffeners are softened (or conditioned) by various types of conditioning machines identical to those used for puffs (see p. 274).

A small upright and oval-shaped roller is frequently used for smoothing the linings down to the stiffener at the seat and pulling them forward, otherwise this has to be done with the fingers.

Puffs and their Insertion

The object of the toe-puff (see Figure 127) is to reproduce the shape of the last and to retain that shape permanently throughout the life of the shoe. Its use as a protector of the foot is practically negligible as the material used is in many cases of an extremely light substance. An exception to this rule is a protective steel cover placed

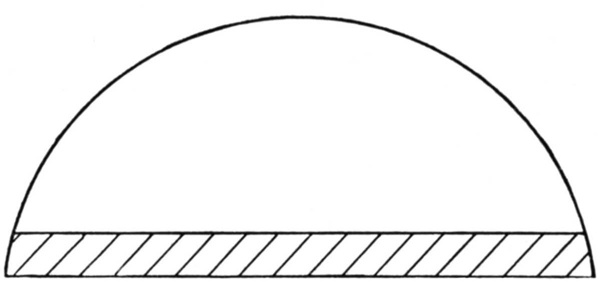


Figure 127. Standard shape of toe-puff for men's work. The shaded portion os skived.

over the toe in the case of boots made for miners; this is, however, not a puff but, if anything, serves to illustrate the fact that the puff inside the cap is inadequate to afford any substantial protection by itself.

The combination of the puff at the toe end of the foot and the stiffener at the heel serves to keep the shoe in shape during the whole of its life.

There are various types of puff or toe-case used at the present time, but the three main types are: (l) the celastic or similar type, (2) the vulco unit, and (3) the celluloid type. In Goodyear welted work the first is now the more popular type. In this case the puff is of a cotton ply base impregnated with celluloid and before treatment is fairly soft. It is conditioned usually by being passed through a number of rollers impregnated with acetone, or acetone—type solvent. After such treatment the celluloid partially dissolves in the acetone leaving the puff in an extremely soft and workable condition. Such a condition can be controlled in length of time by the type of solvent used in softening; for instance a puff for machine-sewn work should have a much shorter drying time than is necessary for a welted type, as it has to be slipped off the last very much sooner than the welted and the puff should be really hard before sewing. It will be found that the portion of a welted puff exposed to air, that is above the wire (see bed lasting, p. 283), will dry much quicker than the area below the cap; in this case it should be dry before removing the wire. In all cases the shoe is better left for a short period after slipping, as the inside face of the puff (formerly next to the last) does not really dry hard until it has been exposed to air for a short while.

In the case of the vulco unit or hot puff, the puff in its original condition is hard, of a tarred nature. It is brought to a mellow condition in a heated press and has to be pulled over fairly quickly after being inserted; it may then be left if required as its subsequent softening treatment is by steam. The apparatus used is a steamer with either electrically or gas-heated water, the toe being inserted into a small hole with the shoe standing on a shelf. These heaters can be obtained to accommodate up to four pairs; they require a certain amount of attention however, and deteriorate very soon. This method is perhaps slightly cheaper, and the puff can be softened at any time after pulling over. It will be seen that this is a decided advantage as work may be simply pulled on and left for any period; by being inserted in the steamer it becomes workable again whereas a celastic type has to be completely lasted within a certain time. The lasts may thus be slipped much more quickly. It was widely used in the past but has died out to some extent in recent years, the main reason being that when it has been broken in wear it will not recover like celastic.

The celluloid type is soft and in condition for working in its initial form. It is kept in an airtight container and must be lasted fairly soon after being exposed to air; it is used fairly extensively on heavy boots but can be obtained for almost any kind of work. Its chief disadvantage is that it must be completely lasted within a reasonable time of insertion as it is practically impossible to soften once it has set and extremely difficult to remove.

The celastic and hot puffs may be obtained in almost any substance or any shape and the skive may be lengthened and shortened at will. In the former type the edge may be treated so that the extreme edge of the skive never sets hard, thus eliminating the hard edge one sometimes feels in shoes with very light vamp linings.

In all three cases it is necessary to treat the last to ensure that the solvent used for softening the toe-case, and in the case of the hot puff, the tar, which becomes liquid when hot, does not stick to the last; although placed furthest away from it this liquid is inclined to seep through the lining causing the toe to stick to the wood. It is usual to use a chalky solution, or grease, for this purpose and this is placed on the toe of the last before pulling over either after or before insole tacking.

Attempts have been made with a measure of success to treat the lasts with a surface lacquer so that the above treatment is eliminated and the lasts may be used for forty or fifty times without attention.

With unlined shoes it is usual to stick the celastic puff to the inside of the vamp or cap with a strip of solution across the skive, before lasting. It is important that the extreme edge of the skive be thoroughly stuck down as when the wearer inserts his foot into the shoe he may cause a fold to appear across the vamp on the inside which may prove extremely uncomfortable. The puff in this case is conditioned with a brush dipped in acetone.

In the normal manner the puff is inserted after conditioning by placing it next to the upper and folding the pocket and vamp lining over it, that is, between the puff and the last. It is sometimes advisable to use side linings; in the case of ordinary cap work these may have been previously inserted in the closing room, but with plain fronts, brogues etc. a wing puff is used and the side linings are placed up to the end of the skive and down to the seam joining vamp and vamp lining. These have to some extent been eliminated by the use of swansdown-backed combination vamp linings and their value, except with very light leather on men's work, is very debatable.

Using heated puffs, the puff is laid to the cap and both are inserted into a press the plates of which are heated both top and bottom, pressure is applied from the top plate and the cap and puff are fused together. The presses are electrically heated and are known as fusing presses.

It was the practice before the previously described materials became universal to use leather puffs, and some are still being used. The puffs in this case were cut to shape on a press and whatever skiving was necessary was often carried out either by hand or on a machine such as the 'Fortuna' Skiver. The puffs were wetted and left to mellow after which a paste such as 'dextrin' was applied to stick them to the caps. A considerably longer period was necessary to allow the puffs to dry and harden. It was difficult to obtain such neat toes as with 'celastic' puffs as their substance had to be so much greater. Their wearing qualities, however, were undisputed and they could be shaped into their original position after being broken down.

The upper is now ready for lasting (see Figure 128) unless it is to be mulled.

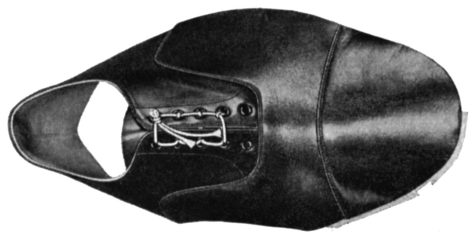


Figure 128. The upper, laced up ready for lasting.

Mulling

Lasters are familiar with the fact that on damp days uppers last more easily; they stretch with less effort, are more fiexible and breakages are reduced. The purpose of the BUSMC Mulling Plant is to reproduce artificially the conditions existing on a damp day but at the same time to speed up the resulting effects by using heat in addition to moisture.

Laboratory tests show that if full-chrome leather is subjected to an atmosphere of 100 per cent relative humidity (R.H.) for a long enough period (about a week at ordinary temperatures or 2 to 4 hr. at l00° F.) its breaking strength and stretch are increased and it stretches more easily under a given load. It also becomes more flexible and increases in area about 10 per cent.

When the mulling plant was first introduced too much emphasis was placed on the area increase as a means of clicking economy. In fact, in a closed upper, as distinct from an isolated piece of chrome leather, the increase is much less and the chief advantage of it is that when the mulled upper is lasted in this enlarged condition and then allowed to dry, the shrinkage gives very tight lasting.

Other materials such as vegetable leather and fabric show the various effects mentioned to a lesser extent than full-chrome leather but in general the treatment appears to be beneficial and gives improved lasting.

The mulling apparatus itself is composed of a number of chambers through which warm saturated air (l00° F. and 100 per cent R.H.) is circulated by fans. The moisture is obtained by passing the air over water. The uppers are hung in the chambers on hooks mounted on pillars in the centre of each. The humid air circulates round all of them, thus ensuring equal treatment. The chambers themselves are lined with asbestos to provide insulation and resistance to damp. The normal time is 2 to 4 hr.

A criticism of mulling is that the fibre of the leather is adversely affected. Repeated tests, however, have shown that this is not the case and the natural fat of the leather is not displaced or removed in any way as a result of conditioning.

In U.S.A., mulling is much more commonly done than in this country, but, as will be seen in Part IX, steaming, which is a form of mulling, is used extensively in the slipper and slip-lasted trade in this country.

Drying or Setting

Although this process actually follows lasting, it is regarded as an integral part of the mulling process and, accordingly, is dealt with here.

The mulled upper after lasting is rather damp and it is necessary to remove this dampness before the last is slipped. This operation is necessary in the case of work which has to be slipped after lasting. It is usual to instal a drying plant in departments making machine-sewn work after pounding, the drying-out process taking about 1 hr. It certainly brings the uppers down to the lasts and at the same time helps to harden the puffs. With welted work again it serves a very useful purpose; it is installed after welt beating and in addition to drying the uppers it also dries out the welts, thus speeding up the time between welt sewing and rounding, and reducing the schedule of the last turnover.

The same apparatus is extensively used after levelling to dry out the soles. In both cases of course the upper is dried in the process although on welted work the extra time on the last enables the uppers to dry out naturally.

These dryers are not installed exclusively with the mulling chamber, they are in much wider use for welts and soles than for setting the uppers, especially the sole drying plant.

The plants are supplied with a varying number of chambers in which warm dry air(110° F. and 30 per cent R.H.) is continually being circulated, both in the chamber and around their walls. The heating is usually by electricity or steam although gas-heated plants are available. In all cases the temperature is kept constant automatically and can be set for whatever use the plant is put to. Dryers are made in various shapes to fit in with the lay-out of the department concerned, and it is claimed that a dryer takes up no floor space as its area is very little greater than the floor space that the racks in it would take up. There is a good deal of truth in this, and it is a very useful piece of equipment to have in the factory.

LASTING

Tacking Backs

The upper of the correct size and correct foot is first placed in an inverted position over an upright stand with a last peg; this applies to both hand and machine methods. The correct last is then placed on the peg and the upper is lifted until the moulded feather line on the stiffener fits the upper edge of the insole; the centre of the upper, either the seam, back-strip or counter, is located centrally to the back of the last and the upper is drafted over.

Hand Method—Holding the upper in position with his left hand the operator tacks over the upper, lining and stiffener with one or two tacks. On ladies' work he smooths down the back and inserts a rivet about $\frac{1}{2}$ in. from the top of the quarter to keep this portion straight during pulling over; this rivet should not be hammered down and should be withdrawn, preferably after side lasting, to avoid its being driven home by the back plate and heel band of the bed and seat lasters; if not the upper may be damaged in removing it.

Machine Method—The upper is placed on the last, with the stiffener correctly located; the operator, holding both hands either side of the upper and last, stretches it evenly to locate it centrally and keep its position, and then moves the stand into the machine. This action causes the machine to wipe over the upper and insert two tacks, about $\frac{7}{16}$ in. square shank machine tacks for men's and $\frac{5}{16}$ to $\frac{3}{8}$ in. for ladies', the substance of upper lining, stiffener and insole being the deciding factor as to length of tack.

Pulling Over

The upper having been tacked to the insole the next step is the pulling over operation. Types of machines vary considerably in their mechanical devices, but all of them incorporate the following few essential features:

(l) a central foot against which the insole and last are placed;

(2) a front pincer, and in the case of the five pincer machine, two more sets of pincers on each side. On the three pincer machine there is one set only on each side with wider jaws.

(3) a heel rest which automatically finds its own level on the back of the shoe when the machine is tripped.

(4) an oil check attachment in which oil passing through a valve controls the speed of movement of the updraw levers. These updraw levers draw the pincers, after they have gripped the shoe, upwards or downwards. The word updraw originally applied to the upright machine when their movement was in that direction. With the inverted machine their movement is down, but the direction in relation to the last is unaltered.

(5) a tackpot and devices for feeding the tacks to the carrier blocks from where drivers will drive them into the shoe. While the

tackpots, raceways and separators are very much the same, the method of feeding the tacks into the carrier blocks varies. With the ‘Rex’ or upright machines the problem is simple, they just drop point first down the seven or five tubes into the carrier blocks and are in the correct position for the drivers to drive them in. On the inverted machine tack delivery presents a more difficult problem. On the BUSMC No. 6 machine the tacks were

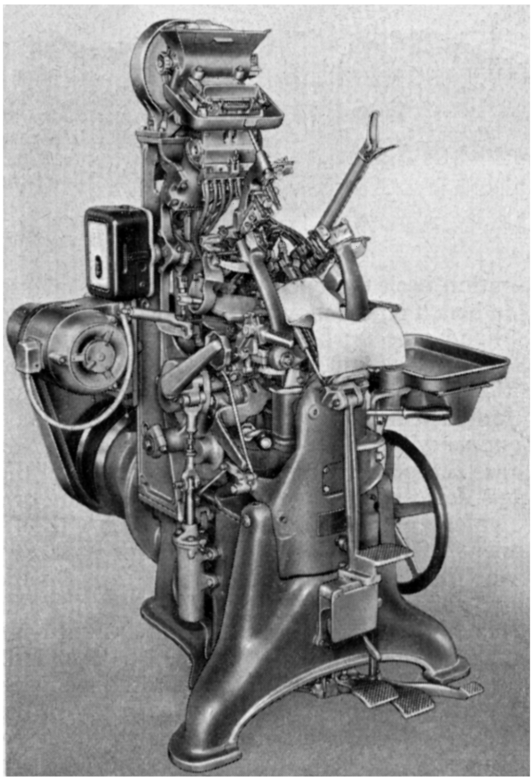


Figure 129. BUSMC No. 7 Pulling Over Machine.

pumped (air pump) upwards into the tubes and after rounding the bend in the tube their position was inverted and ready to enter the carrier block in the correct position. The Standard method is to invert the tacks by the separators themselves. On the BUSMC No. 7 however, the bend of the tube is inverted. The tacks fall from the separator as far as this bend, as on the ‘Rex’, by gravity; the pump in this case then takes over and pumps the tacks straight into the carrier blocks. They are thus in an inverted position ready for the upward movement of the drivers to drive them in. These pumps are worked by compressed air, this being generated inside the cylinder while the machine is moving in the normal way, but their release into the tack tubes is instantaneous.

The BUSMC No. 7 Pulling Over Machine is illustrated in Figure 129.

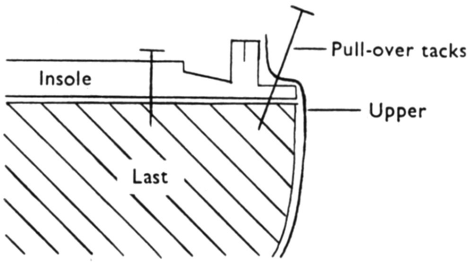


Figure 130. Cross-section of shoe after pulling over. The pull-over tacks penetrate upper, lining and outside edge of insole, and are embedded in the wood of the last.

In the operation itself the operator takes the initial stretch out of the upper by a bench pincer mounted on the tray of the machine, or by a pair of hand pincers; he then places the front into the front pincers in a central position, and then, one side at a time, the remainder of the forepart into the side pincers, pressing the insole down to the foot. The machine is then tripped by a pedal, the pincers gripping the upper while the foot forces the last into it.

At this stage the operator, on viewing the upper on the last, may use the various devices for straightening, lengthening or shortening the cap, straightening the front, and for releasing the front pincer for readjustment of the cap; on most machines there is a foot-operated device for measuring the length of cap. On the BUSMC No. 7 machine there is also a device for reversing the machine, releasing the shoe from the pincers, thus enabling the operator to remove it from the machine and start again. The Standard machines have provision for the shoe to be released without reversing.

Having located and gripped the upper correctly in the machine, the pedal is again tripped, the pincers drawing the upper over the feather and inwards. The clamp arms close and hold the shoe and the machine proceeds to drive in the seven tacks (five in the case of the three pincer machine) into the portion of the insole left between the edge of the insole and the bottom of the already turned back outside insole channel right through upper and insole and into the wood of the last. The width of this portion is about $\frac{3}{16}$ in.

The machine has to be adjusted to the particular width of last, to ensure such accurate driving of the rivets, the adjustment being carried out very simply by two pincer locating handles on either side of the machine. The one on the left alters side and front pincers together, and the right side handle alters the width of the side pincers only.

As all the rivets (approximately $\frac{9}{16}$ in.), have ultimately to be withdrawn, they are left sufficiently high to enable the heads to be taken out (Figure 130). The distance they are driven in may be regulated by the height of the drivers themselves. The height of the foot also effects this, besides deciding how much upper shall be gripped by the initial hold of the pincers.

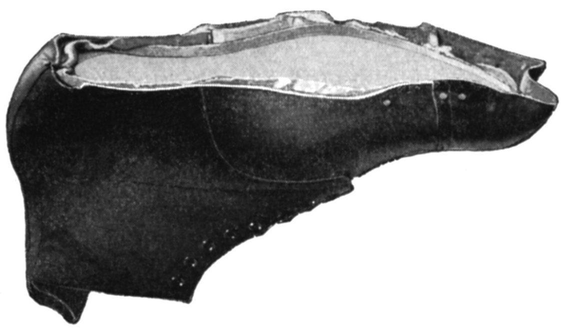


Figure 131. Boot after pulling over. There are three tacks at the side (two at cap and one at side) and one in toe.

The correct location for men's work is one rivet at the toe, two on either side across the line of the cap, or where the cap line would lie, and one further down the forepart nearer the joint on either side (Figure 131). It is common practice when using the five pincer machine to use these latter two rivets as anchor tacks for the wire to be inserted by the bed laster. This is not possible, of course, on the three pincer machine as the rivets are not low enough.

Machines in common use are the BUSMC 'Rex', No. 6 and No. 7 (I.P.O.) and the Standard Engineering Co. No. 5 and No. 7.

Side Lasting

The upper should now have assumed the shape of the last in its main features, but the means of securing it are only very temporary. The next portion to assume a more permanent fixing should be the sides. At this point it should be emphasised that this is the correct sequence of operations from pulling over to toe lasting. It is extreme ly unwise to alter the sequence as this will almost certainly result in untidy linings, and fullness in the waist and the front of the seat.

The 'Consol' machine which drives a soft tack through the upper, insole and into the wood, has almost entirely disappeared. lt was first displaced by a stapler driving a staple from the upper side, through upper lining and the raised outside and inside channel of the insole, finally clenching itself on an anvil located by the operator in the inside channel. These machines, which have been used extensively for some time, are the BUSMC Goodyear Upper Stapler, and the Standard Upper Side Staple Laster Model 73.

These, of course, save the lasts as there is no penetration of the wood down the sides; they also eliminate the difficulty of getting out the side tacks, and so save innumerable needles on the welt sewers. By cutting out an operation and saving these needles it is very much cheaper. The operator requires to use his hand pincers for lining, clearing and tightening the upper. Both of the machines mentioned are said to have a wiping action. The machine construction itself is not of great importance; the great fact is that it changed a principle of machine welting. Previously the method of machine welting attempted to follow the hand method on the insole; the outside channel only was opened when wet and the inside channel left down, this being wetted just before welt sewing and opened

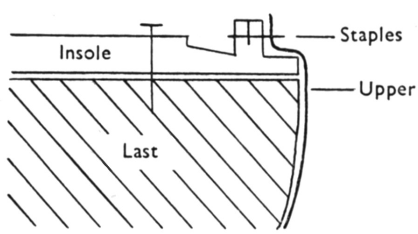


Figure 132. Cross-section of shoe after side lasting. The staples are not removable although they are superfluous after sewing; being slightly up the channel they are sometimes cut out by the inseam trimmer.

up with an old knife or similar tool. After welt sewing it was closed and sometimes stuck down; this practically eliminated the ridge seen nowadays on welted shoes particularly those with lighter insoles and it also made welted shoes considerably more flexible. With the advent of the stapler, however, the inside channel was permanently opened on the double lip turner, and the stapler ensured that there was no possibility of its ever being closed. Further steps to ensure this are the use of solution over both channel lips and opening dry; the ridge is thus permanently on the insole (Figure 132). Whatever way we view this sacrifice of principle to speed, it has certainly not improved the flexibility of machine-made welted shoes, and apart from easing the problems of manufacture in the shape of clean insoles and ease of access of the staple, it appears to be a retrograde step. The wire used on these earlier machines was 0-022 in. gauge.

The latest machine for side lasting, however, is a much improved model as it incorporates pincers which can be used at will by the operator by his use of an alternative pedal, and uses a larger and stronger staple.

The number of staples is really a question of the substance of upper and lining and the fit of the upper from toe to heel; an average size 8 shoe should not require more than seven or eight staples down each side (see Figure 135) with a staple over each seam if possible. The machines in use generally of the latter type are the BUSMC Model 'B' and the Standard Engineering Co. Pincer Side-staple Laster Model 172.

Toe Lasting

The bed laster has now completely superseded the 'Consol' for the lasting of welted toes. The principle of the machine is that a moving head, with a pair of plates accurately fashioned to fit the contour of the last, moves upwards over the upper, drawing it to the last and finally moving in to the channel. In such a position a wire is secured to an anchor tack (either inserted by the operator or placed there by the pull-over), placed directly under the plates and tightened as the plates are withdrawn, to hold the upper in the position in which the plates have placed it (Figure

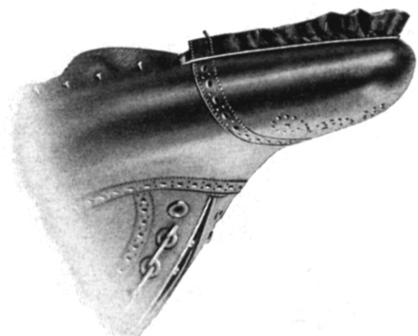


Figure 133. Shoe after toe lasting.

133) the other end of the wire being wound around the anchor tack on the other side, and being finally cut off as close to the tack as practicable. This is important as stray ends of tacks and wire are sources of damage.

While the plates make their upward movement, the last, which has been previously mounted on a jack pin by the operator, is held in position on a rest, which fits across the cap line, by means of a 'foot' or 'hold down' whose shape approximately corresponds to the contour of the inside channel.

Although in principle most bed-lasters are the same, various types differ slightly in operation. On the BUSMC No. 7 the shoe is placed on to a jack pin, the 'hold-down' is brought down manually by the operator and the head adjusted to the length of last by a hand wheel at the extreme end of the machine; the plates can be adjusted to the angle of the last as it is held down, by tipping the head to either side or up and down to level the plates with the last in length as required. The operation of wiping-in the toe vertically is carried out by the foot and the horizontal movement by a handle ; it is usual to apply downward pressure with the heel after the toe has been wiped-in, the object being to flatten the feather as much as possible; the ‘hold-down’ is then released with the knee, the wire attached and the head released and the shoe removed.

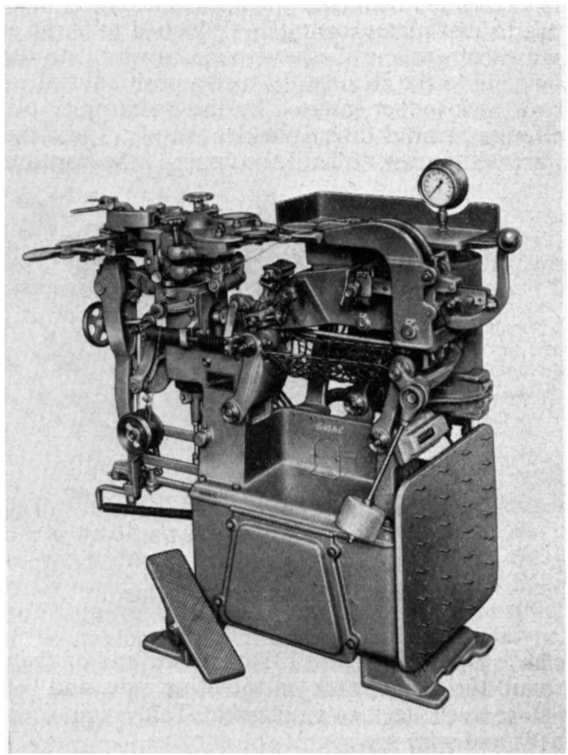


Figure 134. BUSMC No 8 Toe Lasting Machine.

The seats, too, may be lasted using wiper plates at the opposite end of the machine to wipe the upper over the insole; in the case of the seats, however, the jack is brought to the level of the wiper plate by a small, direct, vertical movement of a pedal, the sequence in this case being that the wiper plates are placed over the already lasted seats while the toes are being lasted. On completion of the toes the plates are half withdrawn and a hand tacker is employed to tack down the upper, stiffener and lining, through the insole, the tacks just clenching on the seat plate of the last. This method of lasting seats however, has been largely superseded by the use of the heel seat lasting machine but the standard of work when properly carried out was extremely high.

The BUSMC No. 8 Toe Laster, while in principle being the same as the No. 7, differs very much in mechanical details resulting in very much less effort to the operator and consequently greater output. The shoe is placed on to the rest and by one movement only the operator secures the shoe by (l) a forward movement of the back plate, (2) an upward movement of the toe rest, (3) a forward and slightly upward movement of the foot. The whole of the carriage, with the shoe inserted, is floating, and is located by the wiper plates themselves.

As one movement locks the shoe for lasting, so one knee movement releases it. The action of the plates is controlled, as in the No. 7, by foot and hand levers; their action however, is an hydraulically assisted movement, and after starting to wipe, is automatic. It will be noted that there is no jacking pin, and no arrangement for lasting seats, as the movement of the plates is entirely forward, and so it cannot be used for machine-sewn work but is purely a welted toe laster, The BUSMC No. 8 Toe Laster is illustrated in Figure 134.

With all types of bed lasters the operator himself removes the front rivet, and spreads the toe over and above the plates during their upward movement with a tool known as a toe spreader. The use of this tool together with the timing of the horizontal wipe, forms the greater part of the skill required to carry out successfully what is perhaps the best of all methods of lasting toes.

To summarise, the BUSMC No. 7 and the Standard Engineering Co. ‘Evolution’ are both manually operated and are capable of lasting both toes and seats. The BUSMC No. 8 however, is the only hydraulically-assisted machine. The Standard Engineering Model 240 is for toes only and is manually controlled. On all these types the toe plates are changeable for lefts and rights by simply reversing them in the machine. They are made in pairs with a division in the centre of the toe.

It is usual after toe lasting to allow the toe cases to harden before proceeding further, although the seats may be lasted. It is a good stage at which to carry out any inspection, as any correction may be made while the toe is soft, and without having to remove numerous seat lasting tacks.

Seat Lasting

This operation (Figures l35 and 136) may be carried out by a ‘Consol’, bed lasting machine or a heel seat lasting machine.

‘*Consol*’—The ‘Consol’ has again been largely displaced by the heel seat laster, but the method was in use for many years and deserves some comment. The machine itself is partly described in Chapter 22 (p. 329). The operator starts at the back, lasting towards the toe and in this operation the pincers are kept straight (pincers are operated with right and left twist, controlled by the knee of the operator). The carrier block wipes the upper over and inserts the tack. These machines are fitted with a double tackpot and raceways to provide two sizes of tack, so that any variation of substance can be taken care of. The tacks should be on the inside, as near to the edge of the upper as possible; this applies to all seat lasters. Tacks should be long enough just to penetrate the insole and clench on the plate of the last; the flatness of the finished seat by this method is not to be compared with that of the other two.

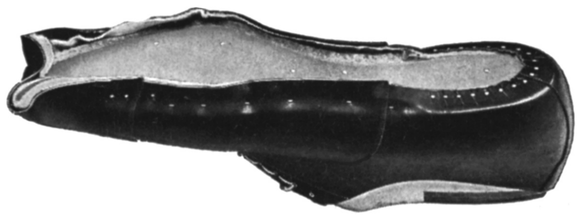


Figure 135. Shoe after seat lasting. The diagram also illustrates the positions of the side lasting staples.

Bed Laster—The plates are made in pairs and are closed by a manually—operated lever. The method is usually used in conjunction with the lasting of the toes; the shoe is placed on a jack and a pedal brings the seat up so that the feather (uppermost side of the edge of the insole) is about level with the underside of the plates. The plates are closed so that they just cover the upper and stiffener when wiped in; the action of closing the plates may be repeated if necessary to ensure a flat surface. The plates are then brought partly back so that about $\frac{1}{8}$ in. of upper is showing beyond the edge of the plate. The operator takes in his left hand a hand tacker replenished by a mechanical tackpot, places the nozzle up to the plates, and holding with his right hand a small grip hammer, taps the end of the driver bar driving in the tack. The plates may, if required, be passed over the seat to emphasise its flatness still further.

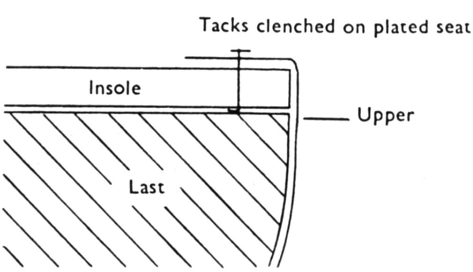


Figure 136. Cross-section of seat after lasting. The insole is flat with no channel and the upper is folded over, machine-sewn fashion. The tacks go through the upper and the insole and clench over on the plated seat of the last.

The result of all this is a very flat seat. Given well cut uppers of suitable material, the correct stiffener *etc.* it is doubtful whether any further operation, in the form of Seat hammering or pounding will improve it.

Heel Seat Laster—This latest method of lasting seats is many times quicker than either of the two previously mentioned. The machine has a tackpot, or two tackpots, with tacks fed by gravity through tubes to the

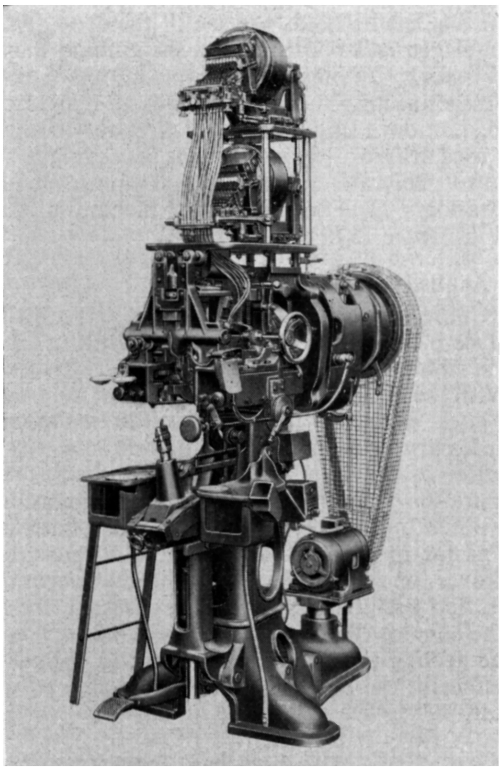


Figure 137. Standard Heel Seat Lasting Machine
Model 216AMO.

drivers, the tacks for each shoe being separated and fed to the drivers by the action of the machine on the previous shoe. An adjustable heel band regulates the distance the shoe is placed into the machine and clamps the upper. The shoe is placed on a jack and is slid into the machine with a pedal moving the shoe up to a foot; the adjustment of this foot is very important as it decides the relation of the wiper plates to the feather. The wiper plates themselves carry the tacks, and the distance they travel is regulated by an arm on either side of the machine and consequently deciding where the tacks are driven in. The Standard machines use tack fingers for carrying the tacks, their position being regulated by hand wheels. The wipers themselves have a double action, the first stroke being a breaking-down movement and the second a levelling and tack-driving movement. There is a lever to suspend the tack driving action on either side of the machine and it is used for setting-up purposes. The machine is tripped by the operator using his right hand while in his left he holds the toe of the shoe. These machines deliver about eleven tacks per side, but the amount may be reduced, as for ladies' work, by closing up some of the raceways on the tackpot, or disconnecting the tubes. They are manufactured by the B.U.S.M.Co., Standard Engineering Co. and by Moenus (Germany).

The tacks used are from $\frac{5}{16}$ in. upwards according to the substance it is required to penetrate, and are always square shanked machine tacks. The Standard Heel Seat Lasting Machine Model 216 AMO is illustrated in Figure 137.

Pounding as Applied to Seat Lasting

With the 'Consol' method it is necessary to pound the work after seat lasting (see p. 332). The Standard Engineering Co. had a seat-hammering machine for levelling the seats, but the usual method is pounding. With the bed and seat laster a much flatter seat is obtained and with a good operator and good conditions pounding is not absolutely necessary; there is no hard and fast rule over this, it being largely a matter of the standard required and the materials used, and the preparation which goes into previous operations.

It may be noted in all three methods that emphasis is laid on the tacks being as far in as possible. As there is only about $\frac{1}{2}$ in. Of upper lasted over, one should bear in mind that beyond these tacks, the seat rivets and heeling pins have to be inserted, the former being as close to the edge of the insole as possible without going over the edge, and the heeling pins between the two. ln the case of the seat laster the further in the tacks the greater the area of wipe. and the flatter the seat.

21

THE GOODYEAR WELTED METHOD

SEWING IN THE WELT

Upper Trimming

Having now completed the whole operation of lasting the shoe, the next operation is solely for the purpose of preparing for welt sewing. Having ensured that the puffs are reasonably dry, the surplus material above the staples in the sides and the wire at the toe is trimmed off (Figure 138).

It is undesirable to trim off more than is necessary as (l) the wires are apt to slip over the trimmed surface, (2) there is less possibility of the needle holes made by the welt sewer 'running' and (3) it is far better for the circular knife of the inseam trimmer to have material to 'bite' into than to slip over a too closely trimmed surface, thus ensuring a flatter seam.

The machines commonly used are the BUSMC 'Rex' Upper Trimmer and the Standard Engineering Co. Model 76. These machines are of similar construction, the method being that two circular cutters are set, with their circumferences overlapping, very close together, one outside and one inside; the inner knife incorporates a feed wheel which runs on the inside channel and besides helping to feed the work along ensures that the upper is trimmed to the required level. A water pot is also included which drips water on to the surface of the lower knife with the idea of preventing clogging; this happens more frequently however, in the case of vulco units or other tarred puffs than with the celastic type.

An earlier model 'Rex' Upper Trimmer had a semi-circular knife running on to the upper lip of the inside feed wheel; this feed wheel, before the advent of the double lip turner, was used to open the inside channel; the knife had a forward prong projecting beyond the feed wheel. This machine has, however, been largely displaced.

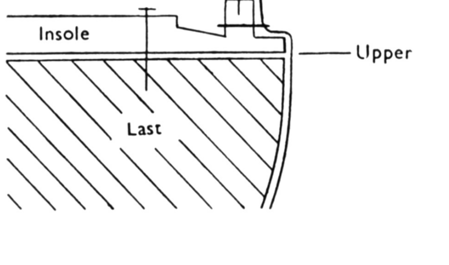


Figure 138. Cross-section of shoe showing the surplus upper which is removed to assist the welt sewer.

After upper trimming,the pull-over and jointing rivets are removed, and the anchor tacks holding the wire are raised, so that they are accessible for removal after welt sewing. lt may be that these tacks and wires are removed altogether at this stage, the bonding of puff, outside and lining keeping the toe in shape.

In the opinion of the writer however, this method, although cutting out the subsequent operation of removing the wires before inseam trimming and saving needles during welt sewing, is not to be recommended as the shape of the toe is liable to be distorted.

Welt Sewing

The idea of the machine is to reproduce as nearly as possible, by mechanical means, the action of the hand sewer. That is, by passing a needle through the welt, upper, lining, and the upturned lips of a previously prepared insole, the effect will resemble to a great extent the hand method. Figures 139 and 140 show where the differences lie, especially in the insole.

Figure 139. Boot after welt sewing.

It will be noted that the welt is sewn, in the case of the machine, in a partly vertical position in relation to that of the hand method. On the machine the needle passes through the groove of the welt from the outside, through the welt itself, penetrating on the edge of the bevel where it meets the grain, through upper and lining, through and slightly under the upturned lips of the insole, emerging at the bottom of the inside channel (Figure l40c). The double thread of the chain-stitch made by the machine is thus buried in the groove of the welt. In subsequent operations, inseam trimming and welt beating, the welt is turned back so that the edge of the bevel and the centre of the groove form a hinge and no undue strain on the stitches should result from the hinging.

The welt-sewing machines themselves do not vary between makers in their fundamental essentials which are (1) a welt guide, (2) a needle, (3) a channel guide or foot, (4) a 'pricker point' or awl, (5) feeding mechanism, (6) looping and hook mechanism, (7) thread tension adjusting mechanism, (8) back-gauge, (9) heating.

(l) Welts vary considerably in their width, substance, and shape (*e.g.* storm welts). The guides themselves are adjustable in width by an internal slide but roughly speaking the substance is catered for by a variety of shields, easily changed, on the welt guide itself. The welts are inserted into the welt guide by the operator before starting to sew and are in the form of either pre-determined lengths cut to the size, or roll welting. About $\frac{1}{2}$ in. is placed through the guide on to which the operator places his finger for the first stitch or two. It is desirable for the guide to

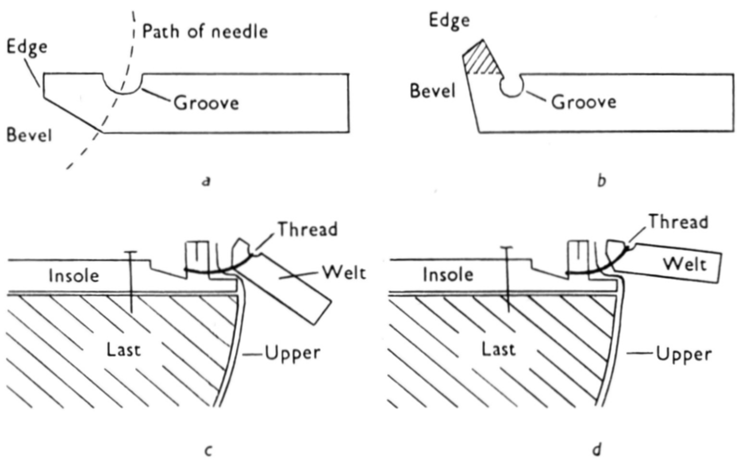


Figure 140. Cross-sections of: *a* Welt, before sewing; *b* Welt, showing effect of beating. (The shaded portion is actually removed, before beating, by the inseam trimming process); *c* Shoe after welt sewing on BUSMC Model 'K' or Standard machines; *d* Shoe after welt sewing on BUSMC Model 'L' machine.

Note:The welt is in practice held tightly against the lip of the insole by the tension of the thread. On BUSMC Model 'K' and Standard machines the tension is on the bottom of the inside channel before the stitch is completed. On BUSMC Model 'L' the tension is on the outside of the welt before the stitch is completed.

be as close to the needle as possible for accurate striking of the needle point. To ensure this the shield is cut away to let the needle guide come forward. The whole of the welt guide is mounted on a spring-loaded slide and moves downwards, backwards and forwards, with a locking device while the needle comes forward.

(2) The function of the needle (Figure l4l) is simply to make the hole through the upper and lip, collect the thread wound around the barb by the looper, and form the stitch.

(3) The channel guide or foot runs in the inside channel and moves backwards and forwards with the awl; together they form the feeding mechanism; the cut of the needle also has a considerable bearing on the feed. The main function of this channel guide is to determine the height of the needle penetration in relation to the insole channel. The single thread should be at the bottom of the channel and it is a good guide if the needle marks are showing slightly on the insole.

(4) The pricker point or awl, moves in and out and backwards and forwards. Its function in the former action is to bring itself slightly in the inside channel in front of the needle in which position it feeds the shoe into the direct line and withdrawing as the latter moves forward, it then moves to its original position by the length of stitch required. A gauge is fitted to the machine to set its forward position.

(5) Feeding mechanism—see (3).

(6) Looper and hook (or thread finger). The looper has an eye through which the thread is permanently threaded. It moves through 360° around the needle, the hook holding the thread in position while the looper places the thread in the barb of the needle.

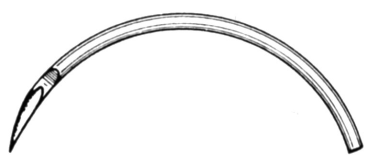


Figure 141. Goodyear type stitching machine needle.

(7) There is always a 'constant' tension easily adjustable, and the movement of a take-up lever gives a variable tension. This take-up lever moves through a fixed arc giving a maximum tension at its uppermost point. Both of these are adjustable by two knurled knobs located at the back of the machine above the thread tension wheel. Any slack or variation is taken up by a separate spring-loaded lever situated directly in front of the main take-up lever.

(8) The back-gauge is spring-loaded and self locating, working on the portion of the last below the feather of the insole; its function is to help the operator to steady the shoe as the needle enters it and it is timed to lock at this point.

(9) The direct method of gas heating, a gas-heated water jacket on the waxpot with gas on the rolls, has practically died out. It was replaced by a steam generator feeding steam to all parts of the machine through a number of pipes. This was an excellent method of heating as all parts were kept at a constant temperature. The modern method is a number of electrical elements situated at the various points necessary to keep the wax warm.

The BUSMC Model 'K' Welter and the Standard Engineering company Model 77 are in common use and both have a reversing action to enable the operator to dispense with the hand wheel and ensure the correct stopping position, that is, with the needle right back and minimum tension on the thread. A thread cutting device is mounted on the looper to enable the operator to dispense with a hand knife for cutting the thread.

The operation of the machine is highly skilled as the shape of the bottom of the shoe and the level of the feather line depends on the operator's skill. If it were possible to sew these welts in automatically, with a guarantee that all shoes would be alike, the operation of rounding would be unnecessary and the soles could be pre-rounded and channelled before attaching.

The size of needle used depends on the type of work — about size 41 needles with nine or ten-cord thread for men's and size 43 needles for ladies' with six, seven or eight-cord. It is always desirable to carry as large a thread as the needle will take, provided it is satisfactorily buried in the groove of the welt, both for strength and the filling up of the needle hole thus adding to the waterproofing qualities of the shoes, although too large a thread is subject to friction when passing through the hole made by the needle which tends to weaken it.

The insole scarf mark of the lip cutter and scorer (see p. 232) are the starting and stopping points for the operator. The first and last stitch should be high up on the insole channel to prevent the seats from 'fish-tailing' or spreading.

Model 'L' Welt Sewer—The latest machine for sewing in welts is the BUSMC Model 'L'. This machine incorporates many new features; It is exclusively motor and shaft driven with a complete absence of belts; the lubrication system is entirely automatic, the drip feed system being visible for checking by the operator. The machine is illustrated in Figure 142.

The greatest change perhaps is the location and action of the awl, which stands on the same side as the needle close to it and working parallel to it. This ensures a much more positive and continuous feed as the awl really penetrates the material coming almost right through to the inside channel, and the needle merely follows in the hole instead of having to punch its way right through; both of course enter from the welt side.

The back-gauge fitted to all previous types of welt sewers has also been dispensed with.

The welt is presented to and laid on to the feather in a different manner. It is put in a position very much nearer to the ultimate position it will take up after welt beating. This practically eliminates the hinging effect, and consequently the strain on the stitches is almost nil. On all previous types of welt sewers the welt is laid virtually flat to the side of the last; the turning back, therefore, involves a considerable amount of strain on the stitches especially around the toe, as the width of the top side of the welt has to be increased when the welt is turned back. The knife attachment on the welt beater (see below) is designed to ease this strain, but it must be borne in mind that the welt will already have been turned from the natural position in which it was sewn into by the feed wheel of the inseam trimmer. This strain is considerably increased if the needle has penetrated the groove and bevel of the welt too

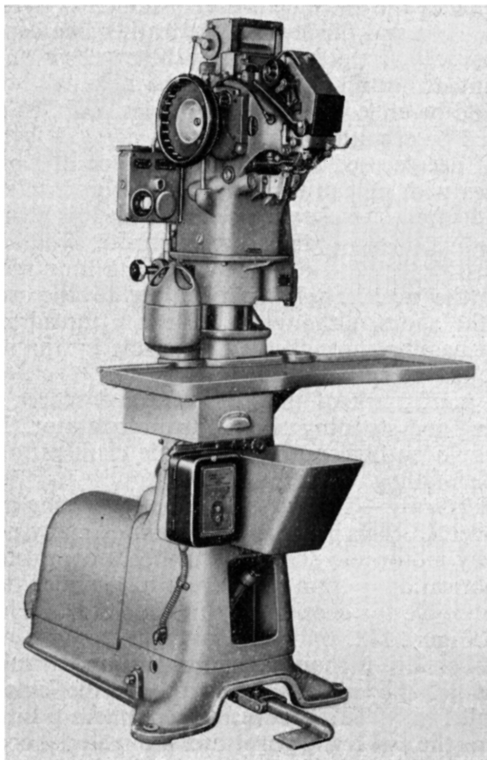


Figure 142. BUSMC Model 'L' Welt Sewing Machine.

far down, or the welt is sewn below the feather. The failing of the seam in welted shoes is not uncommon and this method seems a considerable step towards helping to lessen it. Another new feature is that the pull on the thread is made towards the centre line of the insole and the tension increases gradually from after the loop is made until the stitch is completed. It is thus drawn tight on the welt without undue strain on the insole.

The operation of this machine is considerably less exacting than that of previous types it being claimed that 33 per cent less energy is expended than on any previous model. The heating is all electric, the temperature of the waxpot being thermostatically controlled.

Tack Pulling

Before inseam trimming it is necessary to remove the anchor tacks and the wire attached to them; this is carried out by hand with a pair of cutters or a tack knife. The insole tacks are removed on a machine with a rotating scoop. This scoop goes under the heads of the tacks and digs them out of the insole. lt is important that no tacks are left in at this stage as it will be difficult both to slip the shoe off the last and to remove the tacks afterwards from the inside of the shoe.

Inseam Trimming

The machine used consists of a large adjustable, funnel-shaped, sawtoothed, rotating knife, a feed wheel running on the uppermost side of the welt (flesh side), another feed wheel running on the inside channel, a floating spring-loaded lower table, and a means of taking away the surplus material, usually a fan.

The operator, by means of a pedal, opens the inside feed and lowers the table. The shoe is fed by the rotary movement of the upper feed wheel on the welt and the inside feed wheel, thus bending it back. As the shoe moves along, the rotating knife cuts off the surplus material to just above the sewn seam (Figures 143 and 144) a fan taking away the waste material. The machine is fitted with a grinding

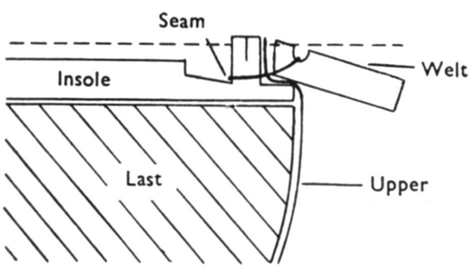


Figure 143. Cross-section of shoe showing inseam trimming. All surplus material above the dotted line is removed. The action of the feed wheels tends to bring the welt nearer its ultimate position.

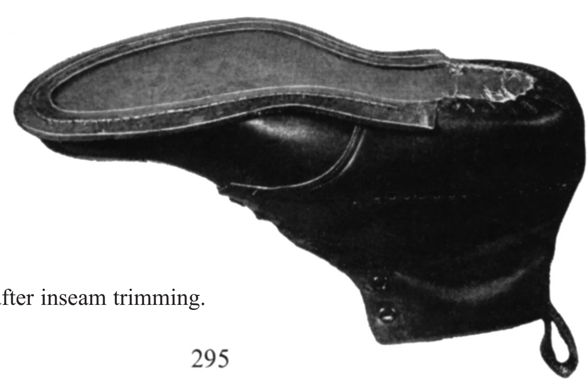


Figure 144. Boot after inseam trimming.

wheel for knife sharpening. The knife itself may be moved downwards at about 45° or horizontally, by a simple quick adjustment.

It is an extremely important operation, for if mishandled the stitches are cut (knife too low) or the seam left too high. The consequences of the former are that the whole bottom of the shoe will come away, and of the latter that the seam will show through the insole, the shoe will be too rigid and excessive bottom filling will have to be used to fill the cavity. This operation should be carried out as soon after welt sewing as possible and while the welts are in a mellow condition. The machines in use are the BUSMC Model ‘C’ and the Standard Engineering Co. Model 171.

Welt Beating

As with inseam trimming the welt should be in a mellow or pliable state. The object of the operation is to complete the ‘hinging’ effect, and flatten the welt so that it is at right·angles to the upper (Figure 145). After being wet prior to insertion the welt is swollen and the operation brings it back to its original substance and closes the fibres.

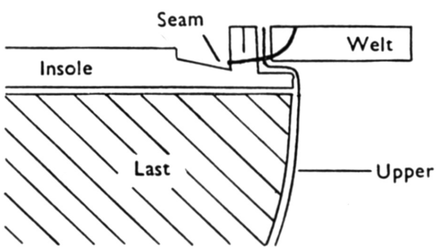


Figure 145. Cross-section of shoe after welt beating. The welt is in the correct position, the ‘hinging’ effect having almost closed the groove with the thread inside it.

The welt is placed, with the shoe inverted, on a flat round floating table. A hammer moving in a vertical direction descends on to the flesh side of the welt and on to the already trimmed seam. A knife is fitted which inserts a series of cuts in the flesh side of the welt only just over half way through and lying at a flat angle in the welt. These cuts ease the strain on the outside circumference of the welt at the toe only; they should finish short of the seam; the action of the knife is automatic when the pedal is depressed.

The pressure on the hammer is spring—loaded and is adjustable, as is the height, in order to cater for various substances of welt; the strength of the blow can thus be completely controlled.

Welt Drying

At this state it is advisable to create a pool of work to let the welts dry and harden. A drying cabinet is often installed to cater for this; with this method dry air is passed over the work several times per minute according to the speed of the fan, while being kept at a temperature of about 98° F.

With both sides of the welt exposed to dry and partly heated air it dries very rapidly, about 20 min. being the usual time for welts in a dryer. If the flesh side of damp leather is exposed, the drying time of the whole is greatly reduced. Natural drying at this stage takes considerably longer thus tying up floor space and lasts.

The sole, being on the average considerably thicker than the welt and being cut from bend, is the stronger part of the two. The problem then is to make the stronger member conform to the weaker, *i.e.* the sole come down to the welt.

It is essential for good shoemaking to make welts dry and rigid, and soles soft and pliable for rounding and stitching.

It will be found that any form of skiving, *e.g.* welt shank skiving and welt butting, can only be carried out accurately on perfectly dry leather.

Welt Shank Skiving

On work carrying a leather sole it is customary to differentiate between the substance in the waists by reducing the soles, reducing the welts, or inserting a middle in the forepart. The reducing of the welts takes place at this stage of manufacture. With ladies' work carrying a heel above $1\frac{1}{4}$ in. it is usual to reduce both waists. In men's work the reduction depends on the type of bottom.

The operation is very simply performed on a welt shank skiving machine, which consists of a smooth table for the grain side of the welt, and a coarse feed wheel on the flesh side, both feed wheels being mechanically driven. These wheels feed the welt into a stationary knife set for whatever substance it is desired to remove. The operator simply inserts the welt, holding the shoe in an inverted fashion, at the point when the reduction should start, and guides the shoe to the shape of the waist.

The skive itself should be slanted, that is it should be at its thinnest on the edge of the welt, tapering until the seam is reached. This is achieved by setting the knife at whatever angle to the rollers it is desired. There is usually a shoulder on the corner of the knife to keep it away from the stitches. The main difficulty with this type of machine is that it is not possible to keep a razor edge on the knife, and as with all splitting types of machines, the knives dig on hard welts and only skim soft ones.

The later types have dispensed with the stationary knives and top feed roll; instead a rotary cutter works from the flesh side of the welts to a given depth. These machines are faster, and give a really consistent depth of skive with much less effort for the operator. The stationary knife machine is in more common use; stationary and rotary cutter models are made by both the B.U.S.M.Co. and Standard Engineering Co.

Seam Levelling

The level of the bottom having been now determined and the surplus trimmed down to the seam, the seam itself is sometimes levelled. The machine used is an auto-leveller (see p. 316), fitted with stirrups, and the shoe is jacked up on to a pin and toe rest with the stirrup covering the seam. Whether the result is worth the trouble is a matter of personal opinion and it would hardly be wise yet to consider this operation as part of the process.

Welt Butting

The object of this operation is to skive the ends of the welts to meet the seats, or, if a seat lift is used, to blend the two together (Figure 146).

As a bench operation, each end of the welt was skived in turn to just beyond the insole scoring mark. The ends were then tacked down and the whole levelled with a hammer. This operation when carried out by a good benchman can hardly be equalled, as it is almost inevitable that the

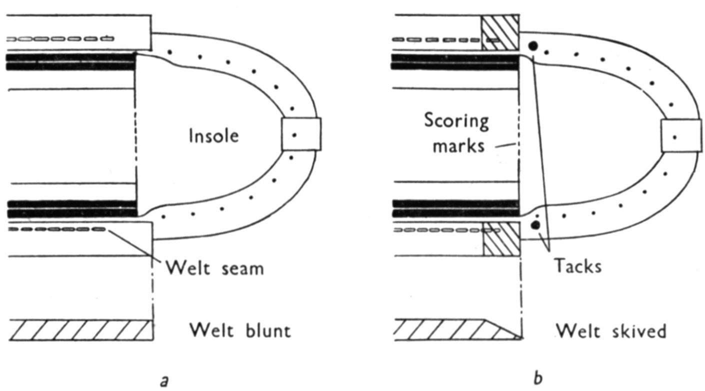


Figure 146. The ends of the welt: *a* before butting and tacking; *b* after butting and tacking. The seam is pressed in and a tack inserted in each side of the upper. The welt is skived off to ensure continuity of like with either seat or seat lift.

gradual fall of an upper and lining standing vertical (when stapled to the channel) to a position of being flat (when tacked over by the seat) will be disturbed to some extent by welt sewing.

The machines in use do a good job, however, but approach the problem from a different angle. The back of the shoe is inserted up to a flat stop plate, which determines the place of the skive in proportion to the seat, and is adjustable to each size by a lever on the side of the machine. The shoe is held in an inverted position. Two plates grip the seat immediately below the welt actually pressing into the seam itself; this action forces the two sides of the seat together with the welts above the plates. The knives, which partly find their own level on the anvils, move forward from the toe towards the seat, shearing off the welts at an angle which is decided by the angle of the crease finders; these crease finders are made in angles from 3° to 7°, 3° for a light welt or long scarf, 5° for a medium, and 7° for a heavy welt or short scarf; they are easily fitted into the anvils. The top surfaces of the anvils are perfectly flat, as are the undersides of the knives; a jig is supplied for grinding these knives to ensure the continuity of this surface; the whole is a precision job and even a small piece of wax will upset the scarf.

The BUSMC machine goes further since, while the anvils are compressing the seat, two tacks, one on each side, are driven into the upper in an attempt to hold the seat in position after the anvils release the shoe. The Standard Engineering Co. machine is a welt butter only.

ATTACHING THE SOLE

Bottom Filling

There is now a difference in the height of the seam and the level of the insole of about $\frac{1}{8}$ to $\frac{3}{16}$ in., that is, from the bottom of the inside channel to the edge of the trimmed seam. It is the usual practice to fill this cavity and bring to one level the whole of the forepart ready for sole attaching (Figure 147).

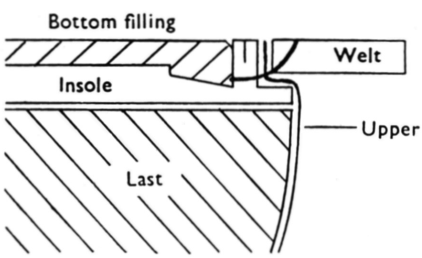


Figure 147. Cross-section of shoe after bottom filling. The surface from the extreme edge of the welt on one side to the extreme edge on the other side should be as flat as possible.

The most usual method of doing this is with a compound of resin and cork. The compound itself is supplied already mixed, and is conditioned in a steam-heated cabinet until ready for use. It is applied with a spreader which in turn is kept hot to prevent sticking. The compound is inserted to a level above the seam and rolled or pressed down. If correctly applied this is the best known method of filling bottoms, the theory being that the resin fills the needle holes and bonds the cork, and as the cork is the lightest and coolest known component for the purpose and the whole is easily applied, the combination is ideal.

The compound is now applied with a spreader and pressed with a vertical heated plate moving continually up and down. The operator simply inserts the shoe between a spring-loaded rest and the moving plate. A separate steamer keeps the compound in condition, the two machines being placed side by side, electrically heated, with the press electrically driven. The usual equipment is the Livingstone and Doughty ‘Setite’ Press and Conditioner.

On the old type of machine, water was gas-heated and steam kept the filler at one temperature, the whole being one unit with the pressure being applied manually by the operator by means of a heated roller.

There are a number of cold fillers available, but their use is chiefly confined to the lighter ladies’ or machine-sewn work. In this case the filler arrives in condition for applying in airtight tins and hardens when exposed to air. There is now a machine for the application of cold bottom filling which is also made by Livingstone and Doughty Ltd.

As to the operation itself, if insufficient bottom filling is used the sole will cave in during manufacture showing the seam, and the insole will cave in whilst in wear. This too, is one of the main causes of bottom filling moving but on the other hand if too much is used the effect is very obvious in the roundness of the forepart after levelling.

Shanks and Seat Lifts

Shanks are inserted at this stage to act as a bridge between heel and forepart of the shoe. The shanks themselves are made of a variety of materials, especially in ladies’ work.

With men’s work they are in the main of wood or steel, shaped to give support to the waist, and at the same time about equal in thickness to the height of seam. The method of attaching these shanks is to drive two tacks through the shank and insole, clenching to the plate of the last.

Ladies’ shanks are made with a much greater curve to fit the waist. Many of them are made of fibre, moulded steel being attached to it.

At this stage and on the same machine (an insole tacker) the seat lifts are put on with about four tacks; the skive should be identical with the welt and the edge placed at the start of the welt butting scarf.

They are placed with the grain side to the lasting allowance to permit the finished or grain side to be visible on completion.

On work which has a stitched or wheeled seat, the lifts themselves are bigger to allow for a row of stitching or indenting; their substance is the same as that of the welt and their use seems to ensure the continuation of the line of the feather, more so on the heavier type of shoe.

It is not by any means universal to use seat lifts on all types of work. It is difficult to lay down when and when not to use them, but generally 12 to 13 iron edge is the limit; above that a seat lift is desirable.

It should also be borne in mind that this combination has a marked effect on the pitch of the heel when the shoe is finished.

Solutioning

At this stage the bottom of the shoe is solutioned. The solution should be spread primarily around the seam and welts, as the sole when applied should be stuck to the more permanent part of the bottom.

It is often stated that this layer of rubber helps to waterproof the shoe bottom. This is rather wishful thinking as most rubber solutions used for this purpose have a very small rubber content which is comparatively insignificant when the solvent has completely evaporated.

It is desirable to use rubber solution and not latex for this operation as part of the area to be covered incorporates the seam and a narrow strip of the bottom filling; latex has to penetrate and 'key' into the material on which it is used, and these portions of the bottom do not absorb latex in this way.

There are various machines for applying solution, but the fastest and best method yet discovered is a brush in the operator's hand with a dispenser or some kind of airtight container in which to dip it.

Sole Tempering

There are two main reasons for tempering soles. The first and main reason is to enable the sole to conform to the bottom and, being naturally the stronger component, to come down to the already dry welt. Secondly, tempering enables the rounder to cut a channel to carry the stitching, such a channel being opened, stitched, and closed again while the sole is in a mellow state.

Sole tempering is a much debated operation for which numerous methods are the 'only one'. It is generally agreed that to find a universal method for all tannages and substances is really out of the question (see also p. 235).

The usual method is for soles, which have already been solutioned or latexed, to be placed in grids in a tank of water, and wetted for a suitable period, after which they are collected together and placed in a mellowing cabinet to remove excessive wetness and bring them to the soft mellow condition ideal for working.

The great problem is time, the more precise the sorting the greater the chance of correct wetting. It is unreasonable to expect good results in a dozen pairs which contains two or three different tannages but which are all given the same tempering time.

Two machines have been introduced for doing the job rapidly, the better known one being the Standard Engineering Co. Vacuum

Tempering Apparatus Model 78. ln this the soles are placed in a rack above water in a chamber which is sealed and then evacuated by a pump. The soles, from which the air has now been removed, are then lowered into the water by an external lever and the vacuum is broken. Air pressure then drives the water into the empty spaces in the leather very rapidly (for very heavy soles, pressure may be built up above that of the atmosphere, a modified machine being available for this).

After a few minutes, the soles are raised from the water and the vacuum is again produced; this helps to clear the surface water. The vacuum is then broken and the soles are removed ready for use. The total time taken in some cases is only 6 min. giving an output of forty dozen pairs per hour. No further mellowing is required before attaching.

With the BUSMC machine the soles are placed in a cylinder which is sealed and ,water is forced into the leather with a pressure of about 1,500 lb/sq. in.

These machines certainly tempered the leather, but they did not stop the tannages or grease moving, and are not at present in very general use. There are, however, a number of tempering and anti-mould solutions on the market which seem to help the problem by speeding up normal wetting methods.

With light bend soles, which are stitched aloft, and waterproof soles, it is a sound idea to mould these dry with the correct mould; in some cases the former may be lightly wetted. This saves drying time, and removes the danger of staining, the only disadvantage being that it makes things rather hard for the stitcher.

A great deal of well-reasoned and scientifically sound facts have been amassed by the British Boot, Shoe and Allied Trades Research Association on this matter, and although it would be foolish to say that no successful standard method will be evolved, at present it is rather an open question.

Sole Laying

The solution on the bottom of the shoe being dry and the sole correctly wetted, the sole is carefully applied to the shoe and the two pressed together (Figures 148 and 149).

There are a number of machines designed to carry out this operation but generally speaking the method is standard in all of them; a lower pad presses the sole against the bottom of the shoe with the last inside it; the last having been already jacked by a pin or a plate and toe rest.

Some of these machines are fitted with a pre-shaped solid rubber pad; others have water-filled bags. Another common type uses compressed air bags to force the sole against the shoe.

On all the above-mentioned machines the action is that by the operation of a pedal; one pad rises putting the shoe under pressure while another falls, releasing the adjoining shoe.

It seems that with such an arrangement the soles are not under pressure long enough; it is therefore common practice to overcome this difficulty in the following manner. When the sole is being prepared for laying, either a rivet is inserted by hand at the seat, under the heel, or two staples by a machine installed next to the sole layer for such a purpose. While this operation is being carried out, the previous sole and shoe remain under pressure. Ten-division presses (Standard) are also in common use to lengthen the time under pressure.

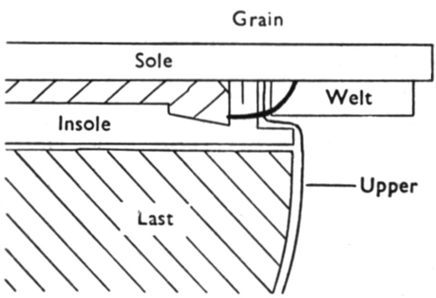


Figure 148. Cross-section of shoe after sole laying. Both sole and bottom are solutioned.

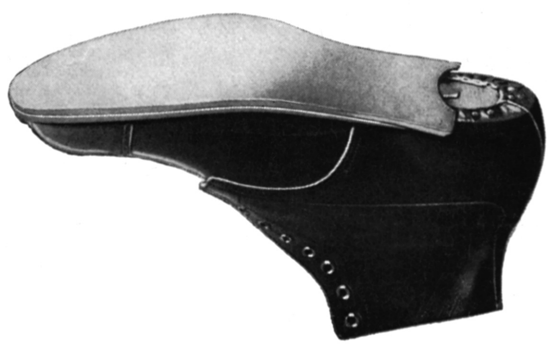


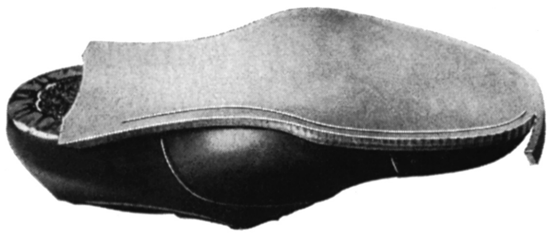
Figure 149. Boot after sole laying.

If the soles and piece-soles are chopped, it is necessary to attach the piece-soles separately on this stapler, all these operations being performed while the preceding shoe remains under pressure. It is a fact however, that the longer the soles are under pressure the better, as they conform to the bottom and remain stuck.

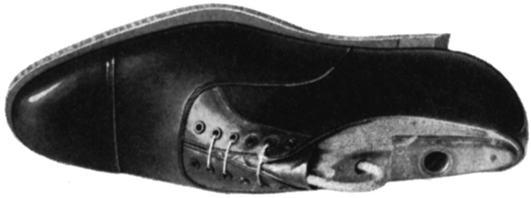
The B.U.S.M.Co., the Ralphs Engineering Co. and the Standard Engineering Co. all make twin sole layers, the last two models being arranged with the pans side by side directly in front of the operator, the Ralphs using compressed air in the bags and the Standard water.

Rounding and Channelling

This is probably one of the most highly skilled of the operations in the making room, the function of it being to round the welt and sole to a consistent width as indicated by the feather line, at the same time to cut a channel or groove in the sole to protect the stitches (Figures 150 and 151).



a



b

Figure 150. *A* Shoe partly rounded and channeled; *b* Shoe after rounding and channeling.

The machine consists fundamentally of::

(1) a guide to regulate the width of welt in the waist;
(2) a similar guide for the forepart;
(3) a knife to cut off surplus leather from the edge;
(4) a knife for cutting a channel or groove;
(5) a means of varying the width of welt in certain places;
(6) feeding mechanism.

(1) The crease guide, simply by the distance of its lower edge from the cutting knife, regulates the width of welt by running against the seam. It is used, except in the case of storm welts (see p. 291) *etc*., for determining the waist only. It is adjustable in relation to the cutting knife.

(2) The forepart guide regulates the width of welt in the forepart only, and runs on the portion of the last immediately above the feather line. It is operated by a separate treadle which brings it into

action just below the joints, at the discretion of the operator. The action of the same pedal also varies, if required, the distance between the channel and the edge of the sole.

(3) The knife which operates backwards and forwards cuts the surplus leather from welt and sole, slightly burying itself into a small piece of brass inserted in the feed block. The position of this knife is fixed and the variation is brought about by the guides as previously described. The

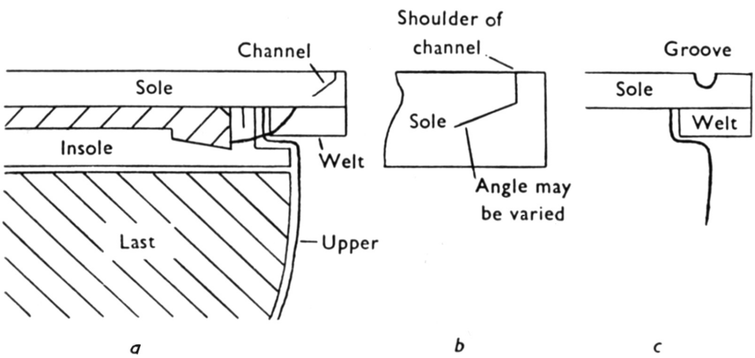


Figure 151. Cross-section of: *a* Shoe after rounding and channeling. The edges are squared and the surplus removed and a channel is cut in the sole; *b* The channel; *c* Alternative groove instead of channel.

speed of this knife, which is cam operated, is about 1,000 cuts per minute. Attached to the knife and clamped with it is a small 'sticker' point which steadies the leather while cutting and prevents the feed over-running the width of the knife: if this happened the cut would not be continuous. The action of this sticker causes no impression on the sole, but merely upon the waste material being cut off.

It should be remembered that the sole as attached is the shape as cut by the caster knife on the press and until reaching the rounder its outline has not been disturbed (see pp. 94, 218).

(4) A channel knife block runs along the sole carrying a channel knife. The depth of this channel can be varied by the position of the channel knife in the block. Its distance from the edge is varied by a small eccentric stud just below it, and its distance in the waist by a small slide block on the right-hand side of the machine which operates when the forepart treadle is depressed, or released, by the operator.

The whole of the stand feeds backwards and forwards with the feed block working from a fulcrum. The distance travelled is about $\frac{3}{16}$ in. on each stroke with a radius of about $3\frac{1}{2}$ in.

The angle of the channel (Figure l5lb) can be varied by the angle at which the knife is cut, and its length by the length of blade, the blades are made as standard in five lengths $\frac{1}{8}$, $\frac{5}{32}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{8}$ in. And the angle from 0° to 20°, going up in steps of about 2°.

The angle 0° which is parallel to the sole is naturally used for very light, ladies' soles, the usual angle being from 8° to 10° for 5, 6 or 7 iron soles for ladies' work and 10° to l6° upwards

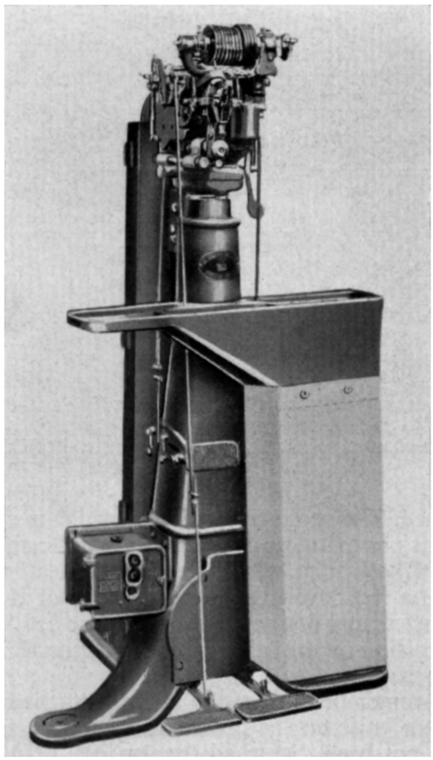


Figure 152. Standard Rough Rounding and Channeling Machine Model 86MO.

for men's work. It is usual to set the machine so that when the edge trimmer has finished, the edge of the channel is just in the edge being trimmed by the cutter. It follows, therefore, that in the case of soles bevelled all around, it is further in and with bevelled waists only the variation between foreparts and waist is defined.

For a groove (Figure l5l*c*) the machine is set so that the distance from the edge is about the same all around, perhaps slightly further in on the inside waist. The centre of this groove is about $\frac{1}{4}$ in. from the edge, that is about $\frac{3}{16}$ in. after trimming. The width of the groove is varied by the type of knife about 0·08 to 0·06 in. and its depth is adjusted in the channel block so that the stitches are just buried.

(5) There is also fitted a pattern cam which gradually throws the shoe further from the cutting knife thereby increasing the width of welt. This is used on the outside joint with the increase in width starting from the cap and finishing just below the joint. It is operated with a knee lever, is adjustable in $\frac{1}{16}$ in. and the distance of the cam's traverse can be varied for sizes.

(6) The feeding along of the work is by a small feed block in which the cutting brass is inserted. Its action is that it protrudes from the crease guide on its forward stroke and synchronising with the channel block (see (4)) feeds the work along, burying itself on the return stroke so that the shoe remains stationary; there is a double movement here to allow the channel knife to cut on its return stroke.

This type of machine varies little in design from one make to another. They are supplied by the B. U. S. M. Co. and the Standard Engineering Co. The Standard Rough Rounding and Channelling Machine Model 86MO is illustrated in Figure 152.

Channel Opening

The channel, having been cut into the sole, is opened by a small revolving tool as soon as possible after rounding. There are three types of opening tool:

(l) a shaft with a bluntly tapered tool at the end, now largely displaced;

(2) a flat tool on which are two wings to lay back the top of the channel;

(3) a pointed tool with an independent flat piece of steel moving in and out to lay back the top of the channel.

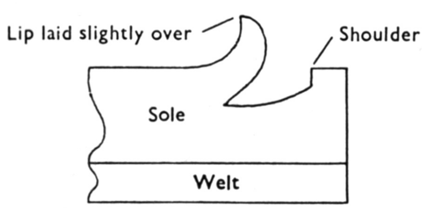


Figure 153. Cross-section of sole, showing channel after opening.

The operation although simple to execute should be carried out with care and the channel fully opened to its base (Figure 153). The sole should be still damp; in fact the operation cannot be carried out too quickly after rounding.

Sole Waist Reducing (Ladies' work only)

It is usual at this stage with the channel open to reduce the sole further by bringing the edge down to the level at the bottom of the channel. The machines used are similar in character to the shank reducers described on p. 297. The object of the operation is to reduce the edge as much as possible in order that it may be broken down to the upper, thus producing a light rounded waist, a very desirable feature of a ladies' shoe with a higher heel.

Sole Stitching

All stitching machines for securing sole to welt are lock-stitch machines, that is, they employ two threads penetrating from each side and locking together with the shuttle thread uppermost (Figure 154). There are numerous types, the oldest type in use being the 'Rapid'

Figure 154. Lock-stitch.

(BUSMC). In describing the stitch formation of this machine we describe it for all types, although the feeding and shuttle mechanism is different on other models.

The shoe is held in an inverted position by the operator. and the sole and welt are pressed together by a table and presser foot, the former being fixed and the latter movable up and down; the foot is lifted, either automatically or manually to allow the shoe to be placed on the table.

Figure 155. Goodyear type awl and needle.

An awl (Figure 155) passing upwards through the table while the foot is locked in its lowest position pinches the welt and sole together. When the awl reaches its highest point the foot releases and the awl moves the shoe to a position directly in line with the needle, the distance being variable at the discretion of the operator, the awl traversing the length of one stitch at each revolution of the machine. At this point the awl withdraws and the needle (Figure 155) closely follows through the hole left by the awl and through the table.

The thread, which runs through the machine over several rollers and through a looper and the table, is placed on to the barb of the needle by the action of the looper and thread hook. The needle which has followed the awl down withdraws back through the shoe, thus drawing a double thickness of thread through the hole. A lifter takes the right-hand thread and raises it vertically and with the thread still on its barb the needle continues to draw back. A loop is thus formed by the lifter and needle; a take-up lever which is, at this point, moving downwards with the thread on its roller keeps the thread taut and helps to keep the loop in its position by taking up the slack thread.

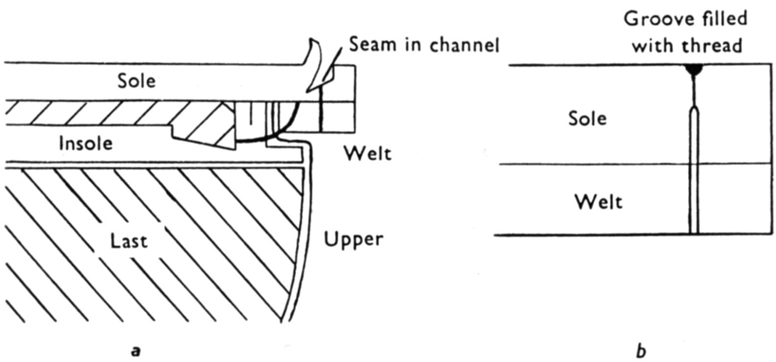


Figure 156. Cross-section of: *a* Shoe after sole stitching, showing lock-stitch seam securing sole to welt; *b* Sole and welt showing stitched aloft thread filling groove and buried below surface of sole. The loop is actually formed parallel to the edge, although shown at right-angles to it.

The shuttle, which is round and fundamentally consists of a point or nose and a separate ball of thread contained internally (bobbin), moves round until the nose enters this loop; it lifts the thread off the needle. At the same time the lifter changes direction and begins to move downwards thus releasing its hold on the thread and leaving the loop over the nose of the shuttle. The shuttle continuing on its circular course, in an anti-clockwise direction, lifts the loop until it passes over the centre. The nose is now pointing downwards. The take-up lever continues its downward course and pulls the thread off the nose, tightening the loop down to the sole with the bobbin thread inside it, thus forming the stitch.

The thread, measured off for the thickness required, is automatically controlled by the height of the foot which rises and falls with the change of substance of the material which occurs at the joints.

The stitch itself should be locked at about one-third of the substance measuring from the sole (Figure 156), that is the bobbin thread should be pulled in to that depth.

All modern machines incorporate a 'Scotch edge' device consisting of a piece of flat steel over the table which runs on the edge of the sole and welt and determines how far from the edge the stitching should be; it is absolutely essential for welted work. It is of vital importance that the stitch should be clear of the welt sewing; the cutting of the seam by the stitches is a common cause of welts failing; it also happens after being stitched on a repairer's machine without this attachment. It is usual to incorporate the putting on and taking off of the Scotch edge with the stitch variation adjustment so that when the Scotch edge is pulled off it also lengthens the stitch in the waist. This lengthening of the stitch in the inside waist helps to strengthen the already reduced waist, it is quicker, and on 'royalty' machines shows a small monetary saving as there are fewer stitches.

Table 11. Stitching Machine Data

Edge (irons)	Number of stitches per inch	Needle	Awl	Thread	
				Shuttle	Lower
4– 5	12 upwards	56	56 or 54	3 cord	4 or 5 cord
6– 9	11 ,,	54	54 or 52	4 ,,	5 ,,
9–11	9 ,,	52	52 or 50	5 ,,	6 or 7 ,,
11–13	8 ,,	50	50 or 47	5 ,,	7 or 8 ,,
13–15	7 ,,	47	45 or 43	6 ,,	8 ,,
15–20	6 ,,	45	43 or 41	6 ,,	8 or 9 ,,
	5 ,,	43	41 or 39	7 ,,	9 ,,
	4 ,,	41	39 or 35	8 ,,	9 or 10 ,,
	4 ,,	39	35	9 ,,	10 to 12 ,,

• This table is approximate and is intended only as a rough guide.

The stitch may be varied from about three and a half stitches per inch up to about sixteen, but certain modifications are necessary all up the scale.

It is usual to have the awl slightly bigger than the needle on men's work as this reduces friction through the hole. Table 11 shows thread sizes, needles etc. It should also be noted that the table should be changed, with any variation above two or three stitches per inch, the slots varying in width with the amount of feed required.

The machines are manufactured by the Standard Engineering

Co. (Models 89 and 313), Ralphs Engineering Co., and B. U. S. M. Co.(‘Rapid`, 1A, Model ‘O’, Model ‘M’ and No. 9).

It is a fair estimate that for ‘Rapid` type machines 350 stitches per minute is the maximum; these machines are fitted with oscillating shuttles and gear driven segments.

With rotary shuttles and lever driven segments on Standard 89 and 313, Model ‘M’ and ‘O’, the speed is increased to a maximum of about 600 stitches per minute. In this case the shuttles turn over twice or three times the speed of the stitch. Only on one revolution is the thread taken round.

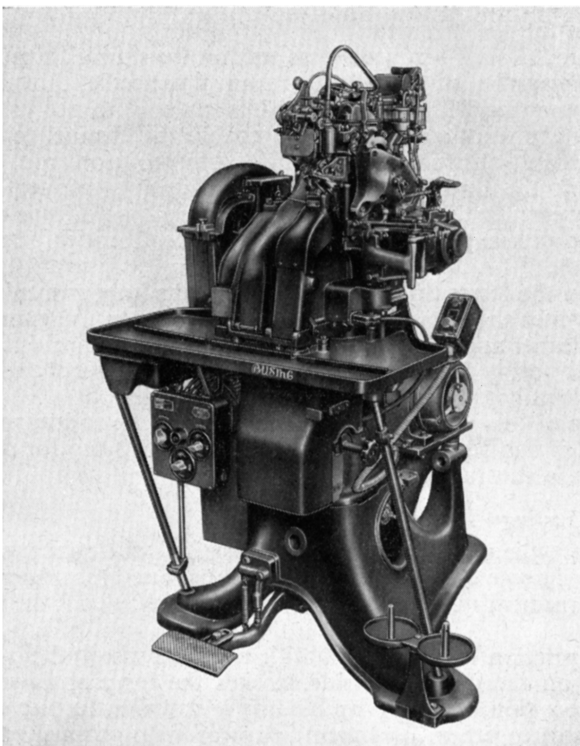


Figure 157. BUSMC No. 9 Sole Stitching Machine.

The BUSMC No. 9 is rather unique; instead of the awl feeding the work along it remains in line with the needle and the feed is by a back and forward movement of table and foot, placing considerably less strain on the awl. The maximum speed of this machine is about 950 stitches per minute. An illustration of the machine is given in Figure 157.

The twist of the thread is determined by the direction of rotation of the shuttle and may be both left and right with a variation of the number of twists per inch. It is usual on all machines to run the bobbin thread a strand or two lighter than the needle thread. The number of the ball indicates the number of single strands while the letter indicates the direction of the twist.

It is always better to use as small an awl as possible, and as small a needle as will take the thread without trouble. This somewhat increases friction while stitching but alternatively a large hole with a small stitch will weaken the welt and the hole itself will be very visible on the finished welt.

It is the universal practice to use wax on the shuttle thread which should always be slightly lighter than the needle thread. It is also the practice with work stitched in channel to use as light a thread in the shuttle as possible to enable the channel to be laid without the stitches showing through. It is fairly obvious that on aloft work the thread is subject to considerably greater friction when in wear; for this reason the shuttle thread on this type of work should be as heavy as possible and should be thoroughly buried in the groove.

Wax on the lower thread is desirable on the heavier men's work, but on lighter shoes and ladies' shoes it is better to use gum, which gives a cleaner and whiter stitch. In both cases the thread is passed through a pot; in the case of the wax, however, both pot and rollers must be kept hot. This is usually done electrically.

A form of cold wax is available for both shuttle and waxpot, but although it has been marketed for some years its use for stitching machines is still rather limited.

Channel Laying

After stitching, the open channel is brushed with rubber solution or latex; the sole being still damp, it will be found that the adhesive does not readily dry. After its wetness has gone, however, the channel is laid.

The operation is carried out with a ribbed wheel; the operator, working on the downward side, strokes the channel down to its original position, the adhesive holding it down. A further sleeking tool presses together the extreme edge of both channel and sole. The machines used are known as channel layers and sleekers.

There are machines for putting on both solution and latex, the former with a thin circular brush, gravity fed from a pot, and the latter with a metal wheel about the shape of the channel, fed in turn from a wheel running in latex, the depth of which is predetermined, and is automatically replenished from a can or bottle. These machines may be a little faster than the hand operation, and they are certainly more economical in the use of adhesive.

Piece-Sole Attaching, Seat Nailing and Paring

This operation is carried out by a number of methods, the finished product, however, being practically standard. The most common method of attachment is by means of nails of a suitable length which pin the seat lift, upper and insole and having just penetrated the latter, clench themselves on the seat plate of the last as close to the edge of the insole as practicable. This latter point is important in the making of solid seats. lt is usual to incorporate the seat paring with this operation and a knife is fitted behind the guard for this purpose thus carrying out the two operations in one (Figure l58).

The older types of seat nailers were slower but the cutting speed relatively higher; an extremely satisfactory result was obtained. If rivets

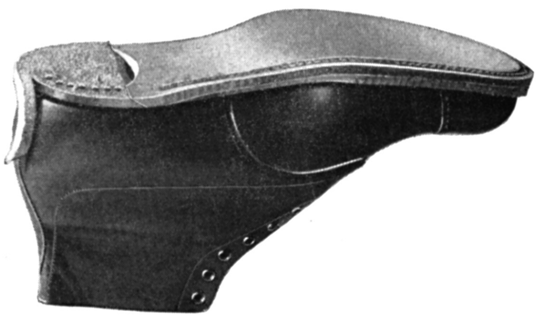


Figure 158. Boot with piece-sole attached, nailed and partly pared.

are close together it is much easier to get this clean cut, but as too many rivets are not desirable a compromise has been reached which enables a rivet to be missed on every other stroke of awl and driver.

Undoubtedly the better method is to rivet the seats separately and then pare them on a heel seat trimmer.

In striving for a high standard, it should be borne in mind that it is all taken off on the heel trimmer afterwards, so that provided the shape is there for the heeler to work accurately, such a standard, at this stage, is wasted.

lt is a matter of opinion whether the piece-soles are to be previously attached, or held on by this operator. Both methods are in general use although the latter method requires much more skill. On the other hand there is no extra grindery in the seat and the temporarily attached piece-sole will not drop off on its passage thus far.

Ladies` work generally carries a full through-sole and only requires securing and trimming with nails, fibre or pegs.

The nailing machine used for this purpose employs an awl which makes the hole and feeds the work along, the distance being decided by a pre-set throat and the machine adjustment, and this decides the space between the nails. The rivets are fed down a raceway from a mechanically driven pot, are separated one at a time and driven into the piece-sole or sole by a separate driver. It is usual to start and finish on the sole just behind where the breasted front of the heel will lie. This involves one or two rivets on the sole itself. On the high speed nailers the nails are fed to the throat every other one by a mechanical device on the separator itself.

The knife is mounted behind the guard and has a reciprocating action; the amount to be taken off is adjusted in conjunction with the distance of rivets from the edge. Both guard and knife are adjustable.

In the case of stitched seat work it is usual to rivet an extra large seat lift of slightly thicker substance than usual. The rivets are in every hole and should have an extra large head as this seat lift has to hold the stitching; the piece-sole is tacked on to the seat lift and up to the sole and trimmed on a heel seat trimmer or rounder; the whole is then stitched together and no rivets are through the piece-sole.

If the seats are pegged, as is desirable with ladies' work, the feed of the pegging machine is identical to a nailer. Here, however, the machine cuts off fibre pegs from a coil and drives them in instead of nails. The machine has no device for trimming so that this constitutes a separate operation.

It is important to see that the angle of the chop or skive on sole and piece-sole are identical and that the join is neither too far away from nor too far under the sole.

The shoe is placed in the machine by inserting the jack pin mounted on the horn into the hole in the last. The pitch of this pin is variable and is important, as it determines the angle at which the nails are driven in and the angle of the cutting edge of the knife. On the high speed machine this horn automatically lowers at the termination of each shoe and is raised to the throat and the machine started by one pedal. On the older type the lowering of the horn to insert the shoe is by a separate pedal, the position of the horn otherwise being always up.

The nailers and pegging machines are supplied by both the B.U.S.M.Co. and Standard Engineering Co. and the nails used vary from $\frac{7}{16}$ to $\frac{3}{4}$ in. according to the substance it is required to penetrate, the usual gauge being 17 to 12 or 16 to 10. To change the gauge of the rivets used, it is necessary to change both raceway and throat. All these rivets are spear-pointed.

Stitch Separating and Wheeling

Separating—It is usual on men's work to separate the stitches showing on the welt with an indent at right-angles to the upper (Figure 159). The theory to justify this operation is that it tightens the stitches; it is quite decorative, however, and justifies itself on this ground alone.

The machine is set to the same length of stitch as the stitcher and the shoe inserted between a rotary spring-loaded table and a tool with a wobbling motion which comes down between the stitches. If this is not precisely between them the tool will slide off the stitch into the cavity between. Having located the cavity a hammer action presses the tool into the welt and into the feather while the table is locked. This tool is gas or electrically heated to emphasise the impression. It is usual to separate (or prick up) from the seat on the outside to the inside joint and the result is improved if a hand plough is used first. The feed is obtained by the tool while it is pressed down, being moved across the distance of one stitch before rising.

Figure 159. Separated stitches.

Wheeling—The wheeling machine is also fitted with a rotary table, also spring-loaded and floating. The feed is obtained with a reciprocating wheel with exactly the same number of teeth per inch as there are stitches per inch. There is a loose action in the wheel itself which partly contributes to finding the stitches, but no claim is made that a wheel will do so and, in fact, it seldom does.

If the stitching is very precise and the operator good, the effect is a heavy indentation of the welt at regular intervals (Figure 160).

The edge is placed between table and wheel and the amount of spring in the table governs the boldness of the effect.

With wheeled-indented work the stitch on the welt is buried into the welt by means of a small knife which runs in the throat of the table on the stitching machine itself. This is called the sunk stitch attachment. The thread is thus buried just below the surface of the welt, and, if the awl and knife are properly cut, difficult to see.

The operation of wheeling is then carried out as previously described, but the wheel has in this case from fourteen to twenty indentations per inch, thus giving a very fine mark on an even surface and hiding the stitch (about five per inch) altogether.

The wheel on this machine is also heated, in the latest model by electricity.

Figure 160. Wheeled welt.

Stitch separators and wheelers are both supplied by the Standard Engineering Co. and B.U.S.M.Co. The separators are practically identical, the B.U.S.M.Co. being the originators of the separators and the Standard being the pioneers of the reciprocating wheeler.

Levelling

It is desirable to emphasise that leather soled work cannot reach this point too quickly after sole laying, and if possible such work should be cleared up every night. lt is usual, if at all possible, to keep substitute soles until late in the day for this reason. The purpose of the operation is to make the sole conform to the bottom of the last and set it permanently in such a position and remove all unevenness and in addition to force the sole towards the welt and the welt to its original position after welt beating. There are exceptions to this rule; ladies' channel waists for example should be brought down to the upper as much as possible having the effect of no substance on the edge and a rounded waist. The forepart should be perfectly level. Quite a few men`s shoes have a channel waist, but the emphasis is not too heavy in this case. Generally speaking men`s aloft work needs to be as nearly level as possible.

Where waists have been reduced by a reduction in the welts, and there is, therefore, weakening of that component, one occasionally finds that after stitching, the welt has gone down to the sole more than in the forepart and after stitching, the sole overhangs the welt, throwing the stitching wide. Although this cannot be put right on levelling, provision is made on the automatic type of machine for extra tip to be given to the rollers at any particular part of the shoe.

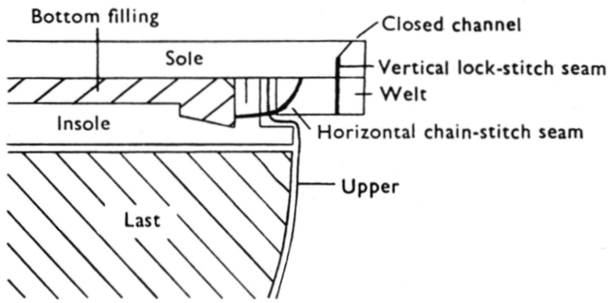


Figure 161 The completed welted seam. Lock-stitch fastens the sole to the welt and the chain-stitch passes from the bottom of the inside channel through the lips of the insole, the lining and the outside of the upper to the welt.

This type of machine consists of a jack and toe-rest which, carrying the shoe moves backwards and forwards under two brass rollers. Adjustment is made on the jack for the height of the shoe and the length of the roll, for varying sizes. All other adjustments are on the rollers themselves. The tip can be varied for waist and forepart by an adjustment to the levers. On the BUSMC Model ‘ D’ machine and the Standard Engineering Co. Model 95, a series of cams gives a very much wider range of adjustment of tip. The pressure is applied by springs and is variable.

The path of action of the machine is (1) the rollers level straight down the centre from toe to seat, (2) inside waist to joint and back to seat with rollers tipped as required, (3) inside length from seat to toe rollers tipped, (4) outside length rollers tipped from toe to seat, (5) outside waist from seat to joint and back to seat, rollers tipped, (6) down centre from seat to toe, rollers level.

By having the rollers rotating a rubbing down action is claimed, but it is generally accepted that this is not really desirable as this action tends to burnish the surface of the leather. The latest machines have dispensed with the mechanism for this purpose.

The other main types of machine for levelling, the BUSMC No. 5 and No. 8, consist of a cradle and a pre-moulded form which fits the bottom. The shoe and last are held to the cradle and are moved into a position under this form which has been carefully shaped to the bottom required. The form itself lifts to allow the entry of the shoe. After coming down on the shoe however, the subsequent movement is in the form of a rocking action by the cradle itself. The adjustment to locate the shoe in the form is by varying its position in the cradle. The forms themselves are rather expensive and require attention as they wear.

A type of leveller which has to a great extent been replaced consisted of a jack and toe-rest with a roller moving backwards and forwards. The adjustments of tipping and pressure were applied by the operator by a series of treadles and levers. Only one shoe was levelled at a time but the effect was extremely good when carried out by an experienced operator. The type of machine is still used to a great extent by repairers and the general effect is probably better than that of any machine on the market.

Machines for levelling are made by the B.U.S.M.Co. and Standard Engineering Co. the automatic model being practically identical in each case. The Model ‘ D ’ is a BUSMC product.

The welted attachment is now complete as shown in Figure 161.

VARIATIONS IN THE WELTED METHOD

Attachment of Substitutes

Vulcanised Rubber—The attachment of vulcanised composition rubber is usually extremely simple insomuch that apart from being unable to channel it, it responds very much as does mellowed leather with fewer complications, *i.e.* wetting, drying and bottom finishing. The main difference is that it is inadvisable to stitch with a small stitch as the holes made by the awl are apt to run into one another. Quite a number of rubber soles have a pattern moulded into them; they are bought as cut soles and though supplied in sizes are all of a standard shape.

Resin-rubber—This behaves, for attaching, very much like ordinary sheet rubber; it is also bought in sheet form. It is a common belief that it is difficult to channel, but this is not quite the case. It is in fact very easy to cut the channel into the sole on any ordinary machine used for the purpose and no particular modifications are necessary; the difficulty is to make the channel stay open for stitching, as when the tool of the channel opener passes beyond the particular section it has opened, the channel simply closes again. To try and overcome this difficulty a foot for the stitcher, which opens the channel as the machine feeds along immediately in front of the awl and needle, has been designed; it slows down the machine very considerably, however, and as yet is not, in the opinion of the writer, at all a practical proposition; further attempts have been made to stick the channel back without any appreciable results. The only way is to cut a groove in the surface and bury the stitches in it as with ordinary rubber, a perfectly satisfactory method, or simply to stitch on top of the plain surface.

It is desirable to bury the stitch in a groove to protect it from wear, and with welted and staple welted work this only requires modification of the rounder channel block and accuracy in the sole laying to cut this groove so that it clears the pattern.

With machine-sewn work, however, the groove is usually dispensed with, the soles being attached in the shape in which they are bought, the surplus being trimmed to the welt after stitching.

Crepe—With crepe soles, however, the attaching is rather more complicated (Figure 162).

The seats are all stitched as there is no solid material to insert the pins into on the sole side. The usual method is to secure a good quality seat lift, up to and blending with the skive on the welt. This seat lift is nailed on, using if possible a rivet with a slightly larger head. It cannot be too strongly emphasised that this seat lift holds the whole heel to the shoe.

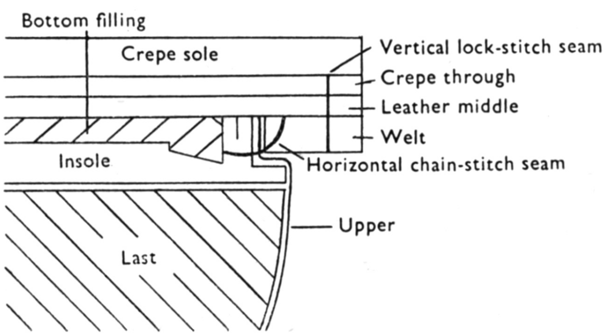


Figure 162. Cross-section showing method of attaching crepe bottoms to welted shoe. The leather middle is optional. The lock0stitch seam passes from welt to through only and the crepe is stuck on.

It is desirable to have next to the welt a light leather middle over the forepart or even a light leather through over the whole bottom. This counteracts to some extent the turning up of the welts due to there being no stable bottom across from inside to outside of the welts.

The first layer of crepe is placed next to this leather through. The most common practice is to stick with ordinary rubber solution, the leather middle or through to the crepe through and attach them both together, that is with the crepe through furthest from the welt. They are stuck to the bottom as for an ordinary welted sole.

The next stage is to round the welt leather and crepe roughly on an ordinary rounder without the groove or channel knife in.

In all cases of crepe the stitching is governed by the seam, and not by the Scotch edge on the edge of sole and welt. It is thus desirable to use a table with a fairly wide front, to keep out the stitching from the seam, and as small a needle and awl as possible (holes in crepe ‘run’ very easily). The stitch itself should not be shorter than four or five stitches per inch. To dispense with any undue heat on awl and needle, and its adverse effect on crepe, cold wax is advocated in all cases where crepe has to be sewn or stitched.

It is not always necessary to round before stitching; if the throughs are cut reasonably well to shape, rounding can be dispensed with from heel to heel, but it is nearly always desirable to shape the seats roughly.

After stitching all around the shoe, it resembles a shoe with a single crepe sole with the stitching aloft. It would be impractical, however in this state for wear, as the stitching would very soon wear and the crepe would fall off.

At this stage the surface of the crepe through and the surface of the sole which meets it are solutioned. The solution used differs from that of ordinary solution as it softens or jellifies the surface of the crepe. After leaving for a short period long enough for this to happen, the sole is applied to the through and the two are pressed together in a sole layer. Another method is that the crepe through already stitched, is scoured on a single roll bottom scourer. This has the effect of roughing the surface of the crepe and the effect of the heat generated by the friction of the scouring also leaves the surface sticky; the sole is applied to this sticky surface and the result is a very satisfactory bond. The sole may, if desired, be similarly treated to make doubly sure although this is not really necessary. The danger with this latter method is that the thread may be damaged in the scouring. It is also much slower than the solution method, although a better bond is obtained. As the former method is, in the opinion of the writer, quite satisfactory a more complicated method seems unnecessary. Crepe to crepe bonds are very satisfactory, if the correct methods are used, as they are welds more than sticks and seem to improve with time. It is the crepe to leather which is the real problem.

The whole shoe is now rounded again and is ready for heeling. The substance of the crepe through and sole depends of course on the edge required; as a general rule however it is not advisable to have the sole heavier than the through, as the latter is rather heavier at the toe on the stitches. This is where most of the trouble with crepe work comes, the through parting with the welt as the stitches have pulled through it.

A further form of this attachment gives a corrugated effect on the edge (Figure 163). The method of carrying this out is described above except for the following additional details: (l) A wider welt is used. (2) When the shoe is rounded the knife is set back from the cutting brass so that only the crepe is cut, up to, but not through, the welt, giving a step effect. (3) The edge is trimmed with a stone and cutter stepped, the welt portion being coloured and set. (4) The rand, in the form of corrugated strips of crepe, is stuck on by hand, after both the strip and edge have been thoroughly solutioned. The surplus crepe from the strip above the sole is trimmed off either with a heated knife or on a machine.

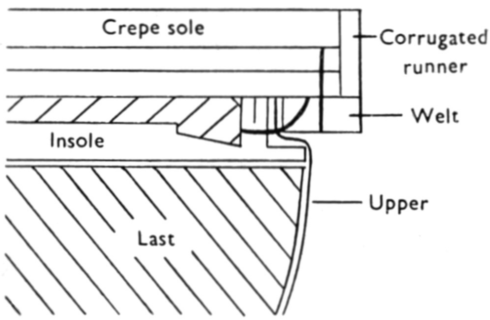


Figure 163. Cross-section showing alternative method. The fundamental construction is as for ordinary crepe, with a runner stuck to the edge.

Curtain Crepe, Welted Method

This method of attachment has come into use comparatively recently, and gives a flexible and pleasing result. It is also cheap and easy to manufacture but rather difficult to repair, a fact which is somewhat offset by its long life.

The insole is channelled as for welted work with the channel extended all around the seat, usually at about $\frac{5}{32}$ in. from the edge of the insole except at the outside joint where it may be brought slightly nearer, although any swell required may be obtained by the edge trimmer.

The lasting is carried out as for the Goodyear welted method except that the seat is stapled to the inside channel on the side laster or lasted with wire on a bed laster.

A strip of corrugated crepe, about $1\frac{3}{8}$ in. wide is sewn all around on the normal welt sewer fitted with a special welt guide (Figure 164*a*). The surplus upper, above the seam is trimmed off on a surplus upper trimmer, or it may be removed on an ordinary bottom scourer using a rough paper. After the bottom has been filled, and a suitable shank inserted, the crepe sole and through, together making the required substance, are stuck to the bottom with rubber solution, and on a sole layer. They should slightly overhang the seam (Figure 164*b*).

The heel is now stuck on either by friction or solution and the work goes to an edge trimmer, who shapes the bottom according to the last and in relation to the amount of welt it is required to show beyond the shoe.

The edge thus formed is solutioned, as is the plain side of the crepe welt; the corrugated portion is lying next to the upper at this stage. After allowing both surfaces to dry thoroughly, the crepe welt is turned up and stuck to the edge of the sole by hand; a certain amount of stretch should be taken out of the welt before its solutioned surface comes into contact with that of the sole as this tension holds the sole up to the shoe.

The surplus welt above the sole and heel is trimmed off, either by hand or on an ordinary machine-sewn surplus upper trimmer. It is usual to heat the knives for this operation and the heating of the hand knife also speeds it up (Figure 164*c*); the latter is in fact probably the quicker method.

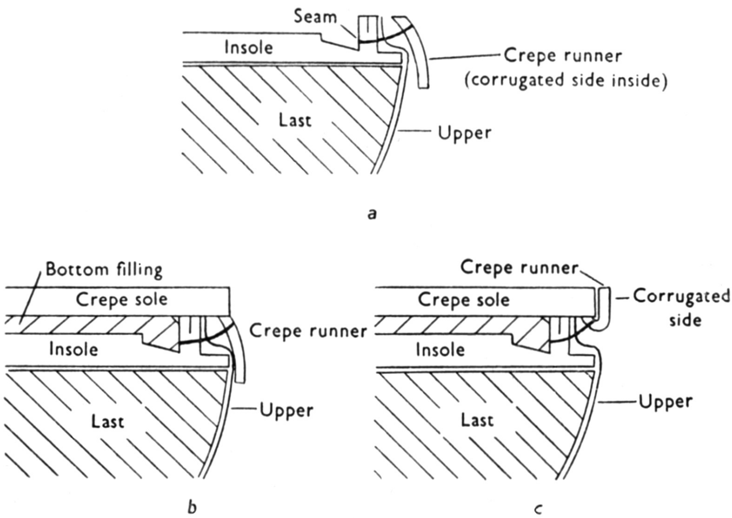


Figure 164. Cross-section illustrating the curtain crepe welted method : *a* Corrugated or plain crepe runner is sewn all round with the corrugated side (if any) next to the upper; *b* Seams levelled, bottom filled, crepe sole stuck on and edges trimmed; *c* Runner turned back on sole and stuck to its edges (crepe to crepe bond). The corrugated side is now outside. The process is completed by trimming off surplus.

Note: The through is optional, and is not shown here.

Veldtschoen Welted

A method used to a fairly large extent for golf shoes, shooting boots and shoes where the waterproofing needs to be as positive as possible, is a combination of veldts and welted, the lining being welted and the outside made as a veldt.

The insole is channelled in the ordinary way, either to heel or around the seat, and the shoe for lasting purposes is treated as welted except for one or two details. The seat should be flanged on the outside of the upper only in a manner described for ordinary veldts (p. 361). A stiffener is inserted and the back tacked over, without the outside, that is, stiffener and lining only, paste being used on the inside of the stiffener, next to the lining, not on the outside.

The puff is put next to the lining, and a piece of paper inserted above it to prevent the vamp sticking to it.

The shoe is pulled on in the ordinary way, and the toe is lasted as welted. The sides are, however, lasted with rivets on a welt 'Consol' with their heads left standing (Figure l65*a*). The shoe is now left standing until the puff is thoroughly dry and has set to the shape of the toe. When this condition has been reached the wire is removed as are the pull-over rivets and the rivets holding the sides. The

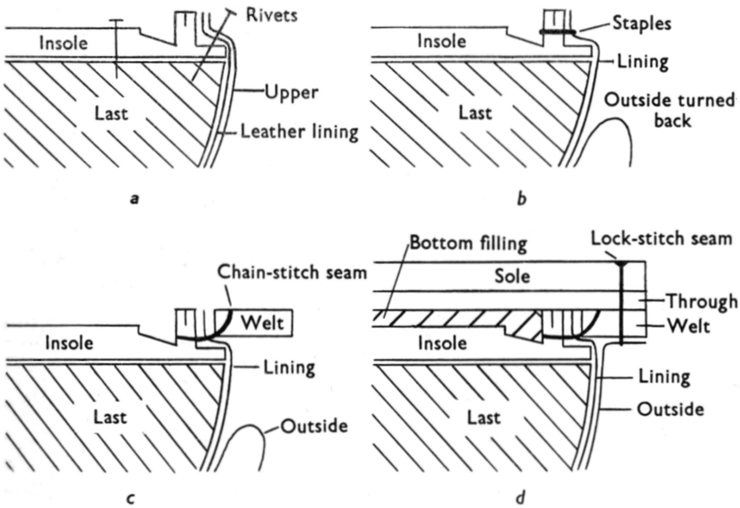


Figure 165. Cross-section illustrating the veldtschoen welted method: *a* Upper lasted in normal welted fashion except that rivets are used in sides instead of staples; *b* Rivets removed, outsides turned back, and lining stapled to lip on side laster; *c* Welt sewn in, inseam trimmed, welt beaten; *d* completed bottom, with outside solutioned and stuck to lining and upper side of welt, bottom filled and sole attached with lock-stitch seam through sole, outside and welt.

outside is turned back all around and the sides of the linings may be stapled on an ordinary side laster (Figure l65*b*). It will be noted that the effect of the bed laster plates and the tension on the wire has had the effect of flanging the vamp.

We have now a shoe in which the lining is lasted and the outside turned back. A welt is sewn in, either to heel, or all around the seat. This welt is a normal welt except for the fact that it is slightly wider and has either the grain taken off it, or is bevelled and grooved the reverse way round. The reason for this is explained later. After inseam trimming, welt beating and butting, the welt is left to dry (Figure 165*c*).

If the shoe has been channelled and the welt sewn all around, the meeting of the two ends of the welt needs trimming up on the bench.

If the stiffener and lining have been lasted with tacks machine-sewn fashion and the welt sewn only to heel, a seat lift of good quality is tacked on up to the welt, flesh side to the upper, and nailed to the edge of the insole through the stiffener, lining and insole. This is perhaps the better method, as welted seats sewn on a machine are not highly successful, either in process or wear, the riveted method giving a much more level insole, the grindery in any case being covered with a heel sock.

The surface of the degrained welt and lining and the flesh side of the upper are now solutioned and allowed to dry, after which the outside is brought down and stuck to the welt being thoroughly pressed into the feather. This bond may be finally pressed together on a welt beater which also serves to define the feather line along the upper (Figure 165*d*). It is usual to use a good leather lining and a stout upper, bearing in mind the eventual purpose of the shoe.

The seam is sealed with wax to ensure filling the needle holes, the bottom filled and usually a sole and through stitched on with one row of heavy wax stitching through sole, welt and outside. It is then treated as heavy welted, except for the fact that no stitch separating is either desirable or necessary.

22

THE MACHINE-SEWN METHOD

Blake Sewn, Machine-Sewn, McKay or Tacked work

The expression machine-sewn, just M/S or McKay is often used in cases where no machine sewing is done to the shoe whatever; it defines the method of lasting in so far as the tacks (1) are shorter, (2) are clenched on the inner side of the insole through contact with the plate of the last, (3) are permanently in position for the life of the shoe. Variations are shown in Figures 166 and 167.

LASTING

Lasts

The lasts themselves are plated all over the bottoms in order to clench the lasting tacks. There are three holes in this bottom plate of about $\frac{1}{2}$ in. diameter; they are located near the toe, at the joint, and in the seat; three holes only are quoted as this is the standard number, but any number can be made anywhere in the centre of the last as the important part of the plate is about $\frac{3}{4}$ in. in from the feather all round, the part on which the tacks are to clench.

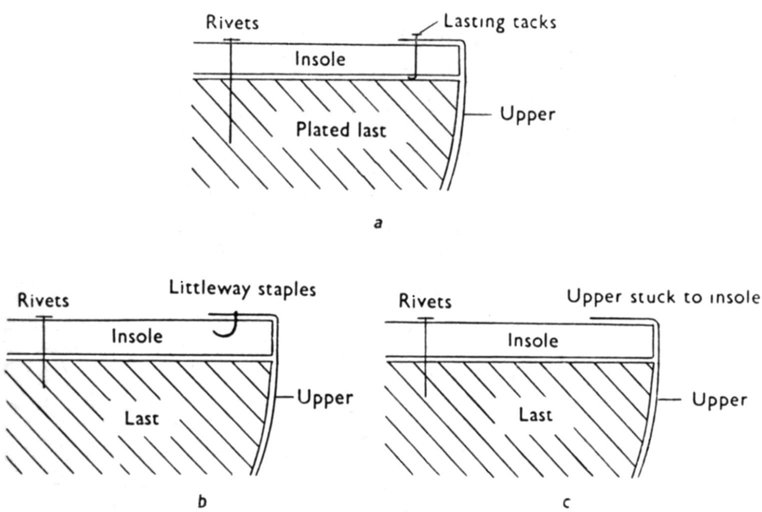


Figure 166. Cross-section showing three methods of machine-sewn lasting: *a* Tacks clenched on plate of last; *b* Littleway stapled; *c* Upper stuck down. In all cases the rivets securing insole to last are afterwards removed.

Machine-sewn lasts usually carry a little more toe spring than welted lasts, the assumption being that the forepart of the finished shoe is not as flexible as that of a Goodyear welted shoe. This is especially true of lasts on which screwed or riveted work is made; there is no flexibility in the finished shoes so that the assistance for the foot in walking has to be incorporated in the shoe (see p. 61). Lasts used for the making of wooden soled clogs are the most exaggerated form of this practice.

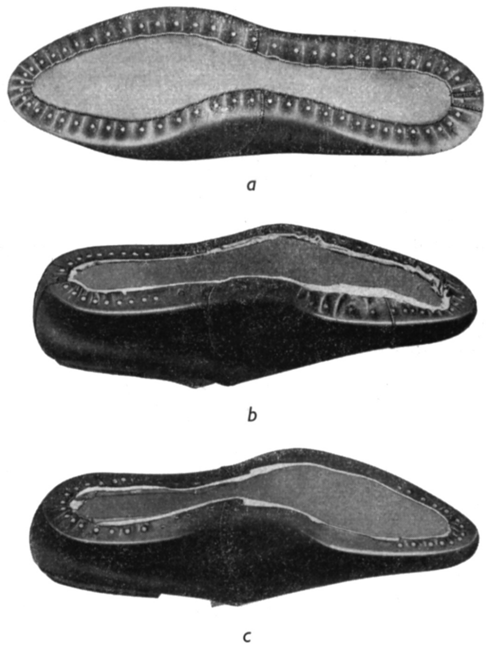


Figure 167. Bottom appearance after lasting by the three variations of the machine-sewn method: *a* Tacked; *b* Littleway stapled; *c* Stuck sides.

As the lasts are slipped after lasting in all work of this character, except staple welted, the time schedule for lasts is considerably shorter. Stuck-on work is usually slipped after sole attaching. Some of the lower heel and crepe work may be completed on the last but these are exceptions to the rule.

On some ladies' work the lasts are not slipped until the work is ready for socking in the shoe room, the heels being attached by inserting a screw through the last which has been drilled right through and securing the heel temporarily to the insole until it can be attached permanently in the ordinary manner. This involves some trouble but the advantages are very obvious.

Insole Tacking

The insole for this type of manufacture is perfectly plain, the only preparation (see p. 228) being the rounding to shape of the last; on the heavier type of boot it is desirable to bevel the insole slightly around the edge on the flesh side. Insoles are not always rounded to exact shape of last: on ladies' high-heeled shoes they are often rounded under at the inside joint.

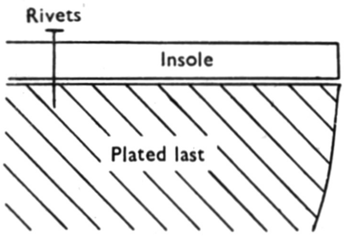


Figure 168. Cross-section illustrating insole tacking for machine-sewn work. The rivets pass through the insole and the holes in the plate of the last into the wood.

The last is jacked up on a pin and toe-rest and the insole located on the last; three rivets are inserted, through the insole and the holes in the plate into the wood, that is, one at each point (Figures 168 and 169). There is a certain amount of skill required to drive the rivet into the insole at a point where it will enter the hole in the plate, as the hole is blind when the insole has covered it.

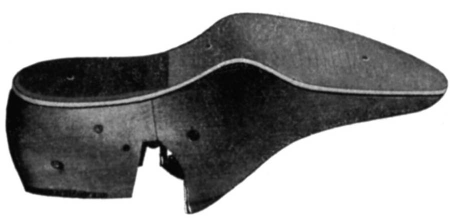


Figure 169. Machine-sewn insole attached to last.

In some cases a staple tacker or ordinary machine tacker is used, in which case the operator does not jack up the lasts, but holds the insole and last up to the nozzle of the machine for the staple to be inserted, judging where the hole is in the process. This method may be a little quicker, but is not in such widespread use as the hand method, the disadvantages being that a double hole is made in the last. Lasts worn at these places can be repaired easily with wooden plugs.

The nails used are approximately $\frac{9}{16}$ in. and should be of a fairly light gauge with a fairly large head. Provided they are long enough to hold the insole their length and gauge are not really critical.

It is worth mentioning that it is the practice in some factories for the pulling-over operator to hold the insole to the last, usually on ladies' work only, without any previous form of attaching. This method is carried out on the upright and inverted pull-over machines on cheaper classes of work, and while it is desirable from the point of view that it eliminates two operations, tacking on insoles and withdrawing nails, the location of the insoles leaves much to be desired and the practice is gradually dying out.

It is also quite common practice to back ladies' insoles, especially in the waists on work carrying the higher heels, with fibre-board, the completed component being moulded to fit the last. The process is known as insole reinforcing and is designed to support the wooden heels and to prevent them from 'walking over'.

Seat Rounding and Bevelling

These operations are carried out in the same manner as for welted work (see p. 270).

Stiffeners and Puffs

These are the same as used in welted work (see p. 270). The paragraph on preparing the uppers for the lasts also applies to this type of work.

Back Tacking

This operation is also carried out as for welted work (see p. 278).

Pulling Over

The machines are exactly as those described for welted work (see p. 278). The difference in their operation lies in (1) the action of the drivers, (2) the type of tacks and (3) the location of the tacks.

The drivers in this case drive the tacks home until the heads are level with the upper material which is now lying flat on to the insole. The usual amount to fold the upper over the last is about $\frac{1}{2}$ in. The tacks penetrate the upper, lining, puff and insole, and should be just long enough to clench on to the plate of the last. Their position as it refers to centre of toe, cap line *etc*. is the same, but whereas they should be as far out as possible on welted, on machine-sewn work they should be further in, as all forms of subsequent attachment come between the edge of the insole and the lasting tacks.

The tacks themselves are shorter and have square shanks; they vary in length as the substance of cap, lining,puff and insole demands. All tacks in this type of work are left in and are a permanent part of the shoe, although it is the custom to remove the front one for bed lasting.

Jointing and Seating (Hand Operation)

It is the practice on ladies' work on lasts carrying above $1\frac{1}{2}$ in. heel to tack over the corners of the seats and joints. The lining should be cleared and the stiffener located so that it fits the seat at the moulded edge. The inside should be tacked down first and then the outside.

The next tack should be just below the joint with the lining first cleared, the whole being vertically strained or slightly towards the toe. The inside is always done first, as such lasts are very much more hollow at the inside waists. Two tacks are inserted at this point, one on each side.

Although it is not usual to joint men's work, it is sometimes the practice to tack over the seats before side lasting on welted work.

The sequence stated is controversial; many people prefer the jointing first.

Side Lasting

'*Consol*' *Machine*—The machine most commonly used is the 'Consol'. This machine is based primarily on the hand method of lasting as its full name (Consolidated Hand Method Lasting Machine) implies. The machine has every device to reproduce the actions and methods of a hand laster and with a good operator the difference cannot be detected.

It consists of pincers which grip the upper and pull it over the edge of the insole, these pincers being adjustable as to strength of pull and grip. Their action is that they are open until they have reached the bottom of their downward stroke, the height of this movement in relation to the insole being determined by a foot on the insole itself; they then close and draw the upper upwards. At this point they twist at the operator's discretion to dispose of any fullness of material.

Their next action is backwards, still gripping the upper, drawing it over the insole. At this point the carrier block working horizontally comes forward with a wiping action. This carrier block contains an already sorted tack. When it has reached a point almost at the end of its stroke the pincers open and release the upper. The carrier block continues moving forward until it has reached the end of its stroke. At this point a slanting driver bar comes down and working through a hole in the carrier block drives home, in an inwards direction, the tack which the latter is carrying. It then withdraws to be fed with another tack.

The machine is fitted with a double tackpot and double raceway for two sizes of tack, the extra length to cater for extra material at toe and seat; this is easily adjustable by the operator, a small handle on the right-hand side moving the raceway. Each tack is accurately separated and the raceways are fed by a rotary movement of the pot itself in which are a number of shelves delivering the tacks into a chute.

Fitted to the machine also is a pair of knives, a left and a right-hand knife; these knives are used in the pleating of toes when the latter are lasted on the machine. They are controlled by a hand lever on the left-hand side of the machine and are instantly brought into action by a lever at the discretion of the operator. They are used on heavy work only.

'Littleway' Machine-—This machine is made exclusively by the B. U. S. M. Co. and its full title is the Staple Side Lasting Machine Model C. This machine leaves the inside of the insole perfectly free from any grindery round the margin at the edge of the insole. The pincers are of the straight type and their action is to pull the upper up and over the edge of the last. A rather important feature, too, is that the staple is driven into the shoe and clenched before the pincers release the upper. There is also no vertical, or near-vertical, blow from the driving bar as on the 'Consol' (see Figure l65*b*).

The staples are formed in the first place in the orthodox manner from very fine wire (0·022 in.). They are wider than normal when formed and the curving action is obtained by their hitting a baffle plate. The staple is driven in with the points curving inwards towards the centre of the shoe, so that the whole action tends to keep the wire away from the needle of any sewing machine following.

The insoles for such a machine should not be less than about 4 irons and should be not too tight in texture.

The staple making speed of the machine is around 150 staples per minute.

Micro-Tacks—A new development made necessary by the fact that the needle of the Lock-stitch Model 'C' machine does not relish hitting tacks, is the 'Consol' using a tiny form of tacks about a third the thickness in head and shank of the ordinary tacks.

This is a particularly commendable innovation as it reduces the size of the point penetrating the insole and to some extent reduces the weight and adds to the flexibility. Any reduction in metal in shoemaking is desirable and the lasting tacks, except in cemented, are made superfluous when the seam is made outside them. An ordinary 'Consol' is used, fitted with a special raceway, separators, carrier blocks *etc*. The method is as yet, very new, but the idea seems to be a definite step forward.

Toe Lasting

There are three machines for lasting toes: (l) 'Consol', (2) bed laster, (3) BUSMC No. 9 Toe Laster.

(l) *'Consol'*—This is not the oldest method, as the bed laster preceded it, and although the latter was itself displaced, it has returned in an improved form and the earlier model has not the universal use it had some twenty to twenty-five years ago.

The machine has been described above, and its action plus the use of a buffer and, for heavy work, the use of the knives, is that for side lasting.

The finished result from this machine is not to be compared with that of a well-operated bed laster or BUSMC No. 9. It is an accepted fact that toes lasted on this machine always require pounding and the operation itself is really hard work for the operator. The fact that the puffs are not cut out on this machine also contributes to a heavier and more clumsy toe.

(2) *Bed Laster*—The machine and action of the head have been described previously (p. 283). There are one or two modifications in the operating for tacked work. The method of inserting the shoe and adjusting the plates is the same. The action of the plates in moving in however, is not limited in the distance they travel by a channel, as the insole is perfectly flat. The plates are therefore brought forward so that the upper is wiped flat over the insole for the area of the lasting allowance. The plates are then withdrawn to allow about $\frac{1}{8}$ in. of upper to show beyond them. A hand tacker is used to insert a row of tacks around the edge of the plates. The plates are moved again over the whole area, withdrawn, and the shoe removed from the machine. The result is a flat lasted surface which, if properly produced, should in many cases not require any further handling in the form of pounding *etc*.

The hand tacker itself consists of a barrel containing a spring-loaded driver and part of a raceway and separator. It is worked by the operator by holding the barrel in his left hand while with a grip hammer in his right hand he strikes sharply the top of driver forcing a tack through the nozzle and driving it into the shoe. The angle at which this tack is driven in is decided by the angle at which the operator holds the barrel to the plates.

The tacker is hooked back to a tackpot with the remaining part of the raceway and is automatically replenished.

The Standard model 240 ZAMO is very similar.

(3) *No. 9 Toe Laster*—The function and action of the machine is to carry out mechanically on machine-sewn toes, the job described for bed-lasting, the movement of the wiper plates being practically identical in direction. The toe spreading action of spreading the upper over the plates by a shaped frame in the operator's hand is reproduced in the form of upper spreading lingers. The manual action of wiping in the plates with a hand lever, the spreading of the toe and the driving in of the tacks, which are all done by hand on the No. 7, are carried out completely mechanically by this machine.

In construction and general working the machine is very similar to the seat laster. Seats are more or less standard in shape, but toes are a different proposition and vary in shape very considerably. This standardisation of seats has contributed to the seat laster in its present universal form being such a success. The action of the tackpot and separators and the feeding of the tacks to the drivers is identical, the main difference being that fourteen are inserted instead of twenty-two.

The wiper plates are made in such a shape as to reproduce the outside contours of the toe of the last. Each set is accompanied by a set of tacker guide plates to locate the tacks in relation to the outside shape of the toe.

The position of the shoe may be varied forwards and backwards. This plus the adjustment of the wiper plates determines the amount of area wiped and the location of the tacks, which should be as near the edge of the upper as possible, both to be out of the way of the seam and to give a greater area of wipe to flatten the toe.

Provision is made, by a compensating device, so that the shoe, once the machine has been set, is held up to the plates at the same height and at the same pressure. A toe rest, as on the bed laster, provides a rest for the toe; this is slightly further forward nearer the toe, is adjustable and locks to take the weight of the drivers as they drive in the tacks.

A foot or guide pressing on the insole ensures the correct location of the last; side plates also locate the position of the shoe in relation to the wiper plates and centralise the toe. The combination of this foot and the toe rest locks the shoe in position while the machine is working.

The machine is tripped by a knee lever, the clamping, wiping and inserting of the tacks being carried out on tripping. The operator thus has his two hands free to handle the shoe.

There are two tackpots for varying sizes of tacks, these being changed by a single lever as on the seat laster.

The machine is extremely fast and efficient. As in a great many semi-automatic machines the work has to be right before being put up to it. The setting for each shape and pattern calls for considerable intelligence and mechanical initiative and really constitutes 90 per cent of the skill required to turn out a first-rate job.

Pounding

The operation consists of flattening the surface of the lasted portion of the upper, smoothing and defining the feather of the insole and removing any creases which may have occurred in lasting.

The machine consists of a shaft running at fairly high speed carrying a drum, mounted in the centre. This drum is composed of a number of spindles on which are loosely mounted rings, which give a hammering effect when running at speed. Also mounted on the shaft on the right-hand side is a grater or cutter, the object of which is to remove the surplus material which has collected at the toe during lasting. A leather pad or smooth steel wheel on the left-hand side of the machine irons out the creases above the feather and an eccentric operates a seat and feather tapping device; this operates when the shoe is pressed against a small steel plate which is gas heated. The machines are made both by the B.U.S.M.Co., and the Standard Engineering Co.

It is customary for the machine to be fitted with a fan and a unit for collecting dust from the grater.

Surplus Upper Trimming

The machine cuts away surplus leather after lasting from inside the line of tacks. lt is used extensively in the cement process and should be used on light machine-sewn work as well. It consists of two knives, one stationary and one moving backwards and forwards to give a shearing action. Models are made by the B.U.S.M.Co., the Standard Engineering Co. and the Ralphs Engineering Co.

Filling

The insole rivets may now be removed and the bottom filling inserted (Figure 170). This takes the form of either a cold filler or felt cut to shape. It should be borne in mind that any form of shoe lasted as described above may be fitted up with pre·rounded bottom material as the shape of the insole determines the shape of the bottom. Apart from any deliberate variations the shape of the bottom

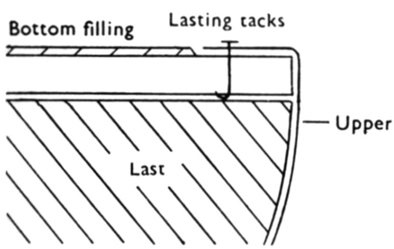


Figure 170. Cross-section showing machine-sewn shoe after insole tack removing and bottom filling.

of each shoe is a faithful copy of its fellow. The width of the lasted edge of the upper may vary considerably due to the variation of stretch, and the tacks may not all be in the same place on every shoe; this shape may also be varied by the surplus upper trimmer. It may therefore be said that the cold filler rather than the felt is the surest way of filling the whole of the bottom.

Note: The method of lasting which has just been described applies to work which is to be cemented (except when cement lasted), machine—sewn, riveted, screwed and stitched, Littleway lock-stitched and staple welted.

ATTACHING THE SOLE

There are various forms of machine-sewn work and these will be dealt with under the following headings:

(l) Machine·sewn.
(2) Machine-sewn middle, stitched forepart, sewn waist;
(3) Machine-sewn through, stitched to heel.

(l) **Machine-Sewn**

Sole Tacking—The sole which has been previously rounded and channelled is now attached before the last is slipped, the most common method being to stick it on and open the channel afterwards. Soles are attached, with the channel open, on a wire-grip tacker either by placing the metallic fasteners on the sole or in the channel. They may also be attached after the last has been slipped by the method described below. This is not to be compared with the stuck-on method, however, and is described for the reason that it is cheaper as it cuts out an operation and is still in use in some factories. .

This machine is an ordinary tacker with a wire spool and a feed mechanism to feed sufficient wire to the knives for each sprig. Having measured off the correct amount a driver drives the sprig into the grain surface.

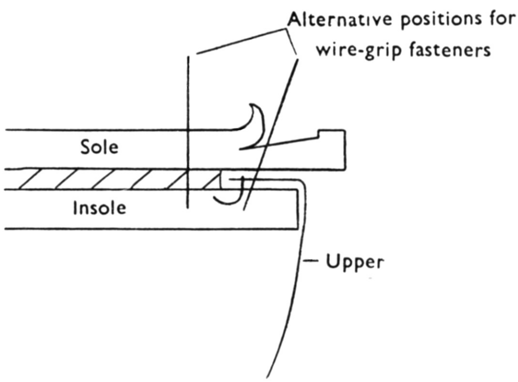


Figure 171. Cross-section of machine-sewn shoe with the sole attached on a wire-grip tacker. The wire fasteners are left with heads standing so that they can be removed after sewing.

The operator, having located the sole, turns the shoe and sole over in his right hand, and while ensuring that the sole will not move, depresses a spring-loaded horn with either his left hand or foot and places the horn inside the shoe. The machine is tripped separately for each tack which is to be put in; it is usual to put one at the toe, one at each joint and two at either side of the sole at the seat, The sole is thus temporarily attached and the shoe is removed (Figure 171). The horn tip is a flat surface and whatever the position of it the tip is always immediately under the driver ensuring that if the sprigs come through they will be flattened and clenched.

Blake Sewing—This operation is to sew the sole in the channel, through the lasted upper, to the insole (Figures 172 and 173). The sewing should be about $\frac{1}{8}$ in. or less from the edge of the insole. It will be obvious why lasting tacks should be as far in as possible, as the hitting of a tack tends to break or blunt the needle or at least strand the thread.

There are two chain—stitch machines commonly used for this operation and one lock-stitch machine which is described later (p. 373).

The machine consists of a freely swinging horn through which the thread passes after previously going through a waxpot; the horn itself is heated. Inside the horn is a geared mechanism in which a

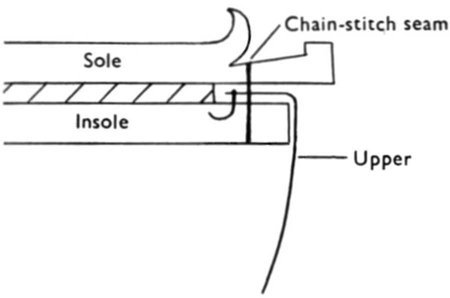


Figure 172. Cross-section of machine-sewn shoe after Blake sewing. The chain-stitch seam passes through insole, upper and sole into the bottom of the channel.

pinion drives a whirl; the thread passes continuously through a hole in this whirl (which is equivalent to the looper on the welt sewer).

The needle or hook acts as an awl and makes its own hole. Its action is vertical and, when it has passed through sole and insole, the whirl places the thread on to the barb with a circular movement. The needle moves upwards with the thread, pulls it right through the sole and begins to descend again leaving the thread looped round its own shank. A small cast-off, which fits over the barb but does not descend with the needle ensures that the previously made loop

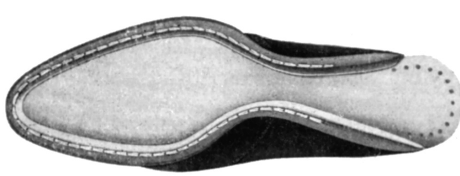


Figure 173. Shoe after Blake sewing.

does not get on to the barb during its next downward movement, but remains in such a position that the new loop will be drawn up inside it (Figure 174).

While the needle is out of the shoe a small feed point moves the shoe along the required distance so that when the needle again descends and ascends, the new loop it carries is passed through the previous one. As it was standing vertical the amount it covers lying in the channel is equivalent to the length of stitch; this is adjusted mechanically on the machine. The length of stitch, the thread tension and the pressure on the foot may all be adjusted.

The two types of machines are the Blake sewer and the improved or Richardson sole sewer. The actual stitch formation is the same but the latter is fitted with two speeds and various refinements and a smaller horn and is very much faster. It has largely displaced the ordinary Blake machine which, it is claimed, is considerably more robust and suitable for heavier work. Sewers are made by most shoe machinery firms, whose models are almost identical.

Figure 174. Chain-stitch

On all classes of Blake sewing it is desirable to use as small a needle as possible. It is true to say that the larger the needle the easier it is for the operator to eliminate thread breakages. The result however, is an excessively large hole showing on the insole and the hole through the sole tends to make the shoe less waterproof as wax will only partially fill it.

Below is given a table of needles and the thread they should reasonably carry, but the sizes are bound to be dependent on the harshness of the leather on sole and insole. It is desirable to have the soles nicely mellowed when sewing, as with all horn machines there is a tendency to twist the shoe from toe to heel when turning the horn, especially on the second side of the toe.

Needle size	*Thread*	
3	4 cord	
4	5 ,,	(The thread one
5	6 ,,	up on the needle)
6	7 ,,	

(2) **Machine-Sewn, Stitched Forepart**

In this case the shoe is taken after bottom filling and a middle is attached with a staple tacker; this middle should be mellowed. The last should now be slipped and the middle sewn on the flat surface of the flesh side. The Blake machine is again used for this operation, the only difference being that a flat foot is used for a flat surface, as against a pointed one for insertion into the channel.

The staples may or may not be taken out although they are better out, and the middle levelled and the ‘welt’ formed by the middle overhanging the feather smoothed out. The middle should be of sufficient size to allow enough welt for stitching. A guide ensures the correct placing of the stitches in relation to the feather. After allowing the middle to dry, a sole, which has been suitable channelled for stitching in the forepart and sewing in the waist, is attached by a wire grip or stuck on.

The sole is stitched to the middle. The shoe is then placed on the horn of the Blake machine and each waist from seat to joint is sewn separately in channel straight through to the insole. This form of attachment is fairly common for a cheaper shoe and is, in fact, a good method. It is direct attachment in the waist and indirect in the forepart. The channel is solutioned and laid and the shoe is ready for levelling.

A form of attachment which looks like the above is an ordinary Blake sewn, already described, with a slightly wider sole. The overhung portion is placed on to the table of a stitcher through which runs a rand. The forepart is then stitched; the rand being stitched to the sole gives the shoe the appearance of a stitched forepart, or even a welted shoe with the waists closed. This latter operation is purely decorative; the only reason for doing it in preference to a machine—sewn stitched forepart is that it is claimed to be more flexible.

(3) **Machine·Sewn, Stitched to Heel**

The conditions for this type of work are as with the stitched forepart. Instead of a middle being tacked to the lasted shoe a ‘through’, either whole or to toe, is attached (Figure l75*a*) and, while ‘ mellow, is sewn on the Blake machine to the insole (Figure 175*b*). After some form of levelling and laying back the welt, the sole is attached (wire-grip tacker), and the shoe is stitched to heel; it is thus an example of machine-sewn which is indirectly attached (Figure l75*c*).

It is quite common practice to put the shoe back on to the original last; in this case the sole can be stuck on, rounded, stitched, levelled *etc*., as a welted one. The fact that the shoe is back on its original last is of course a decided advantage; otherwise the advantages obtained are not particularly great.

The real advantage of the two latter types over Goodyear welted is that they are very much easier to repair; the seam is vertical and there is very little chance of disturbing it when removing the sole. In manufacture the possibility of the stitching getting into the seam is practically nil, a fault so common in welted work. Their disadvantage lies in the fact that they are not nearly so flexible in wear as

Goodyear welted shoes this being due to the vertical seam and the fact that the whole of the forepart is covered by a layer of leather which has to be fairly substantial, this being at the point where the foot is flexed. An attempt to compromise on this question is the Littleway welted method which is described on p. 374.

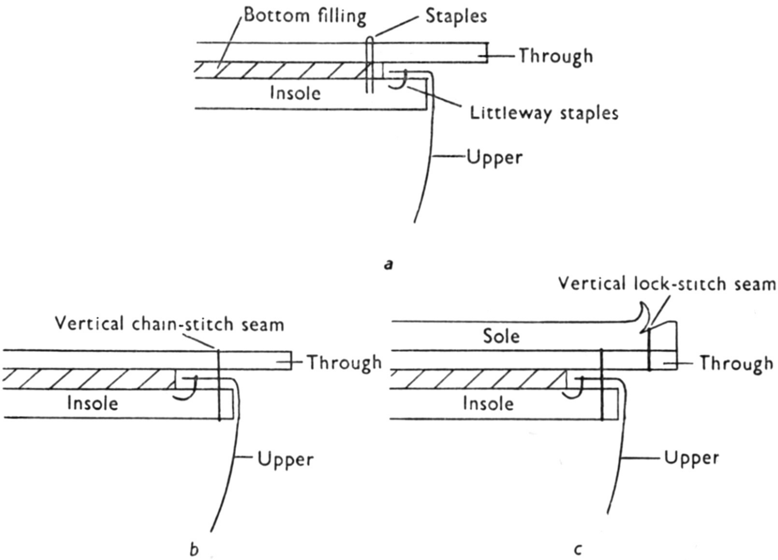


Figure 175. Cross-sections of machine-sewn shoe, stitched to heel: *a* Lasted, and slipped, with the through temporarily attached with staples. Tacks may have been used for lasting on a plated last; *b* The through is sewn to the insole through the edge of the upper, possibly a lock-stitch machine. Staples are removed; *c* Sole secured to 'welt' portion of through on stitching machine. The method is completed by closing the channel.

Pre-fabricated Bottoms

A completely pre-fabricated bottom may be used only in the case of McKay work, as the shape will not vary with the seam. The bottom is stuck to the bottom of the shoe, the corrugated edge effect being incorporated in the pre-fabricated bottom.

A method in fairly common use especially for bootees is that of a pre-fabricated crepe bottom stuck to the bottom of an ordinary machine-sewn lasted shoe. The edge of this bottom is solutioned, as is the upper, about $\frac{1}{2}$ in. above the feather. A wide strip of crepe, usually plain, is stuck to the upper and on the edge of the bottom; this strip of crepe thus holds the bottom on and as it covers the gap between sole and upper makes the shoe waterproof over the whole of its width. The method is not confined to bootees, however, as it is cheap and easy to make and in addition to being waterproof is flexible and light in weight. Crepe runners of any width or design are stuck to the edges of shoes and are often incorporated in prefabricated bottoms, being sometimes sewn on as part of the bottom.

The combinations of methods of attaching bottoms to machine-sewn and stuck-on work, and the ingenious devices for carrying out such methods seem never ending. If the fundamental construction of these types, and the use to which the available plant can be put in carrying out any variations of the method is thoroughly understood, then any verbal explanation can be understood or any particular shoe analysed.

23

METALLIC METHODS OF ATTACHMENT

Riveted

This is a form of attachment only suitable for work in which flexibility is a secondary consideration (Figure 176). The sole is attached, after last slipping, on a wire-grip tacker. In this case the accurate attachment and fit of the sole is very important as the edge guard on the riveting machine runs on it (Figure 177*a*).

The shoe is then placed on a freely swivelling horn of a riveting machine with a guard against the edge of the sole. The tip of this horn, which is always centrally located directly under the driver, is round with a slightly hollowed surface which directs the point of the rivet into its centre in order to clench it (Figure 177*b*).

The machine itself consists of:

(1) a nail pot in two sections with two raceways; a pedal changes the length of the nails to accommodate the extra substance at the toe and, if riveted all round, at the seat also;

(2) an awl inserted in an awl bar which pierces the leather and while inserted in the shoe feeds the work to directly under the driver, the latter being raised out of the way and the horn released, the whole swinging over on one head; this awl being withdrawn partially provides the hole in which the rivet is inserted;

Figure 176. Riveted sole.

(3) a driver and driver bar with a hammer action which drives the nail through the sole, lasted upper and insole, clenching it on the horn tip.

(4) a horn which locks at the time of the impact of the rivet and releases to allow the shoe to be fed along.

The distance between rivets can be adjusted by a different throat and a slide adjustment on the swing head.

The rivets should be about $\frac{1}{8}$ in. in from the edge of the insole, with the mark of the rim of the horn tip actually on it. They should go

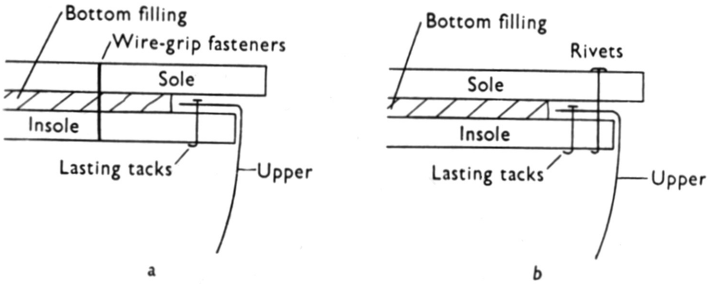


Figure 177, Cross-sections of riveted work: *a* Lasted and slipped, bottom filled and sole temporarily attached on wire-grip tacker; *b* Sole riveted. The rivets pass through the sole, upper and the insole being clenched on a horn tip inside the shoe.

through sufficiently to clench, but if too long will form a blob of metal in the centre of the ring. It is a good idea to extract one; it will be easy to extract if not clenched, but will have to be knocked out if it is.

The machine is supplied by the B.U.S.M.Co. and Standard Engineering Co., the two makes being practically identical. It is also known as a loose nailing machine.

Screwed Through

It is the practice in some cases to screw the through to the insole instead of riveting (Figures 178 and 179). This method although following the idea of riveted work, requires some small adjustment in its sequence. For the reason that a screw has no head like a rivet, and depends on the number of threads into the leather, and the pressure of that leather around the screws, it is customary either to use a heavier through or, instead of fixing the middle through to the sole, to put the two throughs on together and screw them both to the insole; this of course requires a longer screw, the extra length on threads helping it to bite. An adjustment to the length of screw is necessary and the shoe is fed by an auxiliary feed described on p. 345.

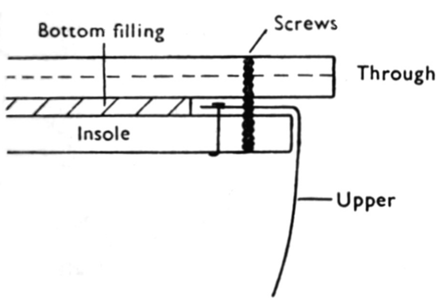


Figure 178. Cross-section illustrating the screwed through method. The method is similar to the riveted through method. Extra substance is needed in the through and sometimes through and middle are combined, the screws penetrating both. The sole is attached as for the riveted, screwed and stitched method (see Figure 180).

The single sole is stitched on and extra screws may be added if required. Such screws are in this case superfluous as this method, although very rigid, if correctly carried out is probably the strongest method of attachment known.

Figure 179. Screwed through-sole.

During the operation a feather guide formed by a shaped metal block runs along the edge of the insole, being adjustable back and forwards by a small hand lever. Its action locates the screws on the insole, the distance from the edge of the insole being about the same as for the rivets.

Pegged

In every respect the method of attachment before pegging is the same as for riveting. Instead of rivets however, wooden or fibre pegs are inserted from sole to insole. There are not many of this type of boot made nowadays, but they are more flexible than screwed or riveted boots. It is claimed that they are more waterproof than the former and their chief use is for sea boots. They are extensively made for boots used in ammunition stores *etc*. where the presence of a metal is, to say the least, undesirable.

The machine itself makes its own pegs from a reel mounted on the side. They are fed into a throat and cut off in widths in the throat itself before being driven in by a driver bar. As the pegs are relatively soft the awl, besides feeding the work along has to pierce the leather almost right through in order that the pegs may penetrate the insole.

The machine itself is often used for ladies' seats and is a very light and efficient form of attachment for this purpose.

Riveted, Screwed and Stitched

This method of construction is used exclusively for boots which have to undergo a considerable amount of rough wear. The weight of such a boot is of secondary importance and its flexibility is practically nil.

The single through is attached on a staple fastener preferably in a mellow condition (Figure 180*a*). The boot is then placed on a riveting machine. In this case the through is sufficiently large to allow the sole to be stitched to it; consequently the guard is of a different type from that used with riveted soles. It consists of a spring-loaded wheel of about $2\frac{1}{2}$ in. diameter with a brass rim. This rim runs on the feather of the insole and locates the position of the rivets according to

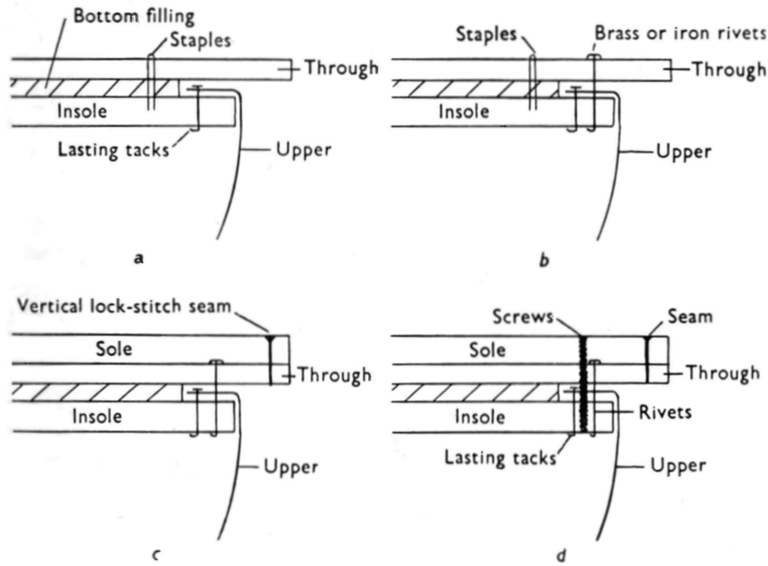


Figure 180. Cross-sections illustrating the riveted, screwed and stitched method: *a* The boot has been lasted and slipped, the bottom filled and the through temporarily attached with staples; *b* The brass or iron rivets securing through, upper and insole are clenched on the horn of the riveting machine; *c* The sole is tacked on and then secured to the through by a lock-stitch seam. The rivets holding the through are sometimes removed before the sole tacking; *d* The screws are inserted, passing between lasting tacks and rivets though sole, though, upper and insole, terminating on the horn of the screwing machine.

the setting of an adjustable slide on which it is mounted. Apart from this the riveting machine used is the same as that previously described, the rivets themselves being shorter (Figure 180*b*).

The shoe is now levelled and the welt portion of the through turned back. There is a machine which runs around this welt, the correct title being a Welt Feather Bending Machine, but commonly known as a 'Jigger'. A cylindrical-shaped table acts as a rest for the bottom of the through, and above the welt is a small roller over which is a hammer head moved backwards and forwards by a small cam whenever the shoe is pushed against the hammer.

It is a matter of opinion whether nailing around the seat is really necessary. If nailed to just below the front of the heel it should be sufficient as the nails in the piece-sole and the action of the inside attaching of the heel are enough to make the seat solid. If it is desired to stitch around the seat, however, nailing is of course necessary.

It is usual for this type of work to carry a middle or another through between the sole and the already riveted through. We assume that this has been already attached to the sole which has been rounded and grooved for stitching. The sole is now attached on a wire-grip tacker.

This type of work is usually stitched on a ‘ Rapid’ Lock-stitch Machine (Figure 180*c*), a very much slower stitcher than those previously described (p. 311). Its principle in forming the stitch is the same and in this

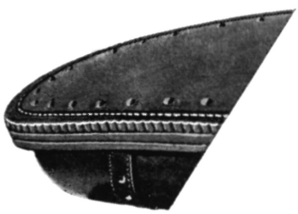


Figure 181. An example of a nailed runner with the sole screwed and stitched. The spacing can be regulated up to 1 in.

respect it carries the same fundamental devices, looper thread hook, shuttle, awl and needle etc. The mechanism for holding down the foot uses ratchets and pawls; it is awl fed and has gear and cam driven segments. Its maximum capacity is about 350 stitches per minute. A model ‘O’ stitcher or Standard 89 may be used for lighter work.

It is usual to stitch work of this kind at about six stitches per inch.

The table of thread, awls and needles as already given applies also to this machine.

After stitching comes the screwing. It is usual to place the screws about $\frac{3}{4}$ in. apart from heel to heel, but this is a matter of opinion; in some cases three or four are inserted at each joint and the toes only (Figure 180*d*). In any case, whatever the number of screws they should be placed inside the stitching on a level with or slightly inside the rivets on the through and outside the tacks used for lasting. As the ring on the horn tip of the screwer is larger, the screws themselves will be just slightly further in than the rivets. It is not desirable to go too close to the edge of the insole as the screwing effect tends to break down the edge (Figure 181).

The Screwing Machine—The machine itself is composed of (l) a horn, (2) a spindle, (3) wire feed and cutting mechanism and (4) feed mechanism.

(l) The horn is of the same type as used on the riveting machine, with a larger horn tip convex in shape. It is located immediately below the centre of the spindle and is locked by ratchets and pawls during the period that the screw is being driven into the shoe and clenched on the horn tip.

(2) The spindle is a high-speed spindle carrying the wire, which is on a metal spool at the top. The wire and spool turn with the spindle itself, the wire being fed inside and down the centre. The spindle speed is about 3,000 revolutions per minute. The lower half of this spindle contains part of the wire mechanism in the form of three pawls whose teeth are engaged with the thread, cut into the wire, and feed it down.

(3) The wire feed mechanism itself is cam-operated by two arms and segments, and moves the nozzle of the spindle up and down to the required length of screw; the maximum is about l in. or slightly over. The wire is cut off by the shearing action of two knives, also cam operated, separate from the spindle and located immediately below its nozzle. The knives are each set at about 45° to the surface of the sole with their cutting edges parallel to it, a table ensuring that the marks of the knives are not shown on the sole itself.

(4) The feed mechanism is a small toothed wheel running on the edge of the sole and parallel to it. There is also an alternative feed mechanism consisting of an arm carrying a milled foot which operates on top of the through itself; this however, is not used for soles. The machine uses iron or brass wire.

Staple Welted

This is a form of indirect attachment used for cheaper classes of welted footwear, but very much inferior to the Goodyear method.

A shoe is lasted by the machine-sewn method, with tacks, and while it is still on its plated last a plain welt is stapled to it by staples vertically penetrating the welt, upper and insole from heel to heel (Figure 182*a*). The staples themselves are set just long enough to clench on to the plate of the last. They should be as near the edge of the insole as possible. lf these staples do not clench the result is disastrous, as the whole bottom is likely to drop off.

It is usual to beat out the welt immediately after stapling, and after having removed the nails holding down the insole, to fill the bottom and treat as Goodyear welted (Figure 182*b*). Alternatively it may be slipped before levelling and levelled on a ‘Hercules’ or a No. 8 machine to emphasise the clenching of the staples.

The stapling machine used is an ordinary staple fastener as used for various operations in the making room, in so far as the formation of the staple is concerned.

A wire feed mechanism feeds forward into a throat, from a coil, sufficient wire for the whole length of the staple and lays it across two knives; the distance between these knives decides the width of the staple. A piece of steel, suitably shaped to form the staple, rises between these knives forcing the middle of the straight wire upwards, the end of the wire being also forced upwards to be shaped by a former.

The length of wire, when correctly measured off, is cut by a shearing action of the knives giving both legs of the staple a sharpened point. A strongly spring—loaded driver descends on the top of the rounded head and drives the completed staple into the shoe through a guide and nozzle to keep it into shape during the process.

It will be noted that no previous hole is made for the staple so that the sharpening effect in the shearing is essential for the staple to drive its way through.

This description is of the ordinary staple fastener used for temporary attachment on machine—sewn and welted insoles, piece-soles, soles *etc*.

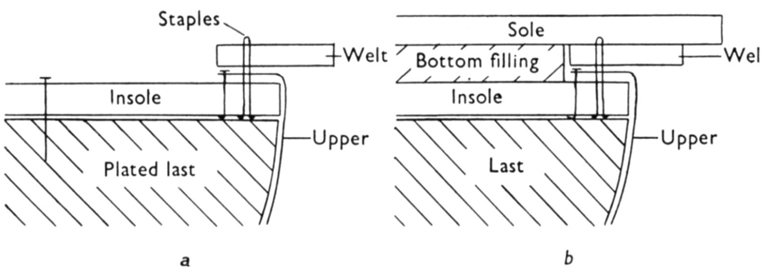


Figure 182. Cross-sections of a staple welted shoe: *a* After staple welting. The shoe remains on the last after lasting and staples secure the welt to the insole through the upper; *b* After sole laying. The insole tack is removed, the bottom filled and the sole laid. The shoe is then treated as a welted shoe.

For staple-welted work the only additional attachments are a welt guide which carries the welt under the nozzle of the machine, a pedal attachment to vary the length of staple to cater for the extra substance around the toe and a small device to feed thread between the legs of the staple making a continuous line of thread on the welt. The insoles should be consistent in substance so that the staples are (j)ust clenched.

The object of the thread is to prevent the staples burying themselves in the welt; it also tends to help space the staples. If the staples have not clenched however, they can all be pulled out by simply pulling the thread. It plays no part in making the bottom solid and the term ‘staple stitching’, by which this method is sometimes called, seems rather misleading, as it implies that the thread has been used in making the seam itself whereas it simply lies on top of the welt.

The method requires, on completion, a full length sock. It is quite common to split the grain off the insole in the preparation room on a de-graining machine and to use the split grain, flesh side up, in the finished shoe as a sock.

All such methods are to make the shoe look welted as the term is used for Goodyear welted. Their advantages are all however in cheapness—an inferior insole, with no channelling and preparing, sometimes backed by board, no welt preparing, cheaper lasting, no upper trimming or inseam trimming. The disadvantages are chiefly rigidity in wear and heaviness in weight.

The method was in extensive use some years ago, but its popularity has waned in favour of the Goodyear method.

It was sponsored by the B. U. S. M. Co. and Standard Engineering Co., both of whom supply the stapler in practically the same form.

24

THE CEMENTED METHOD

THIS METHOD OF ATTACHMENT is in universal use and takes many forms. It is usually used for single sole work.

ADHESIVES

Nitrocellulose

In spite of many suggested and actual alternatives, nitrocellulose (pyroxylin) cement remains supreme for permanently attaching soles instead of having thread or metal. It is relatively cheap, simple to use and produces a strong, permanent bond resistant to heat, moisture and flexing; it can also be used by the repairer. lt is normally applied to both sole and roughened upper (see Figure l86) and allowed to dry (by evaporation of the solvent which is of the acetone family), 3 process which may be speeded up by infra-red heating. When the sole is required to be attached, the dried nitrocellulose is reactivated by applying the solvent; then the sole and lasted margin are immediately brought together in a press. In the case of the sole, reactivation may be carried out by dipping it into the solvent; this not only softens the cement but also tempers the sole without the removal of water-solubles.

Neoprene

Neoprene cements can be used in the same way as other pressure-sensitive cements, *e.g*. rubber solution and latex; that is to say, the dry or nearly dry surfaces are brought together under pressure and they then fuse. There is a danger with neoprene, however, of imperfect fusion unless the cement films are first softened, and SATRA recommend heat-activation by infra-red lamps to do this. A few minutes under the lamps is sufficient to soften most neoprene cements it being the usual practice to apply the heat to the soles if they are leather, or to the lasted shoe bottom if resin-rubber soles are to be attached. As soon as the parts cool down the bond is permanently made so only a few minutes' pressure in the press is necessary. On the other hand, nitrocellulose cements only reach their maximum strength when the last traces of solvent have gone, and this may take some time. Further details of neoprene cements will be found in the SATRA *Bulletin* for February, 1952.

SINGLE SOLE CEMENTED SHOE

The shoe, after lasting, is basically machine-sewn inasmuch as the upper is wrapped over and fastened to the flat surface of the insole;

it may be lasted with tacks all around, with tacks at the toe and seat and Littleway staples in the sides, or the lasting allowance may be stuck down. The first two methods have already been described; the third method is as follows:

The shoe is pulled over as for machine-sewn, the tacks being left with their heads slightly standing (they are subsequently removed); their position in relation to the front and cap line is the same but in this case they should be as *close to the edge of the insole* as possible to enable latex to be applied to the upper and insole after pulling over. The latex is applied either with a brush or a spray at this stage and should cover the area over which the two surfaces are to be bonded together.

After the adhesive has partially dried, the toe is placed in a bed lasting machine as used for tacked work, and wiped in. To ensure a perfectly flat surface and to complete the drying out, a flat piece of steel, heated on a gas jet or electric hot plate, is placed under the plates of the toe laster and pressure applied, the pull-over tacks having been removed. The seat may also be wiped in or it may be lasted with tacks as required on the same machine, and while the toe is under pressure.

Latex is more usually applied, however, when the shoe is in the bed laster, and the up-draw has been taken. lf the upper and the insole have been previously solutioned they tend to stick to each other and it is impossible to draft the shoe correctly.

The sides are now lasted either on a lasting machine or simply by the action of hand pincers with the thumb pressing the upper down to the insole.

The upper, forming the lasting allowance, is thoroughly roughed, that is, the grain of the leather is removed and the flesh penetrated, the object being to ensure that the adhesive penetrates the leather in its fluid state and after setting is permanently `keyed' into it (Figure 183*a*). This operation is performed with a revolving wire brush.

Cement, usually of a nitrocellulose type, is applied by a machine on which provision has been made for a consistent flow of the particular adhesive to be fed through the nozzle. Mechanical methods are far superior to any hand operation as the adhesive is laid on evenly and economically. Cleanliness is indeed next to godliness in this type of work as the adhesive is most difficult to remove from places where it is not wanted.

After allowing the cement to dry thoroughly, either naturally, or to an increasing extent today, by the use of infra-red radiation in cabinets (or tunnels if a conveyor system is used), a softener is used to activate the adhesive immediately before it is required to use it. The softener is applied to the sole only when it is placed on to the shoe. The shoe with sole attached is now put in a press. There are a number of suitable presses in the market each having a slightly different method of applying pressure, and the number of sections also varies giving consequently a varying period ('dwell') during which the sole and shoe are under pressure; these are briefly dealt with in this section. As it is no detriment whatever in the form of output how many sections a press has, it seems common sense that the more, the better, provided that too much floor space is not involved.

Drum type and wheel presses are built containing from twenty-four to sixty divisions, and these hold from twelve to thirty pairs of shoes which are under pressure for a considerable period. For example, in a thirty-six division press the operator applying the softener and feeding the press will refill it four times per hour, meaning that each shoe is under pressure for 15 min. Most two-division presses are designed so that one shoe is under pressure while the other is being taken out and replaced, and the

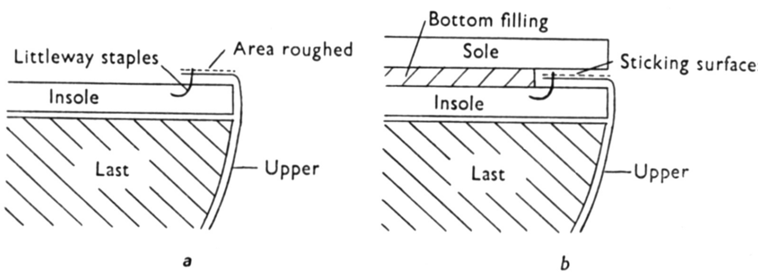


Figure 183. Cross-sections of single sole cemented shoe: *a* The shoe is lasted with Littleway staples and the lasting allowance roughed to receive cement; *b* The bottom is filled and the sole attached.

output from one of these presses using cellulose cement is extremely small.

The B. U. S. M. Co., the Standard Engineering Co. and the Ralphs Engineering Co. supply the greater part of the presses used in this country, and each firm also supplies the ancillary equipment which goes with them.

In the BUSMC method the first operation consists of punching a small hole in the seat portion of the sole. This may at first sight seem a comparatively insignificant operation but in fact the precise and accurate location of this hole is extremely important when the sole is applied to the press. A machine (model 'A' Sole Punching Machine) is supplied for this job with gauges which ensure accuracy and automatically make it as foolproof as possible.

The next operation is sole roughing (Figure 184); this, too, is very important in order to key the adhesive to the sole. It is carried on on the BUSMC Model 'B' or the Standard Engineering Co. Model 259, on both of which a wire brush is used above a rotating table. On both these machines the sole feeds automatically and is not held by the operator during the roughing operation. The fact that the sole passes under the brush at a regular speed ensures a constant finished thickness of sole edge. The width of the roughed surface is adjustable to requirements. The Ralphs machine operates in a similar way but uses a cutting blade in place of the wire brush. The Standard Sole Roughing Machine Model 259 AFMO is illustrated in Figure 185.

The sole is now ready for‘the adhesive. This is applied by the BUSMC Model ‘B’ or Standard Engineering Co. Model 296 Sole Cement Applying Machine, or the Ralphs Sole Cement Applying Machine. It is common practice to cement the soles in bulk, allowing them to dry out completely. Provision is made for an even distribution of the cement by keeping a constant pressure inside the cement pot; a gauge mounted on the machine allows this pressure to

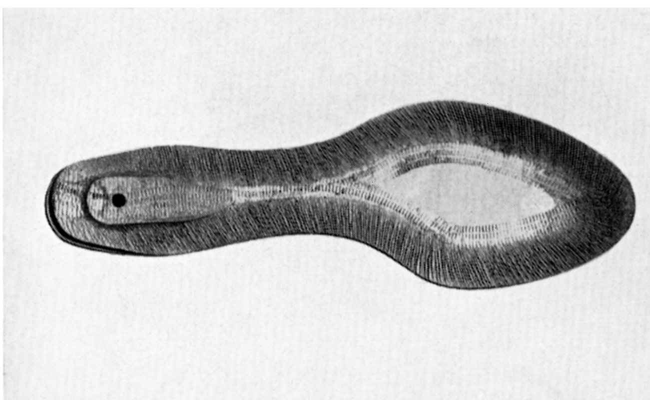


Figure 184. Punched and roughed sole.

be checked. The cement itself is forced by this pressure through a nozzle and is spread over the already roughed surface, the width and the distance from the edge being adjustable.

To ensure that the finished edge is clean and entirely free from cement the edge of the sole is now bevelled on a cement sole bevelling machine. This operation is made necessary by the fact that it is very difficult to prevent cement getting into the edge and on the upper, and once there it is extremely difficult to remove.

When there is likely to be any curvature in the sole in order to conform to lasts that carry a high heel or have a rounded waist, a method of shaping the sole before applying it to the shoe is advisable. This is done on the BUSMC Sole Conforming machine or the Standard Engineering Co. Model 188. The operation is very accurate, conforming the waist only with the help of gauges. By a process described later this operation may be eliminated. It also ensures that the whole of the two cemented surfaces shall be brought together. The moulding is carried out by the wiping action of rubber pads thus eliminating the squashing, and consequent enlarging of the component, so commonly met with in ordinary moulding. The BUSMC machine is also used for the moulding of welted insoles as in silhouwelts and ladies' work of the lighter type, the moulding being carried out after the lips have been raised.

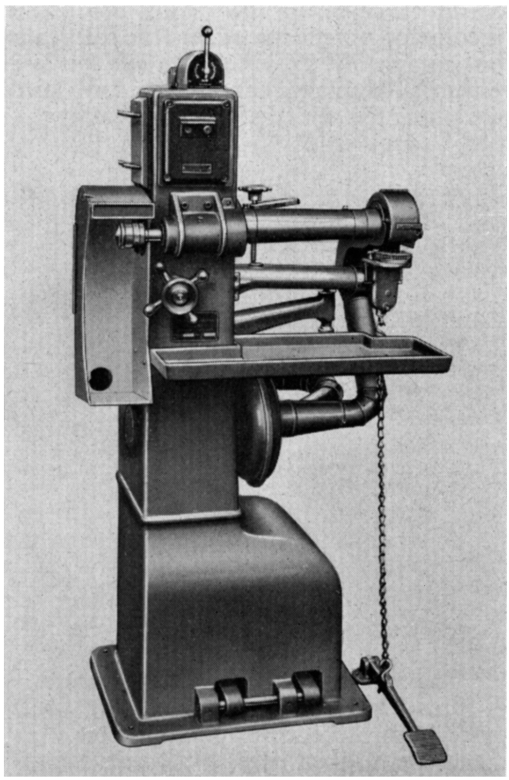


Figure 185. Standard Sole Roughing Machine Model 259 AFMO (fitted with edge trimming attachment).

Upper roughing may be carried out on any type of machine built for this purpose. A wire brush is again used and the shoe is held by the operator, and the success of the operation must depend on the skill of this operator, who must not rough over the feather line and more important still, must take care not to cut through the leather at the feather line (Figure 186).

The shoe itself is now ready for the adhesive to be applied to it in much the same manner as it has already been applied to the sole. A layer of the same type of cement as used on the sole is applied to the roughed surface of the lasting allowance. ln this case the nozzle of the machine used is slightly different. Machines used are BUSMC Model “B’, Standard Engineering Co. Model 245, and the Ralphs Bottom Cementing Machine. After the operation the cement is allowed to dry.

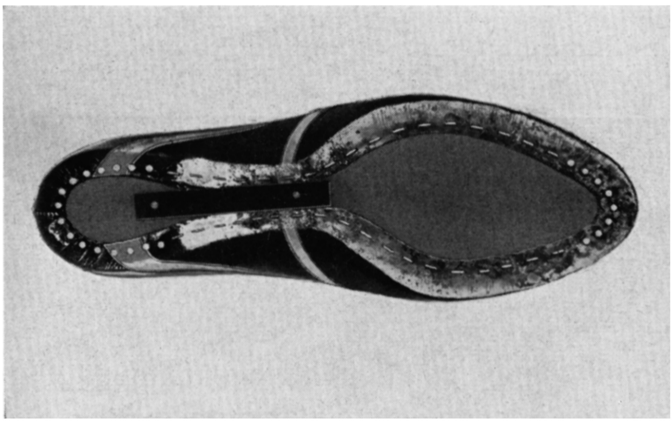


Figure 186. Roughed upper.

The shoe is now ready to be applied to the sole on the press. It will be borne in mind that both cemented surfaces are dry. To activate the cement already applied to these surfaces a softener is used. This is applied by machine immediately prior to the sole and the lasted upper being placed together. A machine for this purpose must be placed in a convenient position so that the operator can use both the softener applying machine and the press with the minimum of movement.

The BUSMC Model ‘C’ and the Standard Engineering Co. Model 306 Softener Applying Machines apply the activator in a series of lines which spread together and form a band when the sole and lasted upper are placed together. It should be borne in mind that the activator is applied to the sole only, and the cement on the lasted upper is affected only when the two are placed together, the object being to use the minimum amount required to activate the two surfaces, and to avoid any surplus which would prolong the drying time before the shoe can be removed from the press.

The BUSMC Press (Figure 187) is an extremely ingenious machine designed with the obvious object of eliminating the chance of human error as far as possible. The sole is first placed on the pad and the peg is placed over the hole previously made by the punching machine; pre-set levers touching the edge of the sole ensure the accuracy of its position in the pad. The sole being now held in approximately its correct position, the shoe is placed on to it; again levers determine its position over the sole and hold it there thus eliminating any possibility of inaccurate location. The machine is now tripped. The initial pressure may be up to 300lb/sq. in., but this is much reduced when it is actually applied to the shoe; it is also adjustable.

There are eight pads; these are water-filled bags, for both men`s and women's work. For curved waists, pre-moulded solid rubber pads are placed over the water-filled ones. The waists are formed by separate rubber profiles. The seat itself has a solid rubber pad.

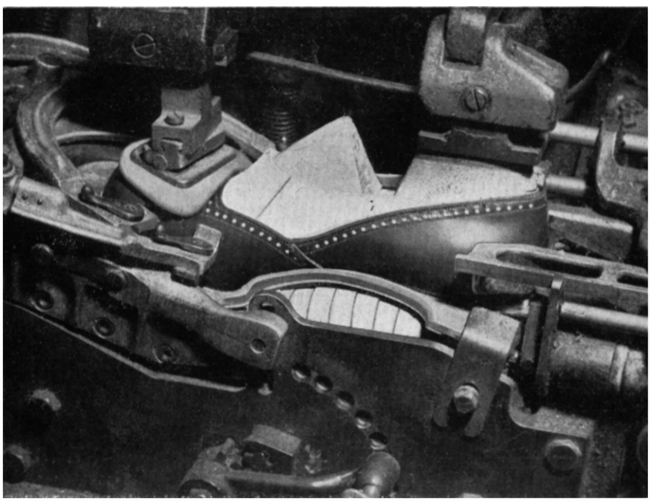


Figure 187. Shoe in BUSMC Press.

The shoes themselves are in the machine for about 3 min.; it is not advisable to reduce this time, as approximately 11 min. is taken up by the cement being forced into the fibres under pressure. The real keying effect does not take place till this stage is reached. The actual drying and setting takes a much longer period, possibly 1 hr. after the shoes are taken out. lt is for this reason that the writer believes that they should be as long as possible under pressure.

The Standard Engineering Co. has developed air presses and air press units for all purposes and all classes of work. The air press units can be used independently by placing them on benches, or a press can be assembled with a number of units suitable for any particular production. In this way it is possible for a manufacturer to instal sufficient units to ensure that each shoe is left under pressure for the requisite time to suit his particular needs, which must be determined by the type of shoe, type of leather, type of cement, atmospheric conditions *etc*.

The units all use the inflated bladder but the containers for these bladders vary very considerably from a flexible case with a leather top to a container with a firm but flexible moulded rubber top which is required on certain classes of work to ensure a perfectly flat forepart. The dish casting is easily interchangeable so that the units can be adapted for high or low heels, and the bridge which clamps the shoe is adjustable for all sizes.

Standard Air Press Unit Model ‘R’ is illustrated in Figure l88 and as explained above, these can be built into air presses of any size. The Standard Two Division Air Press Model 326 is shown in Figure 89.

The press supplied by the Ralphs Engineering Co. also uses air pressure, the best known model being the Ralphs l2 Division Press.

lt is common practice to Hex the insole in the forepart to ensure flexibility in wear. This is often carried out on a converted welt cutting

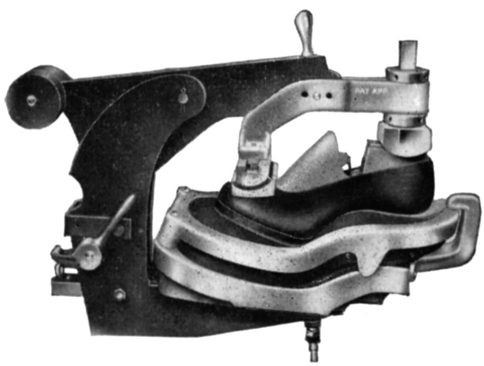


Figure 188. Standard Air Press Unit ‘R’.

machine with an open end, but more complicated versions carry out a bending and cutting operation in a slower fashion with more elaborate detail without apparently influencing the ultimate result in any marked degree.

Water vapour is sometimes used for tempering the soles, and electrically heated tables to help drying, the theory being that the heat which should be in the shoe while it is in the press helps to speed up the sticking part of the process.

A new introduction by Vik Supplies Ltd. is certainly a new departure in the process of stuck-on work, and is to be greatly commended for its simple ingenuity. The sole before attachment is dipped into a solution which serves as a softener for the already hard adhesive; at the same time the solution mellows the sole to a state equivalent to that condition it would reach if it were immersed in water and mellowed; in this case however the drying out time is comparatively negligible. It will be obvious that in such a case the sole conforming machine will be superfluous as the sole would naturally conform

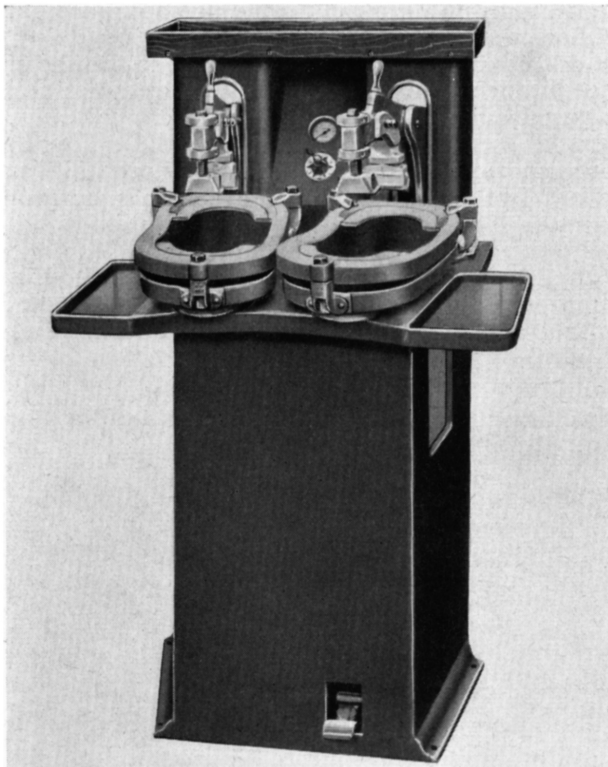


Figure 189. Standard Two Division Air Press Model 326

to the shape of the shoe, due to its mellow and flexible state. The possibilities of such a process of mellowing are extremely wide, *eg*. welts and their quick drying, and perhaps eventually the heavier types of soles.

VARIATIONS OF THE SINGLE SOLE CEMENTED SHOE

The previous descriptions are all for an ordinary single sole cemented shoe both for men's and women's. There are many variations in the form of wedges plus stuck-on soles.

Wedge Heels

It has been previously stated that all bottoming parts for machine-sewn lasted work can be pre-rounded to shape before attaching. ln the case of wedge heels, or wedge and platform combined, the unit is pre-fabricated and covered before attaching, the wedge, usually of wood, is already stuck to the platform, the latter being made of a flexible material, usually of a rubber bonded nature.

After the platform has been attached a Blake sewer sews around the forepart through the stuck-on or tacked-on platform, the needle passing through the folded-over- portion of the platform cover, the platform itself, the platform cover next to the lasting allowance, the lasting allowance itself, and finally the insole. This applies to the forepart only; the wooden portion is fastened by nails driven in from the inside. The sole or, as in many cases, a sole and heel-piece is then stuck to the whole of the bottom. The wedge thus takes the place of the heel. Sometimes a top-piece is required on top of the sole; this may be either slugged on or stuck, and is easily replaceable after wear (Figure 190).

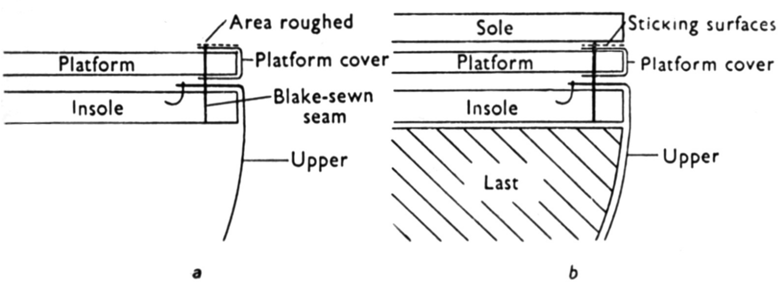


Figure 190. Cross-sections of platform shoe: *a* Last slipped, platform sewn to insole and top area of platform cover roughed; *b* Sole stuck to platform cover with last re-inserted.

A pre-fabricated platform, attached as a through, is often used; in this case it may be sewn all around, the sole being stuck on. This method involves a low heel of one or two lifts to make the shoe stand correctly.

Another method involves using a wrapper (Figure 191*a*) of a different material from the upper, and stitched around it during closing. The line of this stitching is about $\frac{1}{4}$ in. above where the feather of the insole usually comes. The upper is lasted in the usual way ignoring the wrapper; when this latter is turned back a pocket is formed between the outside and the wrapper into which a narrow strip of stiff tape is inserted (Figure 191*b*). The wrapper is then stuck down to the lasted portion of the upper or, as is more usual, to the surface of a thin through previously attached to it (Figure 191*c*). The sole may then be either stuck or Blake-sewn on in the normal

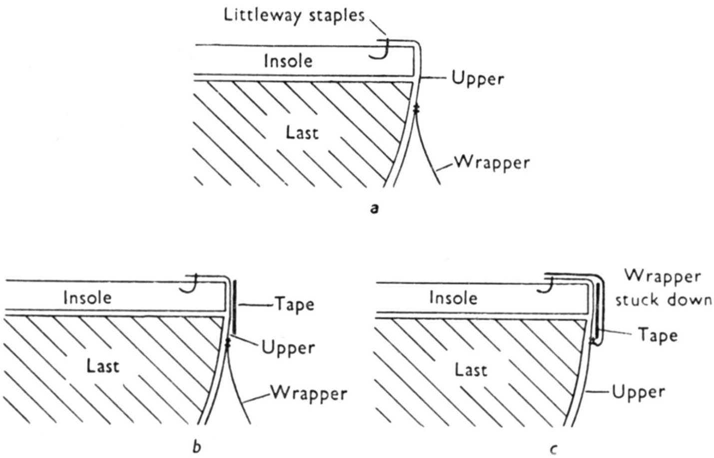


Figure 191. Cross-sections showing alternative method for platform shoe: *a* Wrapper stitched to outside in its position after lasting; *b* Tape stuck to sides; *c* Wrapper brought up and stuck to lasting allowance above the ordinary upper. The sole is subsequently stick to it.

manner. There are a number of adhesives both for sticking down the uppers and for attaching the soles.

There has recently been introduced a type of welted shoe with a stuck-on sole. In this case the insole is channelled and opened all around with the channel about $\frac{5}{32}$ in. or less from the edge. The shoe is lasted in the ordinary manner, the seats being stapled. The wrapper in two pieces is then stapled on the wider section to the seat in order to cover the wedge, and the narrower section around the forepart. The staples are level with the ordinary side lasting staples (Figure l92*a*).

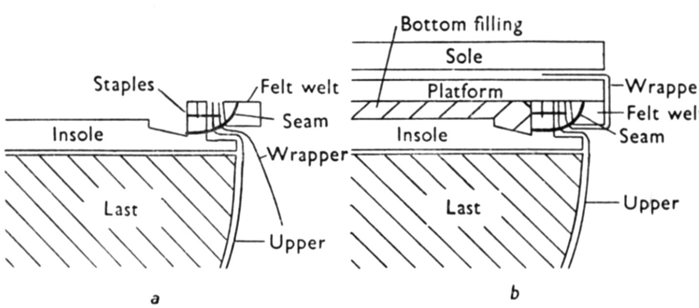


Figure 192. Cross-sections of welted shoe with stuck-on sole: *a* Wrapper stapled in with upper and felt welt sewn on: *b* Wrapper stuck to platform and sole stuck on.

A felt welt or a silhouwelt is sewn all around and the surplus material above the seam taken off on an upper trimmer or bottom scourer. After the bottoms have been filled, the platform and wedge are stuck on slightly overhanging the seam, to allow for variation; the surplus is trimmed off level with the seam and the wrapper turned back and stuck down over the platform. This turned-back portion represents a lasting allowance and after being roughed *etc*. (Figure 192*b*) the sole is stuck in the manner already described. The result is an extremely flexible shoe, but the process is rather expensive.

Silhouwelt

This method is used in the construction of a better type of ladies' light shoes.

The insole is channelled with the same channel as an ordinary Goodyear welted shoe except for the fact that the channel is the same distance from the edge all around with usual allowances for puff and stiffener. It is also desirable to mould the insole after channelling and before opening as is usual with better class of higher-heeled ladies' shoes. After lasting the operations are as for welted shoes.

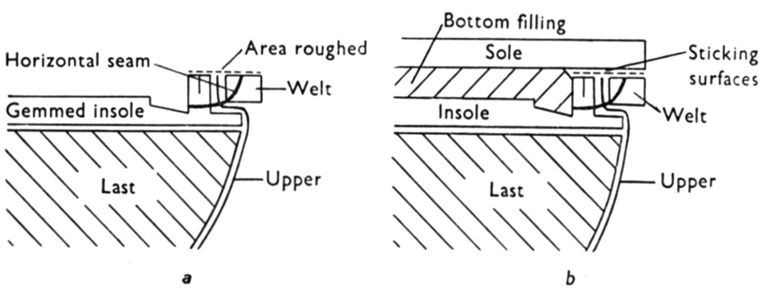


Figure 193. Cross-section of silhouwelt: *a* After sewing. The seams are trimmed and the area indicated roughed; *b* After sole attaching. The area for sticking the sole is mainly the flesh side of the welt itself.

The welt is sewn in dry on an ordinary welt sewer with a lighter needle, about size 45 to 47, the welt itself being about 2 to $2\frac{1}{2}$ iron and being $\frac{1}{8}$ to $\frac{3}{16}$ in. wide; owing to the light substance no bevel is needed, just a very light groove. The welt is turned back and the surplus upper above the seam removed (Figure 193*a*).

At this stage the whole of the surface of the welt, and the thickness of the seam, is roughed on a special roughing machine, the roughing in this case being at right—angles to the seam (see p. 353), and the sole after being similarly prepared is treated with a suitable stick-on adhesive and solvent and stuck on a turret press (Figure 193*b*).

The advantages are:

(l) As there is no stitching, the edge may be trimmed right up to the upper.

(2) There is no channel in the sole, therefore its substance may be as light as required although, of course, the thickness of the welt must be added to obtain the total substance.

(3) It is possible to obtain a perfectly flat forepart, the welt itself stopping any roundness at the edges.

(4) The shoe itself is almost as flexible as a turnshoe and is extremely light in weight.

The method does not entirely lend itself to constant repairing and the process itself requires above the average of skill and supervision. It is a BUSMC process and is not yet in universal use for mass production.

25

VELDTSCHOEN, TURNSHOE AND LITTLEWAY METHODS

VELDTSCHOEN

THE VARIATIONS OF THIS particular type of work are so numerous that it is perhaps safe only to say that the upper, instead of being lasted in as on machine-sewn work, is turned out and stitched through to the sole with a vertical lock-stitch. A rand is often stitched above the upper through which the stitching passes, but this is only one variation of the method as it is known now.

Seat Flanging

In order to ensure that the feather line at the seat is clearly defined and bearing in mind that turning the upper outwards is really an unnatural position for it, it is necessary to give it some shape resembling that which it will eventually take up (Figure 194). This is carried out on a heel seat flanging machine. The degree of moulding required in this operation may vary very considerably, but fundamentally the idea is to turn the upper outwards at a defined place, the feather line, and ensure as far as possible

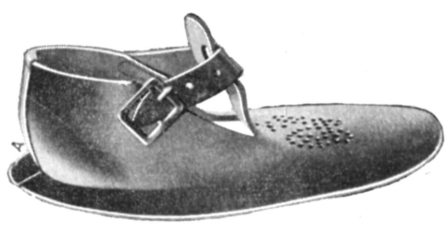


Figure 194. Veldt upper after seat flanging.

that it stays there. The machine consists of a metal seat-piece resembling the back of a last, around which is a pair of moulds which fits the last and clamps over the seat. The upper is placed over the seat-piece, that is between the moulds, and the outside clamps close and hold it, leaving a margin protruding above their surfaces.

A plate descends and with a wiping action by the moulds coming forward, spreads the seat out over the flat surface of the moulds. These moulds may be heated if required to make the crease more definite and help shape the back.

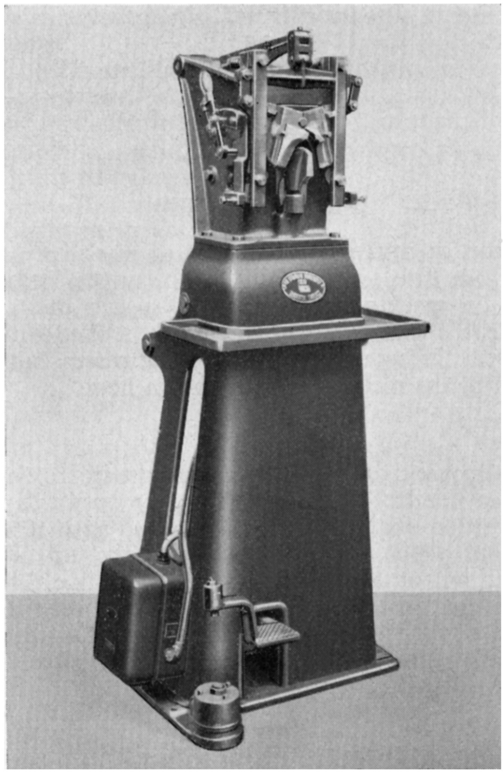


Figure 195. Standard Veldtschoen Seat Flanging Machine Model 182Z.

The Standard Veldtschoen Heel Seat Flanging Machine Model 182Z is shown in Figure 195.

It is not always desired to make the seat in the manner described. In this case the procedure varies slightly. Half an insole is tacked to the last and the back is tacked up to it with an ordinary stiffener inserted, and lasted in the usual machine-sewn way on a ‘Consol’, not a seat laster, the upper being cut as illustrated (Figure 196. This method can be extended right up the waist (Figure 197).

Veldt Assembler

The upper is placed over the last and is inserted into a veldt assembling machine (Figure 198). This machine has three pincers, one at the toe and one on each side. The pincers draw the upper over the last with emphasis on the forward pull, bringing the upper down to the last. While the upper is held in this position two or three nails are inserted around the position of the vamp seam, or if a sandal, at the top of the throat.

The idea is to stretch the upper to the position it will finally assume and hold it there with the tacks. It cannot be too strongly emphasised that this machine is in no sense of the word a pull-over. With veldts themselves the emphasis on ‘down to the wood’ is not possible or even necessary. The operation described however, does ensure the fitting of the top line to the last.

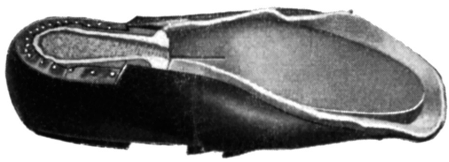


Figure 196. Veldt to heel, with seat tacked over. This shows the insole at the seat only and how the upper is cut to enable the upper to be outflanged to the heel.

The sole is now attached either by hand or on a wire-grip or staple tacker (Figure 199). The component itself is in appearance much wider than the shape of the bottom of the last, this extra width varying from $\frac{3}{8}$ to $\frac{3}{4}$ in. depending on what it is desired to do to the welt (*e.g*. double stitching).

It is desirable to put three or four fasteners of the same kind in the bottom, as this should be held fairly solidly in position. They are left protruding slightly to facilitate their removal (Figure 199). The gauge of these fasteners, however, should be as light as possible as the hole left when they are withdrawn disfigures the insole.

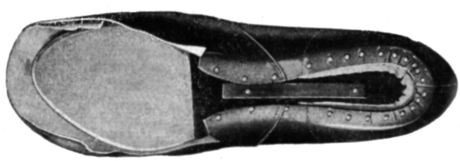


Figure 197. Veldt forepart with waist and seat lasted in. In this case the insole extends to the waist.

The upper is now stapled or stuck to the insole around the seat and up to a line just below a toe-cap (Figures 200 and 201). It may seem difficult to rub the upper in to get a clearly defined line, but using the proper last this is not so. A veldt last has a bevel on the feather line which facilitates a sharp 90° angle of the upper (see Figure 202).

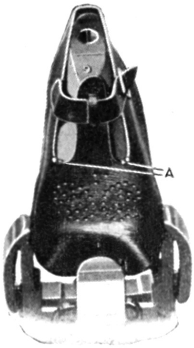


Figure 198

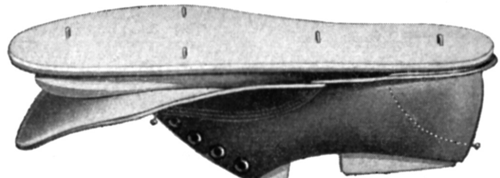


Figure 199

Figure 198. Shoe held in veldt assembling machine. Three pairs of pincers and the nails A at the top of the throat can be seen.

Figure 199. Veldt sole tacked on.

Not all veldts are stapled however, especially smaller sizes of children's work. With bigger sizes the amount of upper tends to become unmanageable if not fastened in some way.

The actual cementing process involves a different technique. The upper and insole may be cemented. and stuck down by hand. A better way however, although not in general use, is to use a *toe*

a b

Figure 200. *a* Upper stapled to insole all round. *b* Upper stapled to toe, with toe stuck only.

flanging machine which also takes the form of a cement laster. The edges of upper and insole are cemented before assembling on the last. The shoe is put in the machine, the plates, made to fit the last, draw the upper over the last and wipe the toe; it is thus something of a 'pull-over-cum-toe laster'. The lower plates come back and the wiper plates press together the insole and upper moving slightly inwards to give a clearly defined feather. These machines are made in pairs so that one may remain in while the other is being assembled.

The seats are similarly treated on a machine of similar design.

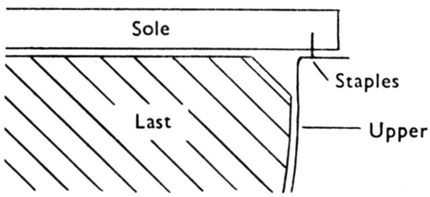


Figure 201. Cross-section of veldt showing positions of staples.

It should be mentioned that the two operations are for better class work and are not essential for the making of veldts. Many operations can be and are cut out in the interests of economy. If they were all put in the price of the shoes would be prohibitive. For children's shoes especially they are not necessary at all.

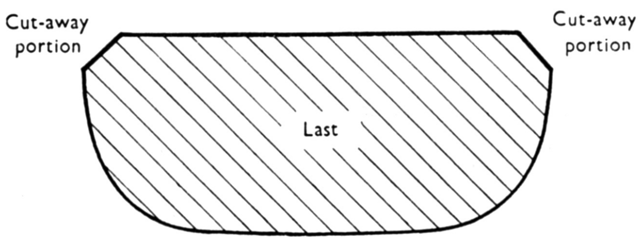


Figure 202. Last for veldtschoen showing portion cut away to allow upper to be acutely turned and rand (is used) to fit snugly to upper.

Stitching

The shoe is now ready for the insole and sole to be permanently attached (Figure 203). The basic veldt is stitched on an ordinary 'Rapid' type of machine or a special veldt stitcher (No. 4) fitted with attachments to throw out the second row of stitching, and pincers to pull out the upper just before the awl enters the shoe. These pincers are behind and in line with the table and work with an in-and-out action.

The No. 4 machine is exactly like the ‘Rapid’ except that it has a self-stopping device, automatic foot-lifting mechanism and a thread saving device. Again the type of machine is not rigid; many veldts are stitched on machines with no pincers and just the standard Scotch edge attachments for throwing out the second row of stitching such as the BUSMC Model ‘O’ or the Standard Engineering company Model 89. The operator does both rows; having completed the first he brings the Scotch edge lever forward and completes the second.

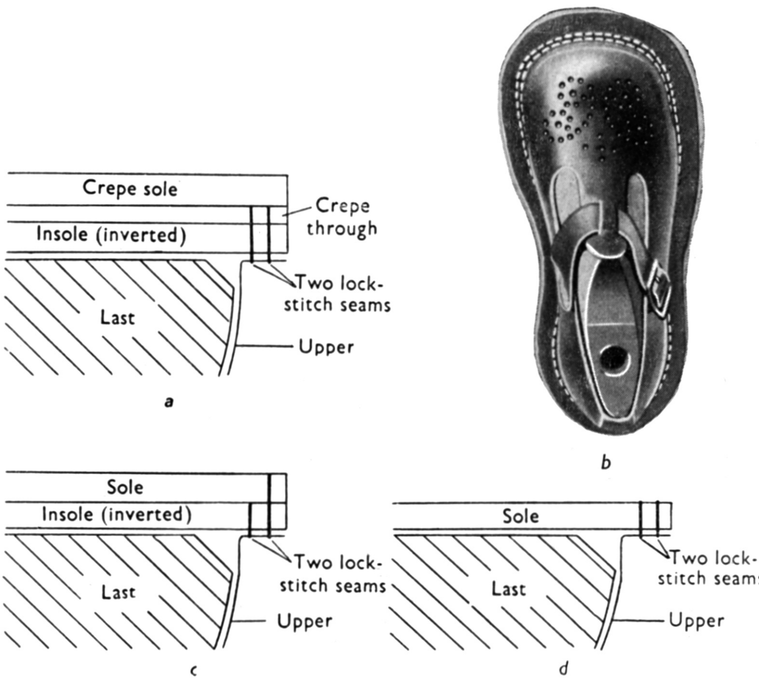


Figure 203. Two-row stitching: *a* Lock-stitch seam through upper, insole and crepe through. The crepe sole is stuck on; *b* Top view; *c* The inside row upper to insole, the outside row upper to sole. This makes for easy repair. *d* Two rows of stitching attaching sole to upper.

A further version of this method of attachment is for the through to be stitched to the insole by the inside row of stitching; the through and the sole are then solutioned, the latter being then applied to the former. The two are then stitched together by a row of stitching outside the previous row, the object being to enable the sole to be removed separately, by cutting through the outside row of stitching thus eliminating any possibility of disturbing the inside row which constitutes the main seam holding the shoe together. This makes the replacing of the sole, after it has worn out, a comparatively simple matter (Figure 203*c*).

Where a rand has to be stitched above the upper it is simply fed into a special table immediately under the awl which thus passes through the rand, the upper and the sole (Figure 204).

It is quite common also to round the work on a machine such as the ordinary Model 'E' Rounder or Standard 86V, the Scotch edge attachment of the stitcher working on the rounded edge. This is useful if a

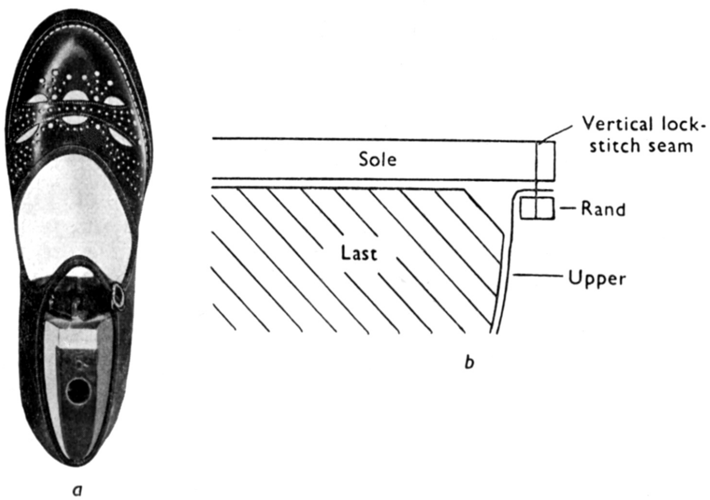


Figure 204. Rand attached by one row of stitching: *a* top view; *b* cross-section.

leather sole is incorporated on top of the insole as this may be grooved at the same time, no forepart guard or outside swell being used. It is difficult to cut a channel however, as it has to be extra wide to contain the two rows of stitching. If only one row is used the problem presents no difficulties. (For information as to the assembly of the soles and throughs *etc*. see Part V.)

The staples holding the insole to the last will, of course, have to be removed before anything is put on top of the insole.

Alternatively to a Model 'E' rounder, a surplus upper trimmer may be used for removing the surplus upper material and the edge trimmer will finish off the rest, or even an ordinary heel seat rounder will do the job all round. This is usual on veldt foreparts where a Model 'E' or similar machine would be of no use.

The seats are sometimes nailed on top of leather soles but there is not much point in this if they are already stitched, except to make a solid base for the low heel commonly used.

Where the foreparts only are veldt, it is usual to use a pre-rounded or channelled sole (see p. 235) with a wide channel, the waists being Blake-sewn as for a stitched forepart machine-sewn shoe (see p. 336) (Figure 205).

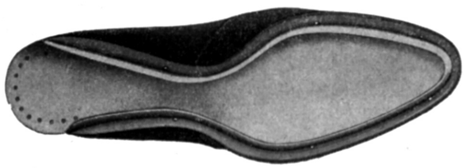


Figure 205. Sewn and stitched veldtschoen. The forepart is stitched in the channel and the waists Blake-sewn up to the joint, also in a channel.

TURNSHOES

This method of shoemaking has to a large extent died out in recent years in favour of the lightweight type of cemented shoes. It was used more for ladies' work than anything else with the possible exception of men's slippers. It does not readily lend itself to mass production, consequently being very much more expensive to manufacture.

It is however used fairly frequently in a modified form for the making of running and cycle shoes, its weight and flexibility being ideal for this purpose. It is also used in a different form for the manufacture of slippers; these are made in bag form, resembling shoes, put together inside out, turned, and blocked to the shape of a last after turning (see p. 503).

It may be that turnshoes are still made by hand; if this is so, however, the proportion of shoes made that way must be so small that the method is of academic interest only.

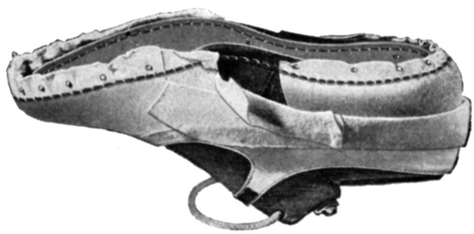
It may be said that there are two types of turnshoes, apart from the slippers already mentioned. The sew-round is, as the title implies, sewn all around the shoe, while the other is sewn only up to the seat, the seat being lasted in the ordinary way after turning.

The single upper (the easiest to make) or the upper and lining are turned and lasted inside out. With lined shoes this should be carefully done as in any circumstances it is difficult to clear the linings, and practically all the shoes require individual attention.

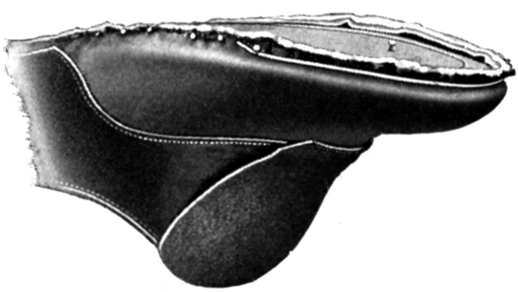
The sole itself, which is also the insole, has been previously channelled on an ordinary Goodyear universal channeller, or similar machine, either all around the seat or only to heel (see p. 229), is wetted, and while mellow is tacked on to the last, and moulded to it; the channel is partly raised and the sole left for a short period to dry slightly in this position. The shoe has to be made and turned before the sole dries out, however, as otherwise it will crack in turning; in any case if really dry it would be very difficult to turn and would probably result in a split seam.

The range of styles is limited to what will turn easily, the more open the style the better for easy turning; most of the work made is very light open court shoes, with light uppers and evening shoes of better class fabrics. The stiffener has to be of some flexible material, usually leather of a light substance, and should be in a mellow state and it is usual for the laster to prepare his own components. A hard toe case is also out of the question.

The upper is now lasted with the outside next to the last. The sides must be lasted by hand (Figure 206*a*) or on a 'Consol' using about a $\frac{1}{2}$ in. soft rivet which is left standing up for easy removal after sewing. The seat is lasted in a similar manner (sew-rounds) but may be held in position with a



a



b

Figure 206. Turnshoes: *a* stapled; *b* toe, bed lasted.

tape and two anchor tacks located at the corners of the seat. The toes may be lasted by hand but are perhaps better done on a manually operated bed laster BUSMC No. 7, or Standard 'Evolution' (Figure 206*b*). In the past the 'Consol' was in fairly common use for lasting toes. The toes also are better held by tape and anchor tacks.

On a lined shoe the upper may be cut in such a fashion that the seam at the vamp is left open, with the lining turned back; this lining is, after the shoe has been turned, smoothed down and then stuck to the edge of the sole inside the shoe—a hand operation and rather complicated. The lasted shoe is now sewn on an ordinary

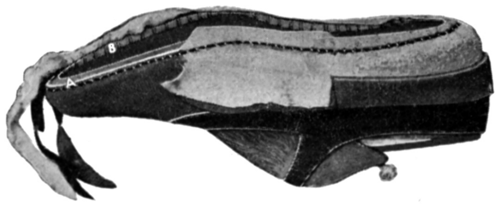


Figure 207. Turnshoe trimming. The surplus material B is trimmed down to the stitching as at A.

welt sewer without a welt. That is, a chain-stitch passes through lining (if used), outside, and the channel of the sole, in a horizontal fashion. Although the welt sewer used for sewing shoes on the last is not particularly altered, if they are sewn off the last the machine is fitted with a horn.

The rivets are removed after sewing and the surplus material above the seam is trimmed off on a surplus upper trimmer (Figure 207). This operation requires a good deal of care as if too much stuff is left on, the seam is bulky on the inside and if too much is taken off the seam is weakened. The channel, equivalent to the inside channel of a welted insole, is now solutioned and laid down to the position it was in after channelling; this is carried out by hand and affects the evenness of the inside of the finished shoe.

At this stage the shoe is slipped off the last and is ready for turning.

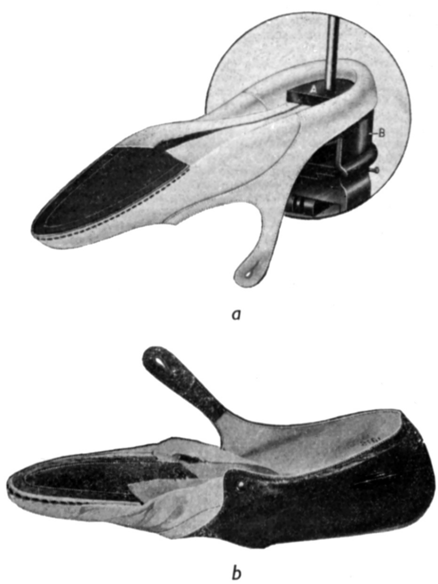


Figure 208. Seat turning: *a* partly turned with inside (A) and outside (B) formers in position: *b* after turning.

The seat is first turned; this may be carried out by hand, or on a machine. The machine consists of an inside and outside former (Figure 208*a*). The outside former is placed with its ridge within the shoe itself, this ridge roughly resembling the outside contour of the seat (Figure 208*a*). The inside former comes down to the seat, the operator exerting the necessary amount of pressure with a pedal; as it continues downwards it forces the centre of the seat down while the upper stays where it is. Thus the seat is forced inside the quarter until that portion of the shoe is turned about (Figure 208*b*). lt is often necessary for the operator to use his fingers to assist to roll the upper back; the operation itself requires a good deal of care.

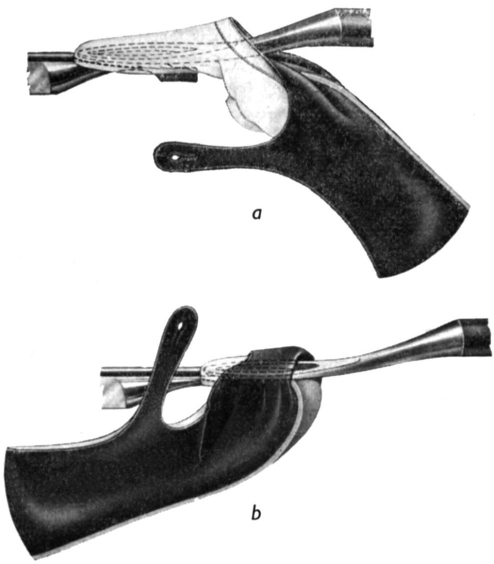


Figure 209. Two stages in the process of forepart turning.

We thus have a shoe with the forepart inside out and the back normal, the former below the seam and the latter above it.

The forepart is next turned; it may be done by hand with the assistance of two pieces of wood, but is better turned on a forepart turning machine. The forepart to be turned is placed over a tool which is in size and shape similar to that of the shoe (Figure 209*a*). A piece of metal rests against the toe on both sole and upper; this tool can be moved forward by a treadle and its return movement is spring-loaded. The operator takes the upper with thumb and fingers and as he eases, with the treadle, the outside tool forwards, turns the forepart right side out (Figure 209*b*).

The shoe is now the correct way round. If the lining has been cut as previously mentioned and the quarter lining not sewn in, this lining is pasted and carefully inserted with the fingers. The creases should all be removed and the upper laid on the insole as evenly as possible; a long sock is always used on this type of work.

It is fairly obvious that a shoe treated in this way is at this stage hardly a replica of the last it was made on. It is now put on a turnshoe re-former consisting of a last in two halves, slightly smaller in length than the original when the gap is closed to ease the operation of placing the shoe on it. This gap is spring-loaded, widening as the machine is tripped, until the original last is reproduced. The subsequent action of the machine is like that of a leveller except that the bottoms are levelled by hand by the operator and only the upper is shaped by the machine.

When this operation is completed the bottom is filled with a shank if necessary, and a pre-shaped filler; this filler is often complete with shank and sometimes a thin insole of leather with swansdown backing, having been completely assembled before insertion.

On turns carrying a higher or Louis heel (evening shoes *etc*.) the sewn seat does not provide a solid enough base for the heel. The sole is in this case channelled only to heel and the seat is as for a Louis, or the sole may be cut to heel only (see p. 218). The seam is sewn to heel only, the seat being completely left alone. After turning, half an insole (to the joint only) is stuck in or tacked to the last at the seat before the shoe is replaced on it, the seat is then lasted in the ordinary McKay manner, with the Louis heel flap turned back.

A shoe made by this method is probably the lightest and most flexible shoe made. It is essentially a job for a craftsman right through and impossible to mass produce as the term is understood now. Its greatest disadvantage is that it is practically impossible to repair without ruining its character as the ‘sole-cum-insole’ cannot be removed. The only way to do anything with it after the sole has worn out is to scour the sole lightly just above the depth of the channel and stick a sole on top. lt then becomes a rather poor replica of the type of shoe that, to a very great extent, has replaced it.

THE LITTLEWAY METHOD

In describing the Littleway method it should be borne in mind that except for Littleway welted work the processes follow closely those of the machine-sewn. The fact that no metal shows on the insole and the seam is much more flexible and neat, justifies the extra trouble and expense that the use of these machines involves.

The Littleway lasting machine has been described on p. 330.

As the lasting machine is critical, and with all better class work this is the case, the insoles have to be carefully chosen for consistency in texture and substance; they are usually buffed or degrained before being tacked on. On slipping a shoe after lasting its appearance resembles that of an ordinary machine-sewn shoe except that the insole has grindery showing only at the seat and toe. The lasting of these shoes is often followed by the mere sticking on of a sole; a heel sock is inserted so that the inside appearance is clean and pleasing.

The laster is used in conjunction with the lock-stitch machine. These methods, with one exception follow those already described for machine-sewn work.

The Littleway Stitcher

Being a lock-stitch machine there is a single thread on both sole (in channel) and insole; the stitch itself is much smaller and it is customary to use white cold wax through the horn, that is the insole side, but hot wax with the bobbin.

It consists of a horn with a whirl-driven pinion with the thread passing through a waxpot as it does on the Blake machine. The difference here lies in the fact that the lock-stitch machine has a thread lock mechanism similar to a 'Rapid' stitcher, a compensating roller and a thread locking lever, but no thread saving device.

The stitch is formed by the action of the needle drawing the loop through the insole and sole. This loop is parted by a spreader to allow the nose of the shuttle, containing the bobbin, to pass into it. The rotary movement of the shuttle passes the thread over it and the thread is pulled tight by the thread locking lever situated below the horn; in other words the thread, unlike on the Blake machine, leaves the needle completely.

To allow for the movement of the thread locking lever, a length of thread is pulled through at the start of each shoe and clipped to the horn itself, the bobbin thread being left sufficiently long to be locked into the loop. The bobbins themselves are wound on a metal cap, but unlike on the stitcher the metal bobbin is not inserted into the shuttle, the wound cap being removed and just the thread placed in. The shuttle itself is lighter than that on a stitcher and is situated just by the needle.

The feed mechanism is the same as on the Blake machine, that is, the point feeds the shoe to immediately below the needle, then withdraws the needle making its own hole through the sole and insole.

The machine is rather delicate and, if it encounters too many tacks at the toe, trouble may ensue; for this reason it is essential that such tacks are placed fairly well in and are not unduly plentiful. Stick lasting is the best way of lasting for this machine, especially at the toe.

The machine itself is not suitable for heavy work and is rather extravagant on thread at the beginning of the shoe, due to the length of stroke of the take-up lever; for the same reason, coupled with the small size of the shuttle, the thread has to pass over it a number of times.

It is usual to insert only a heel sock with Littleway stitching of this type and combined with a buffed or degrained insole and a clean lining the inside appearance is very pleasing.

Lock-stitch Welted

This shoe, having been lasted in the normal machine-sewn manner but with the sides Littleway stapled, is, after bottom filling, slipped off the last (Figure 210*a*).

The Littleway lock-stitch machine is, for this type of work, fitted with a welt guide to take a plain welt, with no bevel or groove, of about 3 to 4 irons. This guide is situated so that the welt is fed directly under the needle in such a position that the seam is about $\frac{1}{4}$ in. inside the inner edge (Figure 210*b*). The shoe is placed on the horn of the machine and the

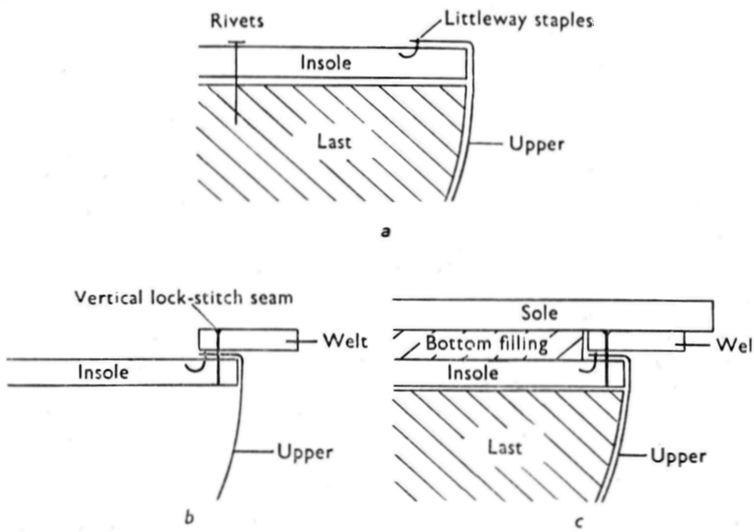


Figure 210. Cross-sections illustrating the Littleway welted process. *a* Shoe lasted with Littleway staples at the sides. Tacks are used at the toe. *b* The last is slipped and a vertical lock-stitch seam attaches the welt to the insole through the upper. The seam is stitched on a Model 'C' lock-stitch Machine fitted with a welt guide. *c* The shoe is re-lasted and the bottom filled after which the shoe is treated as an ordinary welted shoe.

needle penetrates the welt, lasting allowance, and insole. Having thus sewn in the welt the original last is re-inserted and the shoe is made as an ordinary Goodyear welted (Figure 2l0*c*). There are thus two vertical seams both being lock-stitch, one securing the welt to the insole, and the other securing the sole to the welt.

The finished shoe is extremely flexible in wear and has all the appearance and characteristics of a Goodyear welted.

The method is confined to lighter types of shoes as the shoe, when the last is slipped, is rather fragile; it is thus easily distorted in sewing especially if too heavy a welt is used. The only drawback as compared with welted is the seam on the insole, but as the stitches are small and neat and the thread is lubricated with cold wax only, this drawback is visual and is not felt by the wearer; it is usual only to insert a heel sock and leave the seam showing. The insole itself will remain quite flat with no chance of the inside channel showing through as with a good many Goodyear welted made with too light an insole.

This method is not in very great use, but has many points to commend it.

26

THE MANAGEMENT OF THE LASTING AND MAKING DEPARTMENT

THE TWO DEPARTMENTS ARE really separate units and as lasting and making each demand different techniques it is better if they can be sub-divided. For economical reasons, however, they are often combined especially where the output is small but as this is a brief general survey this consideration is not essential.

The management of the room is a matter better approached from a practical point of view but a knowledge of the theory behind it is absolutely vital to get the utmost out of it. It is a fact that 95 per cent of the operations in the department are machine operations. All these machines, however involved their construction may be, are merely tools for the operator to use, in the sense that they are not completely automatic like, say, a machine making pans, which, once it is set up will proceed to stamp out thousands by itself, merely being fed with sheet metal.

Bearing this in mind, not only have the capabilities and limitations of these machines to be known and understood, both from the point of view of output and standard of work, by the person in charge, requiring both study and experience, but the operator's capabilities must be known as well; this latter is a rather more formidable job for which the executive has to rely solely on his own judgement—there is no standardisation or set rules.

It has been the practice of some sections of the trade for many years to approach the product of the machine with an attitude of tolerance of a really unwanted economic necessity and at every opportunity to compare it, to its disadvantage, with the hand-made job. A good many executives have been brought up in this tradition and have been trained in hand methods to the exclusion of machine methods. Fortunately this outlook is changing. In the opinion of the writer, with one or two exceptions, machines turn out a job equal to, and in a good many cases better than, hand shoemakers. Top grade hand-made shoes are indeed works of art but there are not many top grade shoemakers and the products of the less skilled are often missing when comparisons come to be made.

The task, then, of running a room is chiefly to know what standard can be attained by operators, as a team, in view of their collective capabilities, and the tools at their disposal, and how much and how good is going to be the product of each. This latter aspect is very important in the lasting and making departments; each operation is different in character and the standard of skill required; each one is also dependent on the one preceding it. Each individual only carries out a small item of the job as a whole. If one additional operator is set on, for example, a rounder, the total output will not automatically increase; only the skill of the executive in balancing the rest of his department and using the additional man-hours available will result in an increase. If he fails the only increase in total will be on rounding, resulting in this output being too great and thus the department becoming unbalanced.

It is not often found that the executive himself is an expert on every operation and he does not need to be; if he is he has to curb his inclinations to do the job himself. He should never work physically himself except in factories where the output is too small to carry him. While he is working something may be going wrong or someone else may be taking things easy. He will find that he will collect no medals for his physical efforts and operating skill when something has gone wrong while he was thus engaged, and for which he is responsible. He is employed to assess those under him and to organise and use them to do the work. If he should be absent for a period and the department runs smoothly that indeed is a tribute to his skill. There is an all too common opinion among executives that if something happens when they are not there, which throws the department out of gear, that will enhance their personal prestige when they return. If it is something which ought to have been foreseen beforehand, it should be their responsibility whether they are present or not.

The efforts of the department should be subjected to the general interests of the firm whenever humanly possible, and any inconvenience caused by so doing shouldered without hesitation. No firm should be subject to the limitations of one particular section, or any department to those of a single operation. This may not always be possible, but it should always be an ultimate aim; such limitations should never be regarded as permanent and inevitable.

It may be that the whole of the planning is done by a central department, but it is better that such a department do the bulk planning, and the sub-dividing and method be decided in the department itself. Planning is of course a necessity but it can be overdone. It then becomes a case of the ‘tail wagging the dog’! Planning departments can develop into huge unwieldy departments from whence emerge large numbers of important people who carry mysterious looking documents, who are always overworked and must have assistance, and the stranglehold gets stronger and stronger.

The fitting-up of work coming into the department depends on the amount of such fitting-up and the type of work. Arrangements must be made so that everything required is at hand before the work is started on; mistakes in this direction can be disastrous. Such arrangements as, for example, soles going for solutioning and tempering in the same order as insoles are tacked on, are vital. These in turn may be completely upset by damages and oddments, as all broken lots should not be allowed to go too far before awaiting completion. Whether it is advisable or even economical to count out such components as puffs, stiffeners, welts, seat lifts and all the other parts is very doubtful; losses still seem to occur even when this is carried out to the full and no inquests seem to bring the missing pieces to light. Apart from the fact that components get spoiled even in the best run departments, mistakes in counting do occur and the process of making these up is often a comparatively lengthy and argumentative one. Meanwhile time is being wasted to a far greater value than that of the missing component, in addition to work being held up.

It is of great help to the person responsible if he is set a standard of quality and output plus economy and judged on that without being unduly interfered with. It is a fact that everyone gets to the state that one ‘cannot see the wood for the trees’ and outside comments are justified and helpful; such comments should be made to him personally—any good man is annoyed with himself if he has made a stupid mistake and such self mortification is enough. The departmental head should know of any changes contemplated especially where such changes are to be made from other sources, and he should be consulted on such matters. Not only does this go a long way to ensuring his co·operation it also gives him confidence and enhances his prestige with those under him.

On his part he should co·operate with and even accept responsibility for methods with which he does not personally agree. This is perhaps asking a lot, but to have ideas of one’s own and at the same time to realise that there may be better ones is one of the greatest assets anyone can possess. There is nothing worse for an executive to hear of some contemplated change in his department from perhaps one of the men under him, but it sometimes happens that by his own attitude he has brought such a state of affairs on himself.

All too often one hears of a foreman transmitting a disagreeable decision to someone under him with the preface, ‘It is not my doing but Mr. So-and-So’s.’ He is in this case either afraid of his men or he does not want to make himself unpopular. If he thinks that he will retain his popularity with those in his charge he is grossly mistaken in using such methods. He is merely advertising the fact that he is not strong enough to make or transmit decisions and damaging his own prestige in the meantime. To make and convey unpleasant decisions as pleasantly as possible is his job, and his attitude is quite as important as his technical ability.

The transport of work through the department has undergone very considerable changes during the past few years; the two alternatives seem to be the conveyor, or the twelve pair rack, the twenty-four pair rack having almost entirely disappeared, at least for Goodyear welted work. The argument against it is simple enough; while an operator is working on one shoe, forty-seven lasts are standing still in addition to the extra floor space required. The three pair trays of a conveyor go to the other extreme, too far for Goodyear welted, in the writer's opinion; it is a very true statement that a shoe that has been on the last four days is a better shoe than one that has been on only two, although the increasing use of dryers has speeded up the setting process very considerably. Smaller rack are now the standard equipment of most factories and take the form of slotted racks, pegged racks in which the shoe is held in an inverted position by the peg of the last, or ordinary shelf racks; these latter are more liable to damage work, however, as it is better that the shoes should be separated. On cemented work the conveyor comes more into its own; the main suppliers of this type of transport are Messrs. Freeman and Wright who have been the chief pioneers and have developed it to a very great extent with remarkable results in the saving of space and effort.

PART VII

FINISHING

J. HARRIS

INTRODUCTION

IT IS DIFFICULT TO give adequate reasons for some of the titivating done in finishing except to describe it as an expression of craftsmanship in the same way as some of the Victorian furniture was embellished.

Further, the methods used, the order of operations, the type of machine, lay-out of plant and other considerations beyond the intention of the present text, all have a bearing on the kind of result.

However, it is generally considered that finishing operations fall under two headings—the useful and the ornamental. It is not always possible to separate entirely these two groups as some useful operations may be considered very decorative, but, for the purpose of grouping, any operation which serves a partially useful purpose may be included in that group. Such a process is edge trimming which is primarily concerned with shape and appearance, but without the smoothing of the edge, wax penetration and sealing would be impossible by present methods. Seat wheeling is another job where the emphasis seems to be ornamental, but if properly done, it serves to seal the seat as well.

It must be realised that some variation in sequence is possible in order to provide for special circumstances; two typical sequences are now given, one orthodox and one specially planned for an economical 'black through' finish.

ORTHODOX	*SIMPLE BLACK THROUGH*
Heeling*	
Breasting	
Heel trimming	As orthodox method to:
Heel scouring—rough and fine	
Applying 'Smoothene' or dye	
Combination heel trimming	
Superfine heel scouring	Superfine scouring
Edge and heel colouring	Bottom scouring
Heel burnishing	Putting whole bottoms into colour
Seat wheeling	Heel burnishing
Edge setting	Seat wheeling
Edge and heel brushing	Edge setting
Bottom scouring	

*The heeling operation is included in this section for no other reason than that it is a border line operation, essentially attaching or ' making ' but very often included in finishing departments. In large plants it may be a separate entity but, if so, usually includes slugging, heel trimming and breasting.

Bottom making
Top ironing
Side ironing
Marking-over
Crowing
Brushing-off
Last slipping

Bottom burnishing
Side ironing
Brushing-off
Slipping

Note: No hand operations.

27
HEEL ATTACHING

Heel Heights

It is important to realise that the height of a heel is determined by the design of the last, *i.e.* the pitch of the last, and using arbitrarily a heel of any height according to whim will not produce satisfactory results. The design of a last blends the toe spring with the pitch, which implies that, having fixed the toe spring, the correct heel height must be used to safeguard this. Also, for orthodox grading it will be found that to maintain a proper balance between toe and seat, the heel will have to be raised as the size increases (see p. 98).

Pitch of Heel

This must not be confused with pitch of last. It may be defined as the placing of the back of the heel forward, normally, or backward in relation to the back curve of the last (Figure 211).

In connection with this, the type of pitch used on a man's shoe heel will usually be related to the style of footwear. Light dress shoes have a forward pitch, heavy brogues a slightly backward pitch, and in this way character is added to the shoe.

Ladies' shoes having heels of more than $1\frac{1}{2}$ in. will normally have a back shape which follows the shape of the back curve of the last. The position of the top-piece on a heel $2\frac{1}{2}$ to 3 in. high must coincide with the weight·bearing centre of the seat. This seems to come forward (towards the waist) as the heel is raised (see also p. 80).

Stand

This may be expressed as the relationship between the top-piece and the tread. Correct stand is obtained when the whole length of top-piece is on the same level surface as the tread and the toe spring is true (Figure 211).

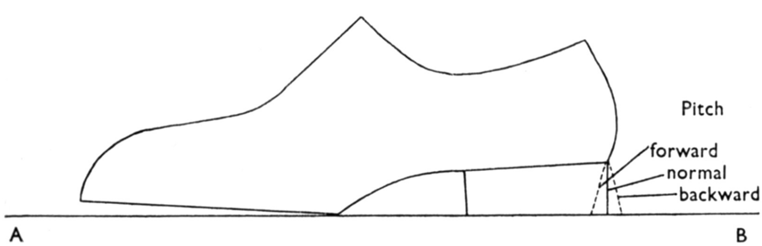


Figure 211. Pitch and stand of heel. The top-piece touches the level surface AB from front to back.

METHODS OF ATTACHING HEELS

Heels may be attached by a variety of methods, but the following will cover those mostly used:

(l) inside attaching;
(2) outside attaching;
(3) temporary attaching;
(4) stuck attaching.

Inside Attaching

By inside attaching is meant that the nails are driven through the insole and sole seat into the heel from the inside of the shoe; the last has first to be withdrawn (Figure 212*a*).

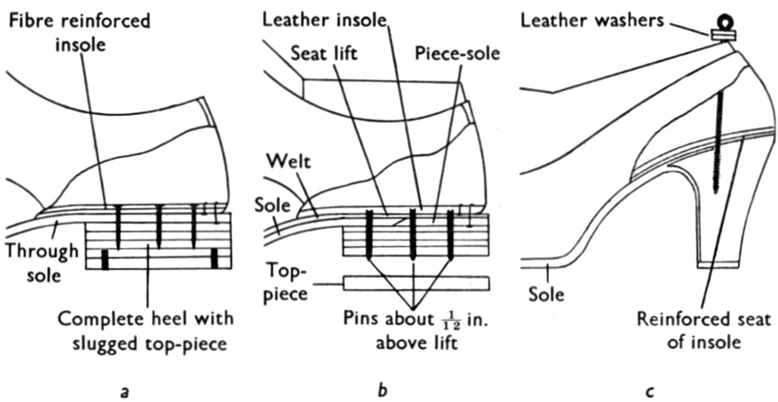


Figure 212. Heel attaching. *a* Inside attaching. Headed screw nails are driven from inside into heel complete with slugged top-piece. *b* Outside attaching. The pins are standing about $\frac{1}{12}$ in. above the lift. *c* Temporary screw attaching. The screw holds the heel in position until last slipping.

The most popular type of machine in use for ladies' wood heels is the BUSMC No. l0 Heel Attaching Machine. This machine has automatic loading and feeding and in action holds the heel very firmly on either side and back whilst the screw nails are being driven home. Normally six screw nails are used from $\frac{7}{8}$ to $1\frac{1}{4}$ in. according to height of heel.

The BUSMC No. 11 Inside Attaching Machine has developed from the No. 8, is of much sturdier construction than No. 10 and is more suitable for leather heels.

Outside Attaching

When this method is used the last is retained in the shoe and the heel is attached separately from the top-piece. The pins used are normally 1 in. long having no heads, being slightly tapered and having a rectangular section. When the heel is attached the pins are driven through the heel first and then into the seat and the 'heads' or ends of the pins are left standing up about $\frac{1}{12}$ in. (Figure 212*b*) so that on the second trip of the pedal the top-piece, which automatically comes under the seat, can be 'blinded' on to the heel temporarily, ready for slugging. The chief machines are the No. 8 and now the No. 11. The No. 8 and No. 11 machines are both convertible for either inside and outside attaching. A recent innovation is the still largely experimental BUSMC No. 12 Heeling Machine which combines some of the features of both the methods already mentioned. Firstly, the last is retained in the shoe. Then the heel to be attached is a complete heel with top-piece already on and slugged, breasted and if desired front scoured and finished. The method of operating, briefly, is as follows. The die is automatically loaded with special bifurcated pins of the screw type and the shoe is placed over the die and these pins are driven into the seat but left protruding about $\frac{1}{2}$ in.

Simultaneously with this happening the heel is pricked with a number of holes to correspond exactly with the number and location of the pins. Then as the shoe is lifted clear of the die the heel is automatically transferred by runway to rest immediately under the pins in the shoe seat. The second pressure 'spanks' the heel on to the pins by way of the holes pricked in the heel.

Although an average of only nine pins is used against an average of fifteen on the No. 8 or 11, it is claimed that the holding power is greater. The possibilities of this machine are very great as it might mean the end of any form of temporary attachment.

Temporary Attaching (Wood Heels)

It has long been realised that the 'setting' of the upper after lasting depends on the length of time it can be kept on the last. For this reason and the fact that when making cemented shoes the last does not have to be removed for sole attaching, it became evident that a method ought to be evolved for the temporary fixing of the heel (wood) whilst the last was still in the shoe.

The first step is to bore a hole through the last from the top to the seat at an angle to suit the pitch of the last. Then the shoe and heel are held rigid in a machine fitted with a clamp whilst a long drill is passed down through the hole in the last and drills a hole in the seat of the shoe and the heel. A screw long enough to go through the last and enter the heel for about 1 in. is mechanically forced into position (Figure 212*c*).

When the shoe is finished the screw is removed, again mechanically, the last slipped and the heel firmly attached on the No. 10 Heel Attaching Machine. When using the temporary screw method some firms put a dab of hot glue on the seat before screwing the heel.

Stuck Heels

Certain types of shoes such as slip-lasted shoes have no firm insole or seat to act as the foundation for heel attaching and it is customary to use a cover to wrap or last over the wedge heel (Figure 213*a*) but

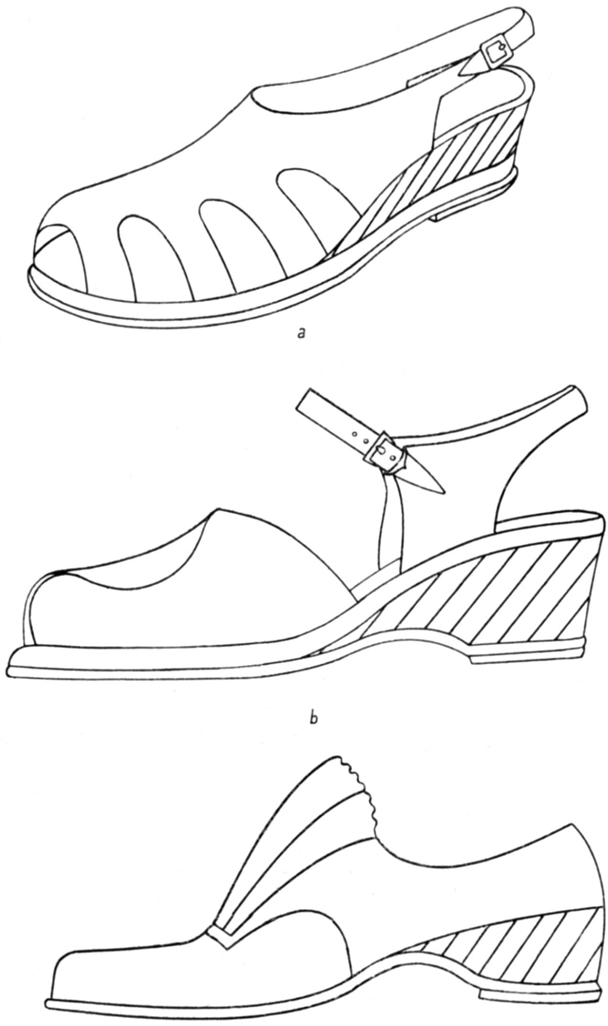


Figure 213. Variations in wedge heels: *a* Concealed wedge, stuck to platform before covering. *b* Covered wedge, stuck either to separately covered platform or direct to seat. *c* Internal wedge, either assembled with insole or inserted into finished shoe.

some slip-lasted shoes are made with through platforms of the same substance extending to the seat and the platform cover is used to cover this, allowing no material for the heel. The heel is then covered in the normal way and is simply stuck to the bottom of the through platform (Figure 213*b*).

Another type of stuck heel may be termed the 'internal wedge' (Figure 213*c*). This needs a special last having wood where the heel would normally fit (Figure 214). The upper is lasted over in the usual way, made up and the wedge heel inserted after finishing; the heel is then covered with a soft rubber pad and a through sock.

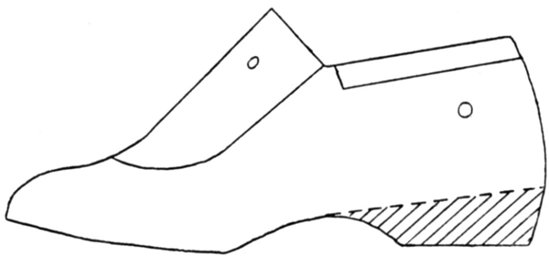


Figure 214. Last for 'internal wedge'. An extra portion on the last allows for the wedge to be inserted.

SLUGGING

Universal Slugging Machine (BUSMC)

This machine with minor mechanical alterations can work with (1) heel off the shoe, (2) heel on the shoe, or (3) top-piece of a wood heel either on or off the shoe.

Wire used is of two kinds, soft steel and brass, and may be obtained in a variety of cross-sectional shapes, square, circular, triangular, *etc*.

Mechanical Details—The machine uses a coil of wire which is fitted in a freely moving reel and the end passes between two pressure cogs and then into the fixed shear. The pressure cogs are controlled by a cam which adjusts the amount of wire to be fed into the shears. When the wire is fed into the fixed shear the full cycle of operation can begin as follows: the awl descends and makes the hole and then goes back; simultaneously with this happening the wire passes through the fixed shear into the throat, at the top of which is the complementary shear. When the full amount of wire is delivered, the throat gives a fractional turn which brings both shears into action and severs the wire in the throat which then travels forward to rest at the point where the awl made the hole. A driver then comes down and knocks the piece of wire or 'slug' into the hole thus completing the operation. It will be understood from the foregoing that the 'timing' of the movements to occur at the correct time and place is of the greatest importance. For instance, the awl must not be bent or it will put the hole in the wrong place, and the wire groove in the throat must be absolutely in line with the driver or broken drivers will occur. Also the driver must be set to drive the slug just flush with the grain of the top-piece or difficulties will be caused at bottom scouring.

Slugging Leather Heels

When this is being done either on or off the last, it must be remembered that the top-piece is the template and that little alteration of the outline is permissible. The guide for spacing the slugging from the edge must be touching the edge of the top-piece to obtain uniformity. Fancy slugging of half rows or double rows is often indulged in but it is common for a double row to have much shorter slugs on the inside row (long enough to penetrate thickness of top-piece).

Slugging Top-pieces on Wood Heels

The guide must be changed when dealing with this type of heel because the template is the wood heel and not the top-piece. It must be realised that the wood heel is a finished heel whereas the leather heel has a margin for finishing. For this reason the top-piece for wood heels is bigger than

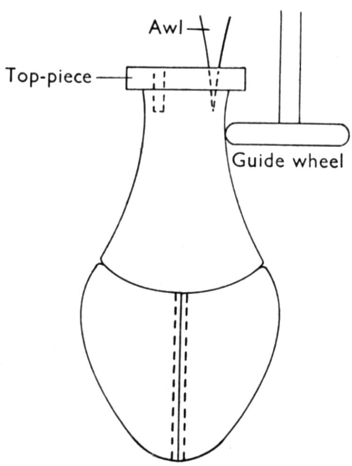


Figure 215. Principle of slugging top-pieces. The top-piece is large enough to allow for trimming and the awl is set in relation to the guide wheel.

the surface to be covered allowing a margin for trimming. The guide used makes contact with the heel and is made from hard rubber—round and free to rotate on its own centre to provide an easy movement for the operator. The positioning of the top-piece is relatively unimportant, providing there is a trim allowance (Figure 215). The most suitable wire for small Spanish heel top-pieces is a fine round brass either ‘OA’ or ‘A’ having diameters of 0·048 in. and 0·055 in. Respectively.

General Observations

The awl should always penetrate further than the length of the slug to be used as the slug is cut off square and cannot make its own hole. Where this is overlooked ‘checking’, i.e. parting of the lifts, may result. Another cause of checking may be the angle of the top-piece position in relation to the awl. The peg should be set so that when the last is placed on it in the working position, the top-piece is tilting towards the operator very slightly and so sending the awl a little inwards. Care should be taken to ensure that both shears are ground properly and set so close that when shearing takes place the cut is square. Badly sheared slugs cause trouble at the bottom scouring stage. Dissatisfaction is often caused at bottom making when using a natural gum finish because iron stains are streaked across the forepart. These are produced when steel slugging wire is used and top-pieces and soles are treated at the same time. As this is a wet finish it is better to work on soles only and then top-pieces only or, alternatively, to use brass slugging wire.

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HEEL TREATMENT

HEEL BREASTING

Unquestionably the best place for heel breasting is in the bottom stock department (see p. 244), because then no damage can arise from soles being cut, even slightly. Unfortunately, this is not always possible as for instance, when the No. 8 Machine is used for attaching men's heels. As the top-piece is attached separately, there is not a close enough union between heel and top-piece to proceed directly with front scouring. When carried out on the shoe, breasting does become an important operation for three reasons:

(1) danger of cutting into the sole;

(2) centralising the heel corners;

(3) obtaining the correct angle with the top-piece.

(1) The responsibility for some of this is due to the bottom levelling being inefficiently done and much danger would be eliminated if a template of the same shape as the knife on the breasting machine could be used across the waist, as very often the breasting knife is cutting in the centre on some shoes and at the edges on others. The machine is fitted with a cut-out lever which makes contact with the waist and prevents the sole from going down any further, but it is not fool-proof.

(2) A bone of contention among shoemakers is the position of the front of the heel in relation to the forepart or the sole shape as a whole. Some lasts have pronounced twisted foreparts whilst others are nearly straight and the problem is to determine the position of the heel front in all cases. The majority seem to favour the heel being attached so that the comers are parallel to an imaginary line drawn across the centre of the waist. The heel breaster has an opportunity to correct slight variations in attaching by cutting off a little more of the top-piece on one side than the other, but it must be remembered that this cannot be carried too far as the top-piece is a finished shape with little allowance anywhere.

(3) Correct angle is not always easy to determine but as a general rule it is slightly less than 90° for light-weight shoes and slightly more for heavy shoes. A smart effect is obtained on men's city wear shoes when the angle is acute by a few degrees. A stolid heavy appearance is obtained on heavy boots and shoes when the angle is just above 90° (Figure 216).

A standard of 90° is best for ladies' heels but these are almost always breasted before heeling.

The position of heel breasting in the sequence of operations has aroused some controversy, it being placed either after slugging or after heel trimming (paring). Those who favour the second position maintain that where board lifts are used there is a tendency for the cutters to drag pieces of the board lifts out on the second side and, if breasting has not been done, some attempt may be made to rectify this, as in any event part of that corner must be removed at breasting.

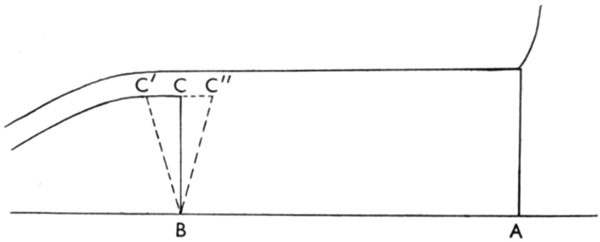


Figure 216. Suggested angles for heel breasting: ABC for average shoes; ABC′ for heavy shoes; ABC″ for light shoes.

HEEL TRIMMING

This is known as heel paring in some districts and broadly speaking simply consists of removing the surplus material (leather and board) from the heel.

The Cutters (‘UItima’ Machine, BUSMC)

These are two in number and are shaped to produce the style of curve intended in the heel (Figure 217). The width of the cutters varies with the height of heel and it is important when dealing with high heels to measure the cutter against the side of the heel about $\frac{3}{8}$ in. from the heel corner. This

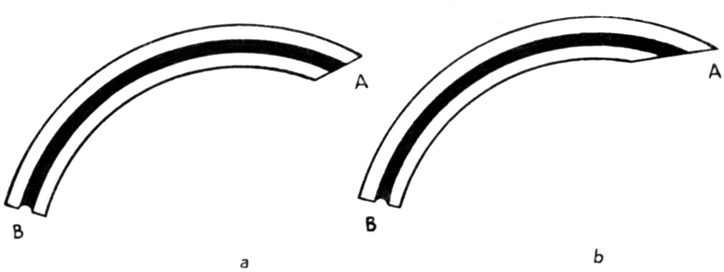


Figure 217. The extent of the scarf on a heel trimming cutter: *a* for leather and fibre-board heels; *b* thinner for leather heels. A = cutting edge; B = groove for clamping into machine.

will determine the width of cutter to be used, as a cutter which would accommodate all the back height will cut into the upper in the waist. This will be referred to in a later paragraph. The other cutter is known as the rander and may be obtained in a variety of styles and cutting angles.

Sharpening Cutters—There is a machine for cutter grinding which maintains the same angle and grinds the cutters to the same extent and thus keeps the cutters true. Some operators still prefer to grind the cutters singly and have their own methods for extracting the best results from the cutters. It seems true to say that cutters used on heels containing pulp (fibre-board) lifts should be ground with a shorter scarf, say $\frac{1}{2}$ in., than cutters used on all leather heels, say $\frac{3}{4}$ in. The shorter scarf is necessary so as to keep a solid edge against the very hard pulp and even so, it is very unusual for an operator to trim more than twelve pairs of heels of $1\frac{3}{4}$ in. or higher containing fibre-board lifts on one grinding of the cutters. On the other hand, it is possible on men's shoes having all leather heels of $1\frac{1}{16}$ to $1\frac{1}{8}$ in. to trim five or six dozen pairs.

Importance of Setting the Machine

The operating of the machine is fairly simple and, except for high heel trimming which is a tricky operation, it is quickly learned. Speed is an asset, especially on pulp heels, as dulling of the cutters occurs much more rapidly when they are revolving continuously against the surface of the heel.

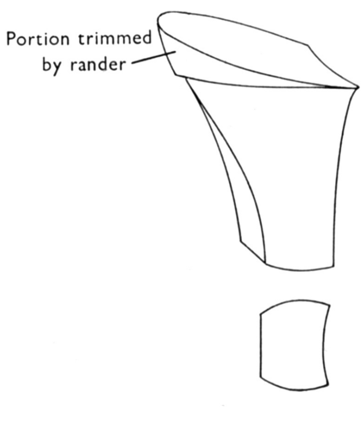


Figure 218. Diagram to show the part of the heel to be trimmed by the rander. It also illustrates the effect of trimming a heel with a straight-back top-piece.

When operating, it becomes more obvious that the top-piece is the template for the heel shape, especially where straight-back top-pieces are used (see Figure 218). As previously mentioned, the cutters must not exceed the height of the front of the heel, and when operating care must be taken to slide the top-piece down on to the top-piece guard and also to force the heel between the counter guard. It must be explained that the counter guard (back guard) works on a spring which allows it to open, but although it does open, the height of heel at the back which is in excess of the width of the cutters will not be trimmed. This must be removed by the rander

(Figure 218). It will be appreciated that as cutters are sharpened they become shorter but a new cutter which is approximately $2\frac{3}{4}$ in. in length can still be used when it is only l in. long. This reduction in length, which could mean a decrease in ft/min. travelled by the cutting edges, is compensated for by having movable back stops. Both stops (to which the backs of the cutters go) are part of one piece of steel plate and are moved by the same ratchet so both must move forward or backwards the same extent, ensuring the same cutting periphery whatever the length of the cutters.

Another point of importance, when setting, is to undercut the top-piece by about $\frac{1}{32}$ in. This will assist the heel scourer in obtaining a clean edge as top-pieces often suffer from pitted edges on the flesh side, resulting from dull press knives, badly worn press blocks or hard dry leather. Further, the counter guard has a cam-like face and can be turned to give three distinct widths of seat, *i.e.* the upper may be touching the counter guard and the width of seat may be one of three widths.

The heel rest is also an important feature as this takes the shock of the first ‘bite’ of the cutters. It must be set to give the maximum assistance. Leather heels having rubber top-pieces, especially soft rubber, need careful treatment. The top-piece guard should be opened and each top-piece rubbed with a wet sponge .This will ensure perfect safety and the lubricant will enable the operator to slide the shoe round easier.

Randing

This is important even on men’s heels, because it takes the place of a hand job known as seat breaking which was always included in hand finishing. Firstly, when the body of the heel is trimmed the action of the cutters is to push the seat lift away rather than cut it (it must be realised that the material is not supported in any way apart from being firmly fixed to the shoe) there being no shield or lip as on the forepart parer (edge trimmer). When randing, therefore, the action is to pull the seat lift against the shield and lip of the rander. This removes any burred-up seat lift and forms a clean seat line for the edge trimmer to work to.

General Observations

The two guards on the machine plus the heel rest guarantee uniform results, but first-class work can only be done on a machine running with a tight belt and with cutters which are true and correctly ground. It is a fundamental truth that the successful finisher is the one who realises that the majority of finishing machines depend upon the accuracy of the circle. The circle referred to is the path of the cutting edge of the two cutters when revolving, the felt refill of the heel scourer, rolls and pads of other machines and satisfactory results can only be obtained when this fact is properly understood.

More must be said concerning this in connection with edge trimming and heel scouring; its importance cannot be over emphasised.

In connection with heel trimming it is better to true up the cutters and to insert them in the machine to the same stop rather than to put them in haphazardly. When the cutters are running at speed, a piece of chalk held delicately to the cutters will show if one cutter is larger than the other. This one should be ground and the operation repeated until both are cutting the chalk. Then if care is taken with the grinding and their set positions maintained, clean edges will be obtained.

There has been an extensive experiment by the Boot, Shoe and Allied Trades Research Association with the use of 'Stellite' and tungsten-carbide tip cutters. These alloys, used in engineering for the cutting of all kinds of steel, have proved to be very successful but both are more expensive than the steel cutters. Tungsten-carbide especially is difficult to sharpen as the normal Carborundum stone will not regrind it.

HEEL SCOURING

In principle, the heel scouring machine has not changed since its inception. It has been made more compact to reduce the 'whip' on the spindle, better bearings have been introduced, fan hoods have become more efficient, the method of securing the abrasive strip has been changed and finally the abrasives have changed too, but, the machine is still only a refined hand tool relying solely on manual dexterity for first-class results. Not only must the heel be perfectly smooth all round, but no part of the upper must be scratched by the abrasives; this is very difficult to avoid on close seats where the heel may be within $\frac{1}{64}$ in. of the upper.

The optimum speed of the machine has for some time been the subject of much interest, various claims being made. For instance, a faster speed is suggested for the finer grit abrasives and undoubtedly if uniform pressure is exerted then there is an optimum speed for each grit size. The variables inherent in scouring are the kind of material (*i.e.* crepe rubber, vulcanised rubber, fibre and leather'compo' board or leather, both chrome and vegetable tanned), the speed of the machine, the kind of abrasive, grit size and the pressure exerted. For the heavier grades of Carborundum where more pressure is used to scour the final shape as quickly and cleanly as possible, there would be a tendency for the shoe to snatch if the speed were too high or conversely, the operator would need to be too careful to obtain consistent results. One of the problems confronting all persons concerned with abrading or scouring is the question of scorching or charring. The two chief causes of this are (1) continuing to use an abrasive after its effective life is finished, and exerting too much pressure in an effort to overcome the lack of cutting power, and (2) scouring on wet leather. Dealing with (1) it is surprising how much heat is generated by the friction between abrasive and heel and where this is excessive, charring of the surface results. This will not produce a polished heel. For (2) it is essential that when scouring, the surface must be dry as the friction-generated heat seems to be retained by the moisture, causing excessive charring. Even with the sharpest of abrasives it is still unwise to scour wet leather as the tendency is for wet leather, being plastic, to be pushed aside rather than cut away; it relaxes on drying to leave a very uneven surface completely unsuitable for finishing.

Abrasives

The breaking down of the silicon-carbide particles into fine fragments is necessary to provide varying grades of abrasive to perform different tasks, *i.e.* shaping (coarse) and polishing (fine). The normal grades in use in the shoe industry vary from approximately 30 to 320 for Carborundum (silicon carbide) and relate to the number of threads to the inch of the silk or phosphor-bronze sieves used to pass the particles.

Where garnet and red flint are used there is an arbitrary number or letter reference for grit size.

It is not intended to give a detailed account of abrasives in this section, but to point out that each grit size can only be expected to do a certain job, consequently the coarser grits must only be used for the first scouring and where an all leather heel is used, this first abrasive need not be too coarse if the heel trimmer has taken enough material away. Some firms are using a grit as fine as 60 for what is called rough scouring, but the usual is either $1\frac{1}{2}$ to 2 in red flint or garnet or 30 to 36 in Carborundum.

One of the difficulties in using abrasive cloths or papers is the tendency to clog between the grit particles and to counteract this, most kinds of abrasives may be obtained with what is known as an ‘open coat’. This type is produced with a much sparser layer of particles on the glue, leaving spaces between the particles to avoid clogging.

Another feature of abrasives is that they are obtainable with three kinds of backer—paper, cloth or a combination of these. Apart from being cheaper, some operatives prefer the paper backed abrasives because they bed down on to the felt more closely. The combination (loosely woven cotton with a paper back) is used largely on the coarser grades of flint *etc*. When heel dyes are ‘backed-in’ it is the cloth backer which is used.

Sequence of Operation

Front scouring, where necessary, is normally the first operation. This is performed on a cone-shaped roll fitted on the end of the top spindle. The fitting of the abrasive to the heel breast scouring roll is important and any abrasive protruding beyond the end of the breast roll must be cut away, as this excess would scour into the sole.

When heels are attached from the inside, it is an advantage to breast and scour, in fact to finish the heel breast before attaching.

Rough Scouring—This produces the final shape in the heel and the shape of the 'x-ray' refill should closely follow the shape of the heel trimming cutters. Only in extreme cases should the top-piece be scoured beyond the undercut made by the heel trimmer. The exception is where the heel has been attached slightly more to one side than another and the heel scourer attempts to true it. This may only be attempted to a limited extent owing to the line of slugging which would appear much nearer to the edge on one side if too much scouring were done.

Fine Scouring—The rough scouring is followed by the fine scouring which is done mainly to remove the scratches made by the rough scourer. The grit size used will obviously depend on the grit used for rough scouring and if 60 grit has been used the fine scouring could use 120 or 150. But if 15 to 2 red flint is used then 60 to 80 would be better.

Superfine Scouring—Normally a superfine scouring is the third and final scouring and grits 150, 180 or 220 are used.

There are many variations, but chief among them is the practice of dyeing the lifts of a composition heel to produce a uniform finish effect and 'backing-in' or using a very worn abrasive. The dye chosen must have good sticking power and it is usual to use a spirit base dye.

Observations

The 'x-ray' wheel with its easily detachable felt refills was introduced to effect speedy changes from one shaped felt to another, according to the height and shape of the heel. It is a surprising fact that some finishers do not take advantage of the fact that wide felts are obtainable for high heels and they have been observed finishing heels up to 3 in. on $1\frac{1}{4}$ in. felts instead of at least 2 in.

Again, it must be emphasised that the scouring wheel must run true and a simple method of testing this is to tear off two pieces of abrasive and place them between the holding spikes to ensure that the wheel will be open to the same extent as when in normal use. Then run the machine and hold a soft lead pencil to the revolving felt to mark the 'high' spots. These can be rubbed off by using a piece of coarse abrasive whilst the machine is stationary and finished off by again running the machine and holding a strip of abrasive stretched along a solid board (pressed firmly to the bottom of the fan cover) and lightly bringing it in contact with the felt wheel. This should produce a true surface and consequently a heel surface free from ribbiness.

The method of holding the shoe is relatively unimportant, but the action should be free and should allow an easy return swing, so that the shoe moves against the direction of the abrasive. This return swing is important because it clears the heel surface of dust making it ready for colour. Otherwise an extra operation is involved—to remove the dust, which, if left on, would mar the appearance of the heel.

Another interesting feature about heels is the use on these of heavy viscous gummy materials marketed as ‘Finene’ or ‘Smoothene’. These consist of gum arabic and shellac in water or methylated spirits, according to requirements. The application is mostly made after fine scouring, each heel being treated (generally sponged) as it is scoured. The effect of the application is to harden the fibres especially where soft belly lifts are used and to give the appearance of a solid heel when finished.

A bone of contention among finishers is the condition or appearance of the heel after scouring. Very often a piece of carnauba wax may be seen among the odds and ends in the dust tray. This means that when superfining, the operator believes it is his duty to wax the abrasive so that he can obtain a highly polished heel. This may have the effect of improving the appearance of his work but the practice is not to be recommended as it may have a contrary effect at heel burnishing. This contrary effect may easily arise in the shape of ‘red heels’. ‘Red heels’ are so named when it is possible to discern the colour of the lifts in an otherwise black heel and may be caused through using hard, horny lifts, greasy lifts or carnauba (or similar) wax at heel scouring. It is often cured or prevented by adding ammonia to the ink. This ‘kills’ the grease and allows the ink to penetrate. Further to this, some firms will not tolerate the use of any grit higher than 150 so that the excessive polishing is avoided. The 150 grit leaves a surface free from visible scratches and yet having a ‘nap’ which will allow the colour to strike.

A final point, but not the least important, is the decision on the position of the various scouring operations in the process line. Circumstances often affect the issue, but it can be stated that as a general rule the rough and fine stages are performed before edge trimming and jointing and the superfine and/or backing-in after edge trimming. Various reasons may be given: for instance, all operations in finishing have a definite bearing on the appearance of the finished shoe and the edge trimmer might cut very slightly into the corner of the heel with his hob cutter. If the heel scouring were complete the effect would be spoiled. On the other hand, if more than superfining remained, the scouring would go beyond the heel corner and spoil the waist trimming.

A further reason for dividing is that only two rolls are used on the machine; thus a change up is necessary. Where output is high enough it is then better to engage one man to do all the superfining. Where machine ploughing by the No. 8 Edge Trimmer (BUSMC) is done, the superfining after trimming takes away any fluffy edge thrown up at the seat by the seat plough.

End of Preparation

The completion of superfining often marks the end of the preparation group of operations although the job of corner squaring is sometimes done. This is accomplished with abrasive cone similar to the type used on heel scouring machines. The advantage of a special corner squaring machine, is that by foot pedal operation, the rotation of the cone can be reversed to scour either corner towards the centre of the breast leaving a clean corner free from loose fibres.

Inspection at this point makes correction much simpler.

29

EDGE TREATMENT

EDGE TRIMMING

THIS IS A MOST important operation and one which improves the appearance of the shoe to a marked extent as well as making the operation of edge setting possible. It can be examined under seven headings:

(1) shape;
(2) angle;
(3) substance;
(4) quality;
(5) care of cutters;
(6) styles of cutters;
(7) materials.

It must be understood, however, that there is bound to be some over-lapping when referring to each section.

Shape

On shoes having leather heels, this embraces all the sole edge at the feather including taking out the seat. This may be done by hand with a hand plough or by machine on the BUSMC Jointing Machine or the No. 8 Combination Edge Trimming and Jointing Machine by using the machine Seat Plough. The importance of bottom levelling and careful blending of seat lift to welt can be plainly seen at this stage as the edge trimmer is responsible for the 'range' of the shoe (Figure 219) which may be defined as the harmonious blending of forepart, waist and seat. Where the seat is 'close' it is important not to take too much out with the plough as this would give the effect of widening or extending the seat.

Figure 219. Range of shoe. There must be continuity of line from A to B.

In general, the shape of the forepart is normally governed by the shape of the last, but there are several variations of this. Orthodox trimming may be so-called when the shape of the last is reproduced by the edge trimmer with an allowance of up to $\frac{1}{16}$ in. on the outside joint (from the toe-cap line to the joint). There is another section of finishers who, whilst following the shape to a considerable extent, have the inside edge of the sole much closer than the outside to allow for the 'treading-over' which invariably takes place on men's shoes. Further, fashion plays a small part in shape; very often square corners are required on the sales for round toe lasts.

Another important point is the 'width of welt'; finishers are not agreed as to the width of welt for different types of shoes and very exaggerated results are sometimes produced. It is true to say that the wider the welt the greater the accuracy needed to produce a good shape.

In connection with shape, the terms pump, close, bare free, free, half wide and wide are often used on work tickets, but with the exception of the first the others might be more accurately described respectively, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$ and greater than $\frac{5}{16}$ in. If normal trimming is carried out then $\frac{1}{16}$ in. must be gradually added from toe-cap line to joint on the outside.

The term 'pump edge' appears to be derived from tumshoe (pump) making and consequently there can be very little margin beyond the feather (edge of last) for any 'width of welt', as the sole, before it becomes the sole, must first act as the insole and must be rounded to the shape of the last. The modern counterpart to a pump edge is found largely on cemented footwear which has superseded the turnshoe. The pump edge has no swell on the joint, it being trimmed close to the feather from joint to joint. Waist trimming is important in connection with shape especially when it is done with a different style of cutter from that used for the forepart, and waist marking is part of the 'taking-off'. Unless the edge trimmer shapes the waist to a known position for each size, it will not be possible to obtain the correct position for the waist mark or two-colour finish. Also, where a bevel waist cutter is used in conjunction with a square forepart cutter, the meeting of waist to forepart should be a well defined semi-circular stop (or start) by the waist cutter exactly on the joint. Fashion has played some part in determining the style of waist trimming; there was, for example, the 'spade waist' which meant that the waist was trimmed almost at right-angles to the forepart at the joint and straightened out at the heel corner.

Finally, a simple point: all shoes having a 'width of welt' should be trimmed in pairs.

Angle

The angle of the edge should be determined by the style of the cutters, *e.g.* where a 'floating' edge is desired, it should be provided for by being shaped into the profile of the cutter. Nevertheless, the shoe is controlled by the operator who can at will tip the shoe towards or away from the bed of the cutter. Variation in angle of this kind is relatively unimportant on light edges of 5 or 6 irons, but the fault becomes increasingly noticeable, especially on stouter edges of over 14 irons. The fault is especially obvious when one side is floating and the

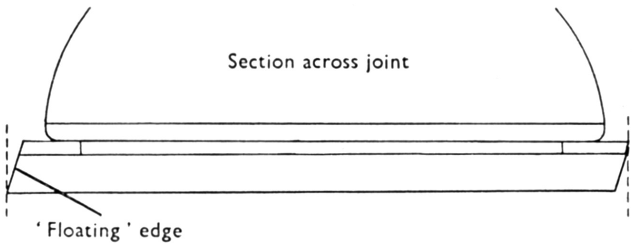


Figure 220. This diagram shows variations in the angle of edge trimming, leaving one side 'floating' and the other under.

other side is under, as shown in Figure 220. A consequence of this is that, where the deviation is excessive, it is difficult to deal with on the Automatic Edge Setting Machine and the part of the edge nearest to the setting iron will receive the pressure, leaving the remainder to be set on the 'Regal' type waist setting attachment.

Substance

The style of cutter in most common use for men's work has two creases which, when the cutter is properly used, will produce two parallel 'beads' on the edge, but this result can only be obtained by maintaining a constant or uniform pressure on the shield. This point has more bearing on successful edge trimming than any other single item and too much emphasis cannot be placed upon it—successful trimming can only be obtained by steady and constant pressure on the shield (Figure 221). The fault which results in failure to achieve this is often found at the joints and for two reasons, the first of which is lack of pressure on the shield; the second is through trying to negotiate the joint too quickly and as the sole edge passes obliquely across the cutter it reduces its effective width. This reduces the width of bed trimmed on the sole edge and increases the amount of bevel or undercut and accurate edge setting is almost impossible under such conditions.

If the sole edge is not held firmly to the shield, the cutter lip cannot work and this results in a loose welt which will not set properly. The variation between cutters is normally only $\frac{1}{48}$ in. and occasionally $\frac{1}{96}$ in. so that full use must be made of that cutter and any tendency to relax from pulling against the lip results in unnecessary and unsightly bevelling of the sole. Also the margin of error increases,

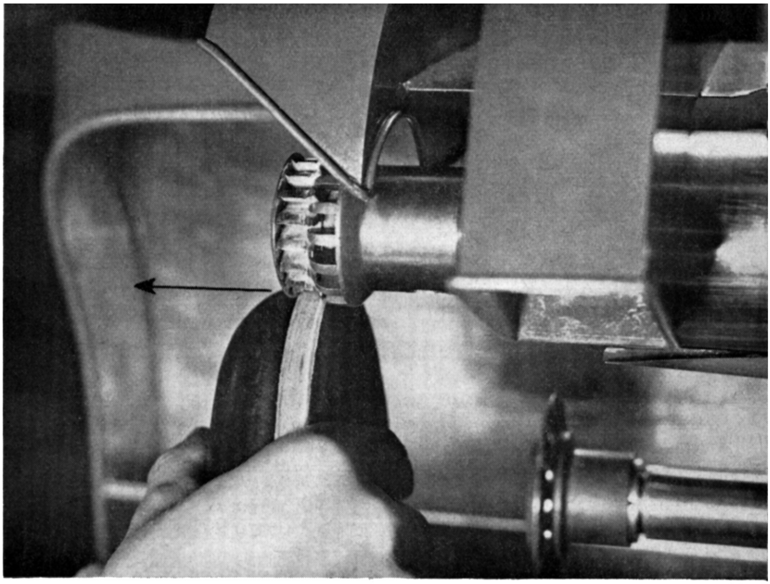


Figure 221. Edge trimming. The arrow shows the direction in which pressure must be applied to achieve good results.

and consequently the need for care increases, as the number of components in the edge substance increases, *e.g.* the welted veldtschoen has very often four distinct substances, the upper, welt, middle and sole thus creating difficulties in maintaining even substance for any number of pairs, causing considerable variation in edges. Very often an operator must change the cutter two or three times for one rack of work.

Quality

As the skill of the operator determines the result, it is true to say that as the speed of any one operator increases beyond his particular optimum, then his quality suffers. The degree of variation in quality and output is very high, as some men have a natural aptitude and others find the task onerous.

Some of the more obvious faults encountered, such as sawing backwards and forwards on the cutter and taking many short strokes to accomplish what could be done in one, may be easily corrected. Whilst no hard and fast rule may be made to guarantee success, the two or three movement methods are accepted, the first for quality trimming and the second for speed or mass production trimming. Whatever method is used, the first requirement is a comfortable stance and a sense of balance, followed by a clear view of the further side of the shield, *i.e*. standing at an angle of about 45° to the machine. Then the shoe must be held firmly but gently to the cutter, and following the contour of the last, pulled in one continuous action to the toe; next, by dropping the left hand down so that it grasps the shoe across the instep, the shoe can be swung (by the left hand using the wrist as the pivot and steadying with the right hand moved to the toe-cap line) right round the toe, followed by a third movement where the left hand is brought back so that the heel is resting on the palm of this hand and the right hand remains in approximately the same position it had occupied for the second movement. A useful tip in connection with this method is that if stops and starts need to be avoided, then after rough trimming, as

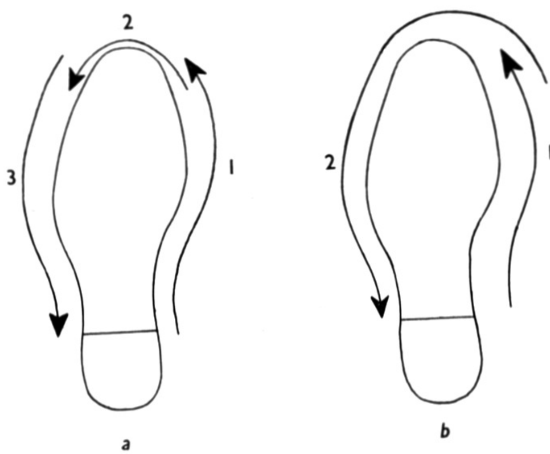


Figure 222. *a* Three movement method. The order of strokes can be reversed after rough trimming to eliminate marks caused by heavy starting. *b* Two movement speed method.

explained in the three movement method, the shoe edge should be wetted and finally trimmed by completing the third movement first, *i.e*. pulling from toe to joint or waist on the second side, then the toe and finally what should have been the first movement. This reversal enables the operator to pass over both starts which occur on either side of the toe as a finishing stroke, thus gliding very lightly over the surface and so eliminating any marks caused by heavy starting (Figure 222*a*). The speed method of two movements is as follows: *first* movement is to the toe as in previous method, *i.e.* grasping the shoe firmly with the right hand around the heel and cradling the forepart in the left hand. The *second* movement is from the toe right round and down the second side. This is done by holding the shoe with the right hand at the heel and swinging the shoe from behind the cutter (Figure 222*b*).

Any operator, with practice, should be able to produce more pairs per day by this method; the quality may be doubtful, but again allowance must be made for individual skill.

In connection with quality it must be mentioned that leather will trim better when mellow. Edges will also look better if a dilute gum solution is applied to the edge after trimming and rubbed in in the same direction as the shoe is trimmed. Wet rubbing is essential on stout edges (men's) if any trimming fault is to be discovered and corrected at this stage.

Quality must take everything into consideration, those points already enumerated, shape, angle, substance and also other points still to be discussed, such as style of cutters, care of cutters and not least of all the output required. Perhaps to a greater extent than heel scouring this operation relies on the skill of the operator and on the vigilance of the inspection.

Care of Cutters

There are two distinct features of this, (l) the cutting angle and (2) the accuracy of the cutting circle.

(l) lf continuous keenness is to be achieved then care must be taken to maintain throughout the life of the cutter the same angle that was provided by the engineers. The only difference that can

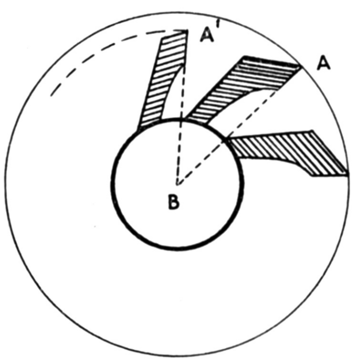


Figure 223. Reduction in periphery of edge trimming cutter. **AB** = radius of original cutting circle; **A′B** = decreased radius after much grinding. This shows the need for a range of sizes of shields to maintain a constant distance from edge of shield to tip of lip of cutter.

then arise is the loss of power through the gradual thinning down of the blades at grinding and also a slight decrease in ft/min. travelled by the cutter as the periphery becomes smaller through grinding (Figure 223).

(2) The relationship between the bore and the periphery is the most important point in connection with smooth running free from ribbiness or scratching. lf the shaft of the machine is true then the bore and cutting edges must be concentric.

It is claimed, and can easily be checked by a clock indicator gauge, that the spindle (shaft) is running true to within 0·000l in.; then there is a good foundation for accuracy. If on setting up a new cutter (not sharpened) it is found to have some blades longer than others, it must be concluded that the cutting edges of the blades are not true to the bore.

The method of 'truing' is as follows: take a worn dish-shaped grindstone as used on the machine and hold it carefully up to the revolving cutter and pass it lightly across the 'bed'. If the action is made with care and precision, the blades which are longer will be ground away flat on their cutting edges, these are then ground on the grinding attachment (as for sharpening) until the flat disappears. If necessary, this can be repeated for further slight adjustment until all the blades are uniform. This method is not sufficient in itself if the spindle has developed a wobble, however slight. In this case, the procedure is as follows (incidentally, some operators follow this rule as part of their everyday method): first, grind a mark on the exposed rim of the thimble and place the thimble in the cutter at a known position, *e.g.* the size numbers, so that the mark on the thimble and the size number correspond. The shield is chosen to suit the cutter and this too may be lined up. This being done, a recognisable spot is selected on the spindle, and shield, cutter and thimble are lined up to it. This means that even if the spindle is not true and the blades are ground by holding the stone up to them, the amount of eccentricity transferred to the cutter by the spindle is removed by grinding and if the same marks are used each time the cutter is used, the periphery will be true and smooth trimming will be obtained.

When the cutter is true it can only be kept true by extreme care in sharpening. First, never disregard the pillar, as, strange as it may seem, some operators have been known to use the same doubtful technique as is used for sharpening randing cutters on the heel trimming machine. When sharpening correctly, slide the cutter down the pillar and apply pressure on the return or up stroke. The pressure must be the same for all blades. Also, sharpen according to the number of blades, *i.e.* fourteen, sixteen, or exact multiples of these.

Finally, in connection with cutters with creases; these creases lose some of their definition or depth through burring at grinding and by passing a thin awl along the creases when the cutter is in motion they will be restored to the full depth and shape.

Styles of Cutters

There is no limit to the shape of the profiles of cutters but, generally, they may be grouped into square, bevel and round. The bevel forepart cutter should not be confused with the bevel waist cutter. The former has a flat bed and a continuous outer edge (unless it is a definition bevel) and the waist cutter has an arc-like profile (Figure 224).

The chief variation found in square forepart cutters whether of flat, convex or concave bed is in the size of the lip. This varies normally from $\frac{1}{2}$ to 2 although some special cutters are made for ladies' fudge-wheel edges which may have a 4 lip, and each size is $\frac{1}{32}$ in. measured vertically from the bed. The angle of the lip is also variable so that a narrow angle say 30° with a 2 lip will take a greater substance than the same bed with a 45°, $\frac{1}{2}$ lip. Some confusion has arisen between the bottom stock fitting-up department

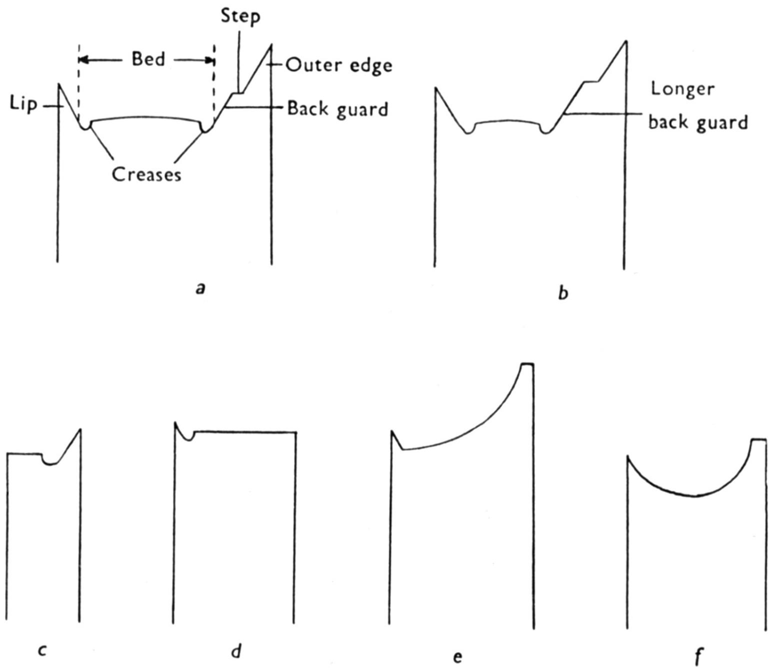


Figure 224. Profiles of edge trimming cutters: *a* forepart cutter ('welted' shoes); *b* definition bevel; *c* pump edge; *d* hob; *e* waist cutter; *f* cork or pipe edge.

and the finishing department owing to this factor not being sufficiently realised by those concerned. It is not enough to read the substance of the cutter as 14 or 16 because due regard must be taken of the lip angle and size, by the bottom stock department. For a 1 to 1$\frac{1}{2}$ lip at 45° an allowance of 1 to 2 irons must be added.

There is a growing tendency to use the edge trimmer as a heel trimmer as well, by using a cutter which will produce a solid edge on the forepart and heel. Two such cutters are the double-roll and multi-roll (Figure 225*a*). Round-edge cutters described as 'cork edges' or pipe edges have been fashionable for some time on casual shoes and also for a longer period on bowls shoes. Another cutter which has been introduced is one which undercuts the edge of crepe-soled shoes. This leaves the welt 'proud' and reduces the rest of the edge by $\frac{1}{16}$ to $\frac{1}{8}$ in. according to the thickness of the rand or 'curtain' it is proposed to stick on (Figure 225*b*, *c*).

No-lip cutters have been very successful on pump edges for producing an edge which is tight to the upper. When a shield only slightly bigger, say $\frac{1}{48}$ in. bigger, than the cutter is used the effect is very good. The definition bevel cutter which forms a kind of step on the grain side of the sole instead of the continuous outer edge has also been popular on pump edges. This type of trimming close to the upper needs a plain shield which is thinner than the ribbed type.

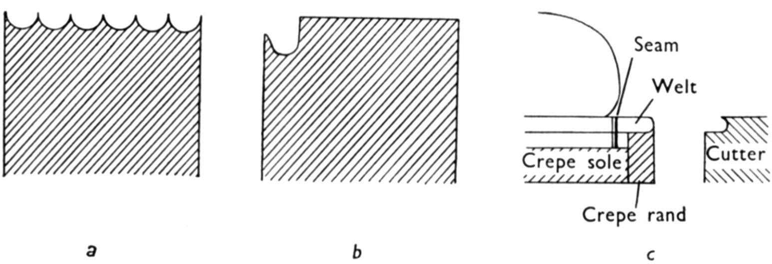


Figure 225. Other cutter profiles: *a* multi-roll (edge and heel trimmer); *b* crepe rabbet cutter; *c* shows how the sole is rabbeted by *b* to allow for the crepe rand or curtain.

The ribbed shield is used in conjunction with forepart cutters on 'welted' work (used as a general term to include all methods of manufacture having a stitched sole). This ridge or rib on the shield lies between each blade on the cutter and assists the lip to make the welt firm and bevelled to the full extent of the lip.

The choice of shields is very important, especially on pump edge work. A fine shield must be used when trimming reptile such as karung as this is easily cut through by the shield if it extends too far beyond the cutting edge. Patent leather will also scorch up in contact with the shield and for this reason machines are fitted with oil lubricators which feed a little oil by means of a felt pad touching the shield to prevent undue friction.

Mention must be made of the seat plough which may be obtained in various angles or more accurately, wedge thicknesses. A very shallow wedge of 12° is used for close seats but on imitation extended seats a machine seat, plough having a heavier wedge section of about 20° is used (Figure 226).

The hob cutter is also useful as this may have a lip and welt crease but no outer edge or back guard. This allows it to be used for jointing, *i.e.* between the waist and heel corners, without the fear of cutting into the heel. An especially large one having a larger bore is used on the No. 8 Edge Trimmer on the same spindle as the waist cutter. An extra attachment is supplied to slip over the grinding pillar to make sharpening

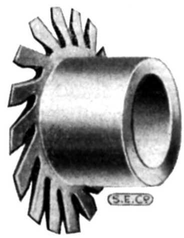


Figure 226. Seat plough.

possible. The bevel waist jointing attachment consisting of planer and side knives should correspond to the shape of the waist cutter but generally one set is used to suit all styles. The planer oscillates rapidly and shaves off the part of the waist near the heel corner which is inaccessible to the waist cutter and as it reaches the heel comer a lever contacts the front of the heel and trips the side knife which descends and chops the shaving off.

Materials

There are many types of materials to be trimmed including leather (vegetable and chrome tanned), vulcanised rubber, vulcanised rubber with canvas backer, crepe rubber, various plastics and synthetics all of which need varying techniques.

Vegetable tanned butt or bend is normally firm fibred and with a reasonably sharp cutter will produce a good edge especially if the leather is mellow. Shoulder or belly soles (especially belly) will respond better to a sharp cutter if trimmed dry, as water will over soften the fibres and possibly push the grain up.

Chrome soles are difficult to trim as there is little chance of moulding the soles by wetting. There are two ways to treat them, firstly by trimming with a very sharp cutter and trimming only a few pairs before re-sharpening or secondly by ‘wetting’ with a specially prepared fluid which hardens the fibres so they will stand up to the cutter. This method is often used on veldtschoen edges where the upper forms part of the edge.

Vulcanised rubber trims very much like leather excepting there is a greater resistance and a bigger tendency to snatch at the toe. When the rubber is canvas backed, the cutter dulls and the canvas will fray and leave a very ragged edge. This type of sole will have a better appearance if it is scoured with a fine abrasive after trimming.

Crepe rubber varies with the temperature but it will always trim better when it is cold as then it is much firmer and ‘stands up’ to the cutter much better. An exceptionally smooth finish is obtained if, after cutting the edge, it is either scoured on a fine grit on the heel scouring machine or the cutter is replaced by an emery stone on the edge trimming machine and the edge is lightly passed over this abrasive wheel. In all cases a smoother surface will be obtained if the edge is rubbed down with the thumb whilst the surface is still warm. It is an advantage in trimming crepe and similar soft rubber to use a lower speed than for leather but this is only possible with a variable-speed machine such as the Italian ‘Ferrari’ model; such machines are not at present made in this country.

PUTTING INTO COLOUR

Since the days of the finishing room foreman having his own secret formulae, much progress has been made by industrial chemists who have produced a wide range of products for finishing edges and bottoms.

The important attributes of edge and heel colours are as follows:

(1) evenness of colour;
(2) transparency;
(3) lustre;
(4) ease of application;
(5) ease of burnishing.

(1) There has always been some variety of opinion about the terms—natural heel, transparent heel, evenness of colour—and it is rather difficult to separate them. However, evenness means that if a tan is required, then that colour should be the only colour and dark and light patches should be avoided. The manner of heel scouring as already outlined has a part in this, as the colour may be rubbed off a very finely scoured heel during the later burnishing operation. The method of application is another factor and a steady flowing action should be aimed at. Any charred patches on the heel will account for variation in colour; so will erratic burnishing, but that will be dealt with later. The difference in treatment of the heel from that of the edge often tends to make the edge darker than the heel. To compensate for this some finishers will use a darker colour on the heel.

(2) As already mentioned, the terms transparency and natural are often confused, but there is a definite meaning for each. A natural finish is one having no dye or pigment and although the edge may be waxed and polished the original surface of the edge and heel is visible in its natural state. Transparent implies that the finish is thin enough to see through. It may be coloured, *i.e.* dyed or pigmented but is not opaque. The opaque finishes known as ‘russets’

are rather like water paints and are thick enough to cover all the fibrous nature of the lifts—almost thick enough to hide the line of individual lifts. This effect is considered too common even for the cheapest shoes and is seldom seen nowadays.

It has been made possible to introduce pigments which are normally opaque into transparent edge stains because grinding mills have been produced which will grind the pigments finer than flour and thus make them more easily dispersable in liquid. In this way a fine film of colour apart from dye may increase the evenness without interfering too much with the transparency.

(3) Lustre is imparted to a heel by two means, first by burnishing, and secondly, by wax. Very little wax is necessary to produce a shine on heels when using a hand 'dummy' even with a blue-black burnishing ink containing nut galls, ferrous sulphate, water and little else. Skilled friction burnishing, therefore, can produce lustre. But wax, either added to the colour as in quick black or applied to the surface of the edge, will assist in obtaining lustre much more quickly and, having obtained it, will preserve the edge as well. It is not intended to give details of formulae or of all waxes but reference must be made to carnauba wax, paraffin and beeswax, the most important ingredients. One of the hardest vegetable waxes, carnauba, is widely used in the shoe trade, both alone and in conjunction with beeswax and paraffin waxes, for producing lustre. The introduction of paraffin and beeswax is done for two reasons: (*a*) the resulting compound of waxes is cheaper, and (*b*) the compound has a lower melting point than pure carnauba and consequently when used as a stick wax for edge setting will flow more easily on the edge.

(4) The term 'flow' has already been used but it must be understood that edge and heel colours are brush applied and enough colour must be held to complete one shoe. The type of brush will vary according to the substance of the edge and the width of welt. For edges having a width of welt, unless the component forming the welt has been pre-coloured, a toothbrush is most convenient. This brush is best fitted with fairly soft bristles and not nylon. Close or pump edges are best coloured with a straight flat brush, and an ordinary pen serves admirably to get into the feather. When leather heeled shoes are coloured it is better to colour edge of forepart and seat first with the toothbrush and follow up with a flat camel-hair brush on the heel only. By using the brushes in this order, the whole surface of the heel will be evened off.

(5) This will be elaborated under the heading of heel burnishing but, nevertheless, it is true to say that colours must be chosen carefully to ensure smooth bumishing, whatever the method. If an edge colour contains an excessive amount of glue or resin, tackiness will occur and the setting iron will stick. On the other hand, if the colour is not binding closely to the heel, it will be pushed off. This is seen when quick black is used on pulp heels which have not been previously dyed.

HEEL BURNISHING

This is a subject which has provided much thought for the finisher, and a variety of machines has been introduced to secure good results. Most shoe machines in all departments have been developed with the hand method as the basis and this is also true of heel burnishing. The 'Expedite' Heel Burnishing Machine was one of the first. Heel burnishing may conveniently be grouped into three varieties:

(l) hot iron burnishing;

(2) cold wax burnishing;

(3) hot wax burnishing.

(1) The two-handled dummy was extensively used for hand finishing; it was heated to 'sizzling' heat and a little 'heel-ball' was then melted on the surface and dummied in. This was 'balled-off' by rag wrapped tightly round the thumb to smooth off the wax and to give a shine. The 'Expedite' machine consisted of a circle of separate segments each one mounted on a spring and heated to the required temperature.

(2) Pads and brushes have been in general use for cold wax burnishing for many years and have, generally speaking, proved very successful. The pad has been made up of various material *e.g*. strips of upper leather of the same width as the pad and placed at right-angles to the centre or strips of woven cloth, according to the degree of hardness required. Speeds of between 900 and l,000 r.p.m. are considered suitable and, unless too much pressure is used in one place, will burnish without burning. Pad wax is held to the revolving pad and is transferred to it by frictional heat. The wax is then transferred from the pad to the heel. This is followed by brushing. Various grades of brushes are available from fine silky hair brushes to stiff bristles according to requirements.

(3) The hot wax machine or 'Universal' Heel Burnishing Machine (BUSMC) has been in use for more than twenty years, but has not yet outmoded the cold wax method. This may be accounted for by the longer time taken to burnish a heel by this process. Firstly the melted wax from the heated container, is transferred by tap or valve to a heated covered felt roll. This heated roll retains the wax in a molten condition ready for application to the heel. The first stage is the waxing of the heel from the hot wax roll, followed by the burnishing roll. This is a second covered roll. The cover, known as a 'Riley' cover, is woven cotton and has distinct 'ribs' woven in about $\frac{1}{4}$ in. apart. These force the wax into the surface and provide a well burnished, solid looking heel. Brushing completes the process.

General Remarks

The pressure must be evenly distributed for good results especially on light brown heels. Dark patches will appear if scorching through heavy pressure is allowed to occur. When brushing, a smooth action is necessary or an uneven spread of wax will be left on the surface. Clean brushes will also provide better results.

SEAT WHEELING

This may be studied under the following headings:

(l) position in sequence;
(2) type of wheel;
(3) style of wheel;
(4) purpose.

(l) The position of seat wheeling can either be before or after edge setting but a good case can be made out for putting it before edge setting. The reason for this is that, if the marks overrun the heel corner, they may be obliterated by the edge setting iron.

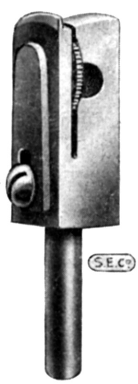


Figure 227. Seat wheel (reciprocating type). The wheel has 16 to 26 teeth for men's work and 26 to 40 for women's work.

(2) There are two distinct types of seat wheels. Firstly, the rotary and secondly the reciprocating, or solid type. The rotary type can be mounted on the same shaft as the polishing brush of the BUSMC No. 3 'Universal' Heel Finishing Machine. The solid type is fitted in the BUSMC 'Regal' or Standard 'Valley' type Edge Setter and reciprocates in the same way as the setting iron. The most important point of difference between these two methods is the amount of control over the shoe when performed on the 'Regal'; because of this, the impression of the wheel and the tightness of the seat are much better done by this method (Figure 227).

(3) The style of wheel must be selected to suit the character of the shoe and for this purpose the various parts of the iron and wheel must be understood: the length of lip, the distance from the lip to

the wheel, the width of the wheel and the number of indentations to the inch, the amount of adjustment of the wheel and the angle of the bed. From these details given, all of which are variable, it will be realised that selection is not easy. However, in general, a ladies' seat wheel will be a fine wheel with up to forty indentations per inch and with a narrow gap between the lip and wheel.

(4) When dividing finishing operations into utilitarian and decorative it is difficult to decide into which category to put this operation. The actual indentations must be considered purely ornamental, but the compressing of the heel seat by the lip and that part of the bed between the lip and wheel (providing the shoe making and heel scouring have been carefuly executed) so that the sealing is complete must be considered to be utilitarian. This state of perfection is more difficult to obtain on a rotary seat wheel.

Observations

Unless care is taken to perform this comparatively simple operation with great accuracy it will detract from the appearance of the shoe and is better not done. ln fact, some continental countries do not include seat wheeling in finishing as it is considered unnecessary.

Better results will be obtained if a little wax is melted against the heated wheel as this will help to seal the seat.

EDGE SETTING

Edge setting, like burnishing, has the useful purpose of sealing the fibres against water and so preserving the shape and appearance of the bottom. Wet leather is very plastic and the edge would become quite shapeless if exposed to the wet for even a short time, especially if knocked as well.

Apart from the useful function of sealing the edge, this operation also enhances the appearance of the shoe by giving increased shine and greater definition to the style of edge created by the edge trimming cutter. The operation may be performed in the following ways:

(l) by hand;
(2) by rotary wheel;
(3) by 'Regal' type machine;
(4) by automatic machine.

(l) The hand method is still in use for very high-class shoes and is still considered by some to force the wax further into the edge. lt is heavy work and requires considerable skill. For all methods, a most important consideration is the temperature of the iron which must be sufficient to melt the wax but not high enough to burn the edge. When the edge becomes charred, it will not polish. Brown edges require greater skill as stopping in one place will result in the edge being darker at that spot. This may be listed as an advantage of the automatic machine as the traverse of the shoe is steady and invariable. The hand iron is still used on the bench for `taking-off' which will be referred to later.

(2) The use of a stepped hollow cone having the steps graded into various 'irons' has become established in the repair trade. The faces of the steps are usually tiled at intervals to form 'flats which tend to knock the wax into the edge.' The use of this circular form of setting iron is restricted in manufacture to a Louis heel top-piece setting machine but in this instance the movement is only a high speed reciprocating one and not rotary, so that only a small part of the circumference is being used at one time. One of the main objections to the method is the lack of control over the shoe to give adequate pressure and the limitations of the stepped cone to provide for all kinds of edges.

(3) This method of setting is still preferred by many finishers and certainly, where done consistently well, excellent results are obtained. The 'Regal' or "Valley' machines are only mechanised hand irons, oscillating at high speed but with the advantage over the hand tool that both hands are holding the shoe. There is a hook provided behind the iron which assists the operator to control the shoe at the toe. The oscillation tends to knock the edge unless the first finger of one hand is firmly holding the hook as the toe of the shoe is held to the iron. A distinct advantage is the ease with which pressure may be varied according to the requirements of a particular shoe. Also the angle of the shoe to the machine may be changed to allow for changes in the edge made by inferior edge trimming. Among the disadvantages of this method is the difficulty of maintaining the pressure required for good setting throughout the day. The iron is spring loaded and enough pressure must be exerted to lift the iron on the spring for each shoe. lt is not enough to smear wax round the edge and melt the wax on the surface; the wax must penetrate the fibres. Another important point in connection with this is that 'Regal' setting is a warm job and both hands are firmly holding the shoe, so some care should be taken either to choose operators who have cool hands, or to provide those who perspire freely with gloves. Where work is divided into black and coloured, the cleaner workers should be on the coloured section.

(4) The BUSMC Automatic Edge Setter has established itself against considerable opposition largely for two reasons: firstly for increase in output, and secondly for consistent results throughout a day or any other period. lt is difficult to describe the intricate system of valves and springs which go to make up this machine but one important item is that only foreparts are set and waists must be set on a subsidiary machine placed alongside the main machine. The practice is to set the waist of one shoe whilst the forepart of the other is being automatically set. The correct iron is selected and inserted into the machine and electrically heated. The shoe is jacked up in the machine and the head containing the iron is brought to the shoe by the control handle. The sole feelers are fed under the

sole and when the iron is seated on the edge the operating lever is pushed over. When the iron is set to run there are four feelers to locate variations in contour and transfer these variations to the iron. Two of these feelers are on the sole in front and behind the iron and the other two running on the edge of the shoe on either side of the iron. The traverse can be controlled and set to run for one or more times but the general rule is three complete traverses of the shoe and the mechanism may be set so that the iron which is normally oscillating is stationary for the third movement and sleeks the edge. This machine can also accommodate a combination iron, *i.e.* fudge wheel and set at the same time. In fact it is considered an improvement in the setting to run the fudge wheel at the same time.

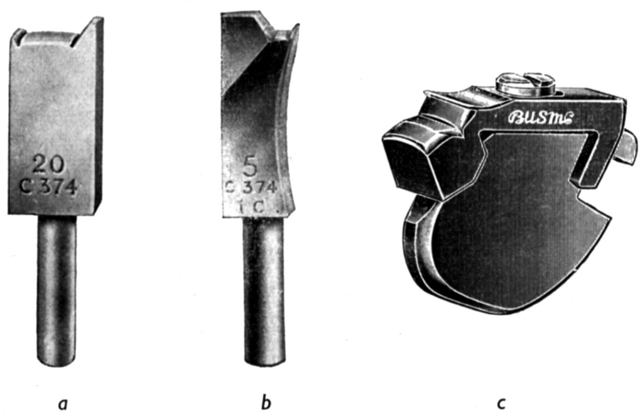


Figure 228. Edge setting irons: *a* Forepart iron; *b* Waist iron; *c* Forepart iron (women's work) for BUSMC Automatic Edge Setter.

Although the feelers will transmit variations, the point raised at edge trimming regarding angles crops up here as the iron will not tip to any extent and it is possible that only the edge nearest to the iron will be set.

A fault with the automatic machine is that once set it will give the same result regardless of the quality of the leather.

Mention must be made of the supplementary mechanism for waist setting. This has a 'Regal'-like oscillating action and can carry two irons back to back with a lever for quick change of the two irons. In this way one iron may be used to blend the forepart with the waist (square) and the other may be a bevel waist iron.

General Remarks

Edges set better whilst mellow; for this reason it is better not to allow colouring to be done too far in advance. Irons wear and lose their true shape and must be periodically inspected and re-cut. All profiles of irons must be exact copies of the profiles of cutting edges (Figure 228) and when new edge trimming cutters are bought, new irons must be obtained to match. If an exceptionally tight edge is required, the iron may be marked as the cutter but the 'bed' can be reduced by $\frac{1}{2}$ iron ($\frac{1}{96}$ in.). Where only the welt has to be set an idea has been used which has possibilities. Simply, it consists of a circular wooden shape with shield and, if desired, it may be covered with a fine abrasive with the exception of the part which will be used for setting. The tool is used on an edge trimming machine and enough heat is generated by friction to melt paraffin (candle) wax on the edge. In this way, the setting and rubber scouring may be accomplished at the same time.

EDGE POLISHING OR BRUSHING

This operation is not always carried out at this stage but is better done here especially when coloured or natural finishes are used on black shoes. Edge setting, however well done, will require brushing to remove heavy deposits of wax, requiring some pressure on the brush. No special care is necessary to prevent the brush from spoiling the bottom if bottom scouring has not been done; consequently, edge brushing can be efficiently performed with greater speed.

30

BOTTOM TREATMENT

BOTTOM SCOURING

THIS OPERATION HAS ALWAYS been criticised by the layman as one which takes a week's wear from the sole and does not serve any useful purpose. Both these statements are untrue, because in the first place only about 0·002 in. need be removed and in the second a useful purpose is served in the waist as leather with the grain layer removed will be much less liable to crack than leather with this layer intact. A further reason is found for bottom scouring in the fact that scoured bottoms will respond to staining or colouring much easier than grain with the hyaline layer still there. The hyaline is more horny or compact than the rest of the grain and will resist the application of almost any kind of finish. Besides obtaining a good surface for bottom making, bottom scouring takes off the dirty surface and evens the colour to make the finish uniform. It is incorrect to believe, however, that scouring will unify a variety of tannages—it will not, but it will clean up soles of the same tannage to uniformity.

First a brief description of the machine must be given, a typical one being the BUSMC No. 10.

It has at least three abrasive points (some have more) but three are essential for rough, fine and naumkeag scouring. The rough and fine rolls usually have different materials to form the pad over which the abrasive sheet is held. Circular pieces of felt or cotton fabric tightly placed together form a very suitable base; another type has soft thin strips of sheep lining leather radiating from the centre. There is a fairly large range to choose from and judgement must be used to decide which pair will be most suitable for the particular work being done, the softer base usually being the best for fine scouring. When new, the surface is true and level, but inevitably most of the wear occurs in the centre which causes it to sag. This is one of the causes of burst bands because puckering occurs, and, eventually, splitting.

It is important to keep the abrasives as tight as possible on the roll to prevent puckering or wrinkling as this tends to produce waves or ribbiness on the surface.

The rolls have a double action, *i.e.* both rotary and reciprocating. This reciprocating motion is provided to break up the line of scratches which would be produced by pulling the shoe backwards and forwards against the roll. The split type of roll is seldom used today. The solid type with end clips and using 'Webster' diamond sheets is preferred. One reason for this is that the diamond sheet can be wound more tightly to the roll than the split one.

The ‘naumkeag’, which is conical or mushroom-shaped-according to type, can have a soft felt or rubber pad or a pneumatic rubber cover(Figure 229). The first two types are applicable to the older kinds of machine and the pneumatic to the No. 10. Again, the type of pad will depend on the work being done and the choice of the operator. The naumkeag has no reciprocating movement but a skilled operator can impart this effect by manipulation. The machine is also fitted with a brush which ought to be used to remove the dust from every shoe. There is no set order for rough, fine and naumkeag scouring, but experience shows that rough, fine and naumkeag in that sequence do produce a good result free from any ridge which might be made across the top of the waist if fine scouring were done last.

Figure 229. Naumkeag for waist scouring.

The operation may be studied under the following headings:
(l) rough scouring and shaping;
(2) naumkeag for waists;
(3) fine scouring;
(4) attention to detail;
(5) care to preserve surface;
(6) faults in previous operations.

(l) The degree of rough scouring and shaping depends largely on the weight of the sole leather, the kind of metal used in top-pieces and the grit size of the abrasive. Generally, men’s soles need a fairly coarse abrasive and an 80 grit may be used. This is necessary where no previous top-piece sanding has been done. lf cutlan nails are used for slugging, then an 80 grit will be necessary to clean up the top-piece. The shaping referred to is especially applicable to all edges having a sole bead (crease) or a `definition bevel`. For accurate finishing, care must be taken to scour to the sole bead and for this reason precise edge trimming must be attained. Where a cutter is tight and the step cuts into the sole, the bottom scourer will have to remove too much to blend the edge in with the rest of the sole. On the other hand, if no crease is present, the edge will be only half finished. When scouring the top-piece particular care must be taken to ensure a flat surface with no rounding off either at the back or at the heel corners.

Ladies' soles, especially for cemented shoes, are often pre-scoured in the preparation department, but where no scouring is done previous to finishing, it is not necessary to use more than a 100 to 120 grit paper for rough scouring as the hyaline layer is not so hard or deep. In fact, some firms use only one scouring of either 150 or 180 grit plus the naumkeag.

(2) The naumkeag, already described, covered with a cloth-backed abrasive, revolves against the shoe held in position by the operator. Usually only one grade of abrasive is used, of either 150 or 180 grit. It is difficult to learn the technique of control over the shoe and to marry the forepart with the waist without leaving either a ridge across the top of the waist or partly circular scratches. However, most operators have a piece of abrasive handy to rub over and clear the waist. Where fitted heels are used, *i.e.* covered wooden heels having no leather flap, it is an advantage to scour about half of the waist so that there is no danger of the naumkeag scouring the heel cover. The pneumatic type of naumkeag of about 6 in. diameter has largely taken the place of the finger cones for Louis heel flap scouring. Some firms on cheaper work scour the whole of the bottom on the naumkeag type of scouring wheel and do not use scouring rolls at all.

(3) Fine scouring is done to remove the scratches of the rough paper and also to raise a fine nap on the surface ready for the bottom finish. It is done on both forepart and top-piece and the grit size will be between 150 and 220 according to the kind of leather being finished.

(4) As has already been mentioned, attention to detail is most important in finishing if accurate and pleasing results are to be obtained. The point about scouring to the sole bead should not be overlooked especially when a natural forepart and 'top iron' is included in the finishing. The top ironing effect will be spoilt if a brown top iron mingles with the remnants of a black border left after edge setting. If slight hammer dents are left on the bottom or deep grooves remain after bottom levelling, it is likely that the naumkeag will have to be used in the forepart. If so, extreme care must be exercised to remove any scratches which may appear. Whatever finish is used the fine scouring must be adequate, as a bottom finish can easily be ruined if deep scratches from the rough scouring are left on the bottom.

(5) Whatever else is neglected, the complete removal of the grain into the corium or central part of the leather should be avoided at all costs. There may be remedies for other faults but there is no remedy for this. No polish can be obtained on any part of the bottom where the grain is completely removed. This may be bad enough to produce a reject shoe.

(6) Some of the faults such as uneven surface and tight edge trimming have already been dealt with, but there are others such as thin channel lips, unstuck channels, stitching not in the groove, greasy soles, damp soles and stained soles. Thin lips will show the imprint of the stitch and will often become scoured through, leaving a very unsightly appearance. Unstuck channels often lift up and tear away and cause much trouble. When soles are stitched in a groove it is important that no part of the stitching is on the surface as this will become frayed when scoured, and although it will not affect the wearing qualities of the shoe, it will disturb the potential customer and possibly lose a sale. Greasy soles will not scour well and present a problem to the finisher. They are caused very often by too much oil at rolling or finishing in the tannery. Damp leather will not scour and this is true whether it is the heel or the bottom. The effect of damp is to increase the risk of charring enormously. It also increases the rate of clogging of the paper. Very often racks of shoes are placed in drying cabinets before bottom scouring and some finishers have small two pair cabinets which have a gas jet. The shoes are placed in them for a short time at the commencement of the period and as a shoe is taken out another is put in so that normally the shoes are in the cabinet for as long as it takes the operator to complete two pairs. Simpler still, some operators have a gas ring placed on top of the machine and if a particular shoe seems damp he can hold the shoe over the flame for a few seconds. Stained soles are not strictly the province of the bottom scourer but it is at this stage that they become most apparent. Apart from iron stains caused by tools and iron benches and poor tempering, there are stains caused by the movement of the free tans around the channels especially on machine-sewn shoes. There is, however, nothing that the bottom scourer is able to do to correct these faults which must be passed on to the bottom making section.

BOTTOM MAKING

This section is one which confuses many people, being so variable in methods, choice of medium and suitability for different types of footwear; even those types similar in constitution vary in method. However, it is possible to classify finishes into two broad groups (1) transparent, and (2) opaque. The modern types of finishes, however, are a compromise of these two and it is very difficult to decide to which group a particular finish belongs. Two such finishes are ‘damp-down’ and gum stains both of which, if analysed, will normally be found to contain a good percentage of pigment. As already mentioned in discussing edge stains, pigment is non-soluble and is opaque but may be ground fine enough to appear transparent; that is, the layer of pigment is fine enough to settle in the surface rather than on it.

Another point which can be discussed at this stage is the desirability or otherwise of bleaching the bottom before the application of the bottom finish. However it is viewed, there can be little doubt that some harm is done, but perhaps not sufficient to prohibit its use. Bleach is not a new thing, as the old hand finishes such as ‘damp-down’, used to contain such ingredients as salts of lemon (potassium binoxalate), which is a close chemical associate of oxalic acid, also used. Epsom salts (magnesium sulphate) has also been used. It would appear that modern bleaches contain stronger acids such as sulphuric but it is difficult to obtain accurate analyses. Where bleaching is done separately it is carried out with a flat camel-hair brush, the bleach being in liquid state.

Owing to the number of firms manufacturing bottom finishes, it is rather difficult to classify them but roughly they are as follows:

(1) ink;
(2) natural gum finish;
(3) transparent gum stain;
(4) pigmented gum stains;
(5) damp-down finish;
(6) ‘Silco’ variations;
(7) paints.

Ink

Strictly, the application of ink to bottoms is not considered to be bottom making, the degree of skill entailed being less than for any other type. Nevertheless the application, consistency and kind of ink play a big part in obtaining a satisfactory burnish. None of the other types is burnished by padding. The application is by camel-hair brush and the ink must be applied evenly in the direction of the heel to toe and leaving as few brush marks as possible. The $1\frac{1}{4}$ or $1\frac{1}{2}$ in. brushes make a quick job. When inking, care must be taken to cover every part requiring ink or the result is most unsatisfactory. Level inking cannot be obtained unless the ink is fairly thin, enabling it to flow, and to achieve this the ink must not be allowed to ‘settle’ especially when quick black is used. These are rather out of favour since the introduction of the BUSMC No. 4 Bottom Burnishing Machine. The reason is that quick black contains water-soluble nigrosine dye which always has a tendency to ‘run’ in contact with wet and if the waxing and burnishing have been ineffectively performed, much harm can be caused by soiling of carpets. On the other hand, quick black is a fairly soft ink and responds to friction padding quite well and consequently was very popular. The Hot Wax Burnisher (No. 4) however, will deal successfully with the harder spirit inks and very good bottoms have been obtained. The spirit seems to have an astringent action on the surface, opening up the grain and making it harsh. This surface is very difficult to pad excepting when a film of hot wax is applied first. Another advantage of the hot wax method is that pure carnauba can be easily used. The waist pad has a heated cover which keeps it hot for good results in the waist. It has been stated that the black bottom is not a paint and this should be clearly understood. Although iron stains and water stains will not show, the formation of the grain, barbed-wire marks and other blemishes will be clearly visible. The fact must be borne in mind when the soles are looked out.

Natural Gum Finishes

These have the greatest appeal on coloured shoes of the finest quality. To be fully effective the leather must be clear and white. The gum used is gum tragacanth commonly called by finishers, gum dragon. This is soaked in water to the consistency of jelly, called a mucilage. The finisher takes a sponge, dips it in the mucilage and circulates it evenly over the bottom until a saturated surface is obtained. Unless this is done, a stained patchy surface will result. This can then be wiped over by hand rag or power brush to remove the surplus lying on top. If the brush is used, continued brushing will quickly dry out the water leaving a clear film of gum. A small but important point arises here. When iron is used for grindery in the top-piece, it is better to leave the top-piece to be done separately as very often the water content of the mucilage picks up an iron stain and smears the forepart and waist with long smears of dirty black which are very difficult to remove. Some finishers prefer simply to wipe off the surplus gum and leave the bottom to dry naturally and then to apply a smear of fake (polish) and to brush by machine.

Transparent Gum Stain

This needs no further mention apart from the fact that it is similar in constitution to the simple gum with the addition of dye or colouring matter. As most finishers desire a leather finish the dye used will be one such as golden brown aniline dye or a vegetable dye such as annatto. The amount of dye will depend upon the depth of colour required. Except for this the operational details are as for clear gum mucilage.

As it is well within the scope of any finisher to make up such a gum stain, some details of preparation follow: put loz. of leaf gum tragacanth in a porcelain dish and pour on l quart of water. Stir occasionally for two days. The consistency of thin jelly should be aimed at. Some prefer thick and others thin mucilages; the quantity of water is simply altered to suit individual requirements. The mucilage should be strained (after soaking for 48 hr.) in a muslin bag. This is necessary as one constituent of the gum, bassorin, is insoluble in water and remains in the mucilage as messy lumps. After straining, the dye, which is prepared by adding the powder to boiling water, is carefully added to give depth of colour. Vigorous stirring is essential.

Pigmented Gum Stains

These are of two main types, one fairly thick and sponged on and the other thin enough to brush on. This is the second stage in the development of ‘cover’ for doubtful leather. The presence of chalk in a transparent gum stain does help to cover some of the less obvious blemishes and also evens up the colour and makes it more uniform. The method is similar to the other two previously mentioned but wiping away the surplus is usually done by power brush and faking is done before polishing.

Damp-down Bottom Wash

This is a legacy of the hand finisher and consists chiefly of ‘bottom balls’ (chalk), water-thin gum and Epsom salts with some oxalic acid as well. The modern version may have some binding material such as rye flour, casein or even dextrin. The method, too, has changed somewhat. The hand finisher would apply it with a piece of flannel, rubbing well in and wiping off with another clean piece of flannel and lightly rubbing in French chalk to a polish; the modern method is to brush on and then rag off, often using the palm of the hand to smooth over the surface still further. The brushing on does not seem to be effective as many shoes have been observed having a streaky appearance. Now also the finish is completed by fake which is another departure from older methods.

‘Silco’ (B.B. Chemical Co.)

This is a form of paint which is brushed on in the normal way by a flat camel-hair brush. This is allowed to dry. The next step is to choose the correct mop for the cutting of the surface. A rag mop tapered to thin edge is rotated at a good speed, say l,000 to 1,200 r.p.m. and forms a firm surface to work against. The third requirement for a successful finish by ‘Silco’ is a friction stick wax which contains an ingredient of a caustic nature. This is rubbed against the rag mop and when operating the mop plus the friction wax, the thickness (depth) of the layer of paint is reduced so that the appearance is very similar to that of the pigmented gums. Faking and brushing will add further lustre to a ‘Silco’-type finish.

Paints

There are many different types in use in many different colours but all of them have one thing in common and that is the ability to hide blemishes such as tick marks and faint wire marks. The natural grain formation disappears and the surface is clean and neat but without character. That is the disadvantage of paint—the qualities of the material are hidden; no cabinet maker would paint oak and no finisher would paint oak-bark leather. However, such are the variations of quality in leather that reasonable appearance is often unobtainable in any other way. Paint is a natural leveller and presents the shoes in a uniform manner.

True as this is, paint is still confined to the very cheapest footwear or on footwear without the tradition of quality behind it.

To be successful the paint used must have some particular qualities: ease of flow, fineness of pigment, tightness of bond, and elasticity. However fine the brush, some brush marks will appear when the paint is applied, but these should disappear as the paint settles down, leaving a perfectly even surface.

The surface must be smooth so the pigment must be finely ground. The ingredients should be well bonded and must adhere firmly to the surface and not flake off. Finally, as it is possible the shoe will be flexed before purchase, the paint should be flexible or elastic to prevent cracking. One precaution is that the painted bottom must be perfectly dry before putting it on a brush for polishing. A pleasing effect may be obtained by powdering on French chalk instead of polishing. One serious disadvantage of paint from the 'taking-off' point of view (see p. 427) is that top ironing, waist marking and crowing are wasted as the marks are indistinguishable on a painted bottom. The iron does not reach the leather and the typical brown mark is unobtainable. This will also apply to branding.

Two-colour Bottoms

Many methods are used to obtain satisfactory results, but one will suffice to explain the process.

When a gum stain is used for the forepart care must be taken to apply it evenly and also to prevent it from going too far over the waist. When the forepart finish is on and dry, the waist ink is applied with a camel-hair brush to obtain a definite line at the joint. The style of line, either curved, straight, fish-tailed or any other variation must be at the discretion of the finisher. When the ink is dry some fake should be smeared over the forepart just above the waist and if any black goes on the forepart at waist burnishing it is easily rubbed off with the polish (fake). An alternative method when padding (burnishing) the waist is to take a thin leather strap and shape it to the waist curve and hold it over the forepart to prevent soiling the forepart. Another kind of strap may be made from used diamond shape abrasives. A strap made from one of these sheets will not stretch or slip and will last long enough to make its use worth while.

A two-colour finish need not be confined to black work or entirely across the waist. The accentuating of arch supports by colouring only the inside waist is very effective. Finally, on black or coloured shoes having a two-colour finish, a natural front enhances the appearance of the shoe.

General Remarks

As with all finishing operations, attention to minute details at the bottom making stage is vital for good results. Some shoes manufactured recently have been left unfinished, *i.e.* bottoms scoured but not finished. No justification can be found for adopting this except perhaps ‘fashion’ and that is always whimsical. During the war it was compulsory.

TOP IRONING AND SIDE IRONING

These form part of the ‘taking-off’ section (below) but as they may be performed by machine it is better to mention them first.

Top ironing has always been favoured by high-class finishers for putting a border round the forepart to form a `frame’ for the edge and also to hide any channel not trimmed into the edge. On a black shoe having a natural forepart, the top iron is better made brown by staining and waxing or only waxing. Side ironing or heel corner ironing is a minor operation and very sadly neglected by some finishers. The aim should be to set the actual corner as firmly as possible in the same way as a Vienna edge is set on a Louis heel shoe. It would seem that the ambition of some machines and operators is to scratch a mark about $\frac{1}{16}$ in. from the heel corner and parallel with it leaving the corner unset.

TAKING-OFF

This bench job is gradually dying out as fewer items are being included in finishing off. Red bevels, scallops, strips, fiddle waists have disappeared and bunking, janking, crowing and corrugating are not so common as formerly. There is little doubt that no one suffers from the deletion of these operations, but some manufacturing blemishes may be obliterated by judicious use of crow and bunk wheels. This taking-off operation is nowadays performed standing, and the tools, apart from the hand tools, are gas jet and a soft leather covered pad shaped like an inverted U with fairly wide arms and a gap in the middle for the shoe to rest in. Various kinds of wax polish and colours are necessary.

Top Ironing

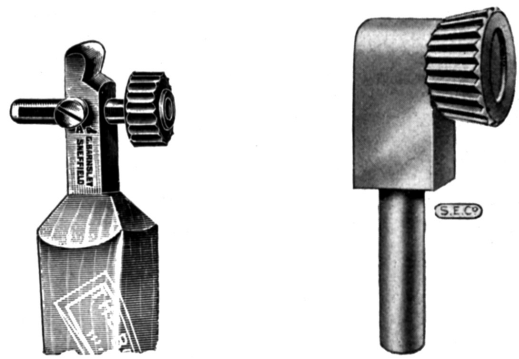
Although a machine may be used, a better effect is obtained by using a single lip hand iron. Again stain and wax may be used. The length of the lip will determine the width of border and care must be taken to keep the iron firmly pressed to the edge to ensure an even mark.

Waist Marking

If carefully done so that the mark separates the waist from the forepart, and accurately paired, this improves the appearance of the bottom. The usual tools are either a dull knife or crow wheel but some special effects can be obtained by finishers using tools of their own design.

Bunking

There has always been some difference of opinion about the names of the operations consisting of putting a fancy pattern by means of a heated iron on the edge of a gum or damp-down bottom. It is called bunking. The difference between bunking and crowing is that the crow wheel is positioned between a fork and the bunk wheel is adjustable to allow the pattern to be placed nearer to or further away from the edge but still providing a guide for accuracy (Figure 230*a*).



a *b*

Figure 230. *a* Jank wheel. For bunking the wheel has a fancy pattern; *b* Fudge or welt wheel.

Janking

Janking may be best described as stitch separating on the sole. It may be done by hand with a single tool, by machine with a single tool, by machine on the 'Regal' with a circular tool, or by hand with a similar tool. Janking should, theoretically, be performed only on stitched in a groove or stitched aloft work. When done by the 'Regal' machine the tool is very similar to a fudge wheel (Figure 230*b*) and very often a subsidiary bunk wheel is fixed to the jank wheel. This may have led to the confusion of bunking with janking.

Crowing

Already mentioned with bunking, this tool may be obtained in many variations, *e.g.* single dot, herringbone, straight indent etc. The use of a crow is reserved for the waist either for waist marking, channel covering or marking across the breast of heel on the waist.

Corrugating

This is another embellishment confined to waists, consisting of a series of marks of definite spacing. The marks are made with either a dull knife or single dot crow wheel. Patterns may be produced and among these the diamond or lattice pattern is outstanding. For straight across marking the B.U.S.M.Co. introduced a machine which is very quickly and easily operated to give a series of dull knife marks accurately spaced.

The taking-off operator is also responsible for filling any slight holes with wax and running wax in the seat of leather heeled shoes.

BRUSHING-OFF

When all finishing operations are complete, the whole of the bottom is brushed up to give the final polish. In fact, some firms are now cleaning the upper by a stitch and upper cleaning machine before last slipping (see p. 454).

LAST SLIPPING

This is generally a hand operation but machines have been introduced to assist the operator. One machine is fitted with a revolving roller and a jack. The shoe is placed on the jack peg and swung towards the roller which grips the back of the shoe by friction and lifts it from the last, the operator completing the process.

Another type of last removing machine is the Standard machine which employs an action similar to the hand method. The shoe is placed on the peg and when the pedal is depressed the rubber pad presses against the back of the shoe and lifts in a forward arc whilst the operator is pressing down the toe. This enables the operator to slide the shoe easily away from the last. This machine has a rod attached at the right-hand side which is inserted into the block hole of scoop block lasts to facilitate the removing of the block. The success of last slipping will depend largely on the style of pattern, *i.e.* amount of opening, the treatment of the last before lasting to prevent sticking and the withdrawal of grindery used for anchoring bracing wire and tacking on insoles.

Another important aspect is the style of last, *i.e.* whether ‘easy-exit` or block last, and also upon the degree of thinness along the counter line because this means that the narrow top line must be pulled over the wide seat.

Types of Lasts

There are several types of easy-exit lasts designed to ‘break’ in the waist, such as the circular hinge, link hinge, spring gap, coil-spring hinge gap and more recently the reverse cut. With the exception of the last mentioned all these can be handled by the last removing machines. The reverse cut last possesses the unique feature of shortening immediately it begins to break, whereas other types must lengthen slightly, before breaking. The introduction of this last was due to the need for easier insertion of lasts for slip lasting and it is now gaining ground for other methods of shoe making; it has, however, one drawback as yet, namely, it cannot be slipped by existing machines.

31

LOUIS HEELS

INTRODUCTION

Definition—For practical purposes the term Louis heel is any style of heel which has part of the sole fitted up the front (of the heel) in the form of a flat. This will embrace Cuban, Louis and various types of Spanish heels.

Louis Heel Shoe Manufacture from Bottom Stock to Finishing—The emphasis must be on those operations which are peculiar to Louis heels but to preserve continuity the names of all operations will be included. It will also be impracticable in a chapter of this brevity to include all the variations of method which abound in different factories. The secret of successful Louis heel shoes lies in the extent of preparation of the component parts, *i.e*. insole, sole and heel.

INSOLE PREPARATION

The preparation of the insole using the Unishank method will have a sequence as follows and those operations which apply only to Louis heels are printed in capitals:

(1) press cutting of material to caster shape;
(2) grading where necessary;
(3) sorting where necessary;
(4) ticketing (making up into work tickets);
(5) "Planet' rounding;
(6) forepart scoring (to increase flexibility);
(7) UNISHANK ASSEMBLY (BUSMC);
(8) 'Apex' waist reducing;
(9) scouring waists;
(10) moulding.

Unishank Assembly

The waist and seat of the insole are latexed together with the waist reinforcement so that when placed in the assembling machine a good bond is obtained.

If a range of sizes is required by the work ticket it is possible to set first of all the largest size and then the position of the smallest and the machine is fitted with a gauge which will grade the joint or locating position for all intermediate sizes and half sizes. This accurate location is essential for steel shanks.

The method is simply to place the insole in position and bring down the shank holder; this holds the steel shank in position whilst the waist reinforcement is laid over; at this stage the mould is positioned over the waist and seat to form a solid single unit.

The use of Unishanks is not confined to Louis heels, but does help to achieve that solidity of heel and seat so essential to that form and does help to eliminate one of the common faults—breaking of the sole at the front of the heel. Great care must be taken to ensure the correct size and curve of shanks so that the completed insole fits the waist curve of the last.

A very important point in connection with wooden-heeled shoes is that the heel is a finished width when it goes on the shoe and this must be borne in mind when preparing the insoles. No scouring can be done to the sides of the seat of the insole which will reduce the width unless a system of heel fitting is carried out after lasting. To repeat, if heels are looked out and covered at the same time as the insoles are prepared, then rigid control must be exercised over the width of the seat to ensure accurately fitting heels.

PREPARATION OF THE SOLE

The sequence for the preparation of the sole is as follows:

(l) press cutting;
(2) grading;
(3) sorting;
(4) fitting-up;
(5) planet rounding;
(6) sole stamping;
(7) joint marking (to denote position of waist reducing);
(8) BACK SPLITTING;
(9) FLAP SPLITTING;
(10) TONGUEING;
(11) reducing waists and foreparts ('Apex');
(12) seat punching;
(13) sole roughing;
(14) sole cementing;
(15) edge cleaning;
(16) sole staining (on roughed portion to obviate colouring on to the feather in finishing room).

Back Splitting

This is done on the same machine as the flap splitting and the purpose is to reduce the substance of the waist and seat where soles of more than 6 irons are needed for the foreparts. If the sole is more than 6 irons in the waist and seat the tongue and flap will be too stout.

Flap Splitting

Whereas back splitting actually removes some material from the sole in a similar way to grading, flap splitting only opens or divides the sole at the seat to allow part to go up the heel and the other under the heel.

The BUSMC Louis Heel Sole Splitting Machine is adjustable to produce very thin flaps for batted edges (not set or ironed at the sides of the heel) or thicker flaps for Vienna edges (which are ironed). The extent of the flap will depend upon the length of the base of the heel and the height of the heel plus a small margin ($\frac{1}{2}$ in.) for applying glue or cement between heel and flap.

Mention has already been made of the possibility of the sole breaking and in order to prevent this as much as possible, the roller which keeps the sole down to the knife has a shallow depression which reduces the pressure and leaves the flap thicker where it joins the sole. Another method is to dispense with the tongue entirely, the flap being formed in the same way as when back splitting. When this method is used sole breaking is avoided but extreme accuracy is necessary to produce a neat join between heel front and sole.

Tongueing

To revert to the orthodox system, after flap splitting the flesh split is placed in a machine which forms the tongue thus providing a reinforcement under the heel.

Lasting

No essential differences occur from standard practice and consequently it can be passed over here.

Attaching

Again the sole attaching will not be altered in any way for Louis heels.

HEELING

The heeling section contains machines which have been devised especially for Louis heels and deserve special mention.

The sequence after sole cementing is as follows:

(1) heel fitting and seat cutting;
(2) heel attaching (temporary or permanent);
(3) front cutting;
(4) glueing;
(5) flap sticking; a
(6) side Hap trimming;
(7) tab forming and sleeking;
(8) slugging; .
(9) top-piece trimming.

Heel Fitting, Sole Seat Cutting and Heel Attaching

The machine is fitted with two sets of knives, one pair operating towards the waist from the seat, the other across the seat at the location point. The principle involved for accurate fitting is quite simple. Each heei becomes its own template and its length when held in a clamp on top of the machine is transferred to the shoe rest or stop and thus the exact cutting position is located on the underneath split (Figure 231). It must be pointed out again that this fitting is only in the length direction and many factors influence the fitting across the heel. Factors such as the substance of the stiffener, the type of seat lasting machine *etc*. will affect this.

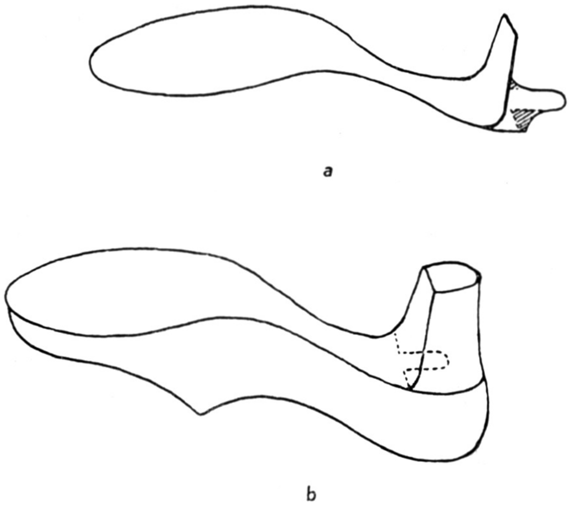


Figure 231. The sole is split and the tongue formed before sole attaching. After the sole is attached the heel is fitted. The shaded portion shown in *a* is removed. In *b* the dotted lines show how the tongue is cut back to the position of the heel seat.

Heel attaching by the BUSMC No. 10 Heeling machine or the temporary screw method (see p. 387) is followed by front cutting.

Front Cutting

There is seldom complete continuity between the flesh split and the front of the heel after heel attaching and there is the option of using a small machine fitted with a narrow circular rasp or any irregularities can be removed with a hand knife. Should a gap be present a little plastic wood will till it.

Glueing

Various adhesives are used such as 'O' glue, plastic film, latex . and liquid pyroxylin. 'O' glue is the standard adhesive and is of the bone or fish type and is specially prepared for flap sticking. It is prepared by steam heating to a running consistency and a thin film is spread on the front of the heel and the flap. This is allowed to dry.

Flap Sticking by the Turret Press

This is a specially designed press for sticking up flaps and will hold six pairs. The centre of the machine is fitted with a steamer from which steam escapes at a point arranged to hold one shoe. The heel rests over the escaping steam and both flap and 'O' glue are softened. The shoe is immediately transferred to one of the circle of clamps. Some skill is necessary to avoid wrinkles when the rubber pads press down and to avoid this some operators tack the flap to the top of the heel. The flap will be stuck firmly enough in the time taken to complete one circuit of the machine (about 5 min.).

The method of having no tongue under the heel involves the use of slightly different treatment. In this ease it must be realised that the flap sticking is a continuation of the sole sticking and for this reason a similar adhesive is used, *i.e.* pyroxylin. Latex is also used by some shoemakers especially where a very thin flap is used and very often no press is used, but instead a wide elastic band firmly secures flap to heel until a bond is obtained.

Side Flap Trimming

When 'O' glue is used this operation should be carried out immediately after the turret press before the glue has become too brittle. Various methods are in use and although an efficient machine has been introduced many firms still prefer to trim by hand. Even at this

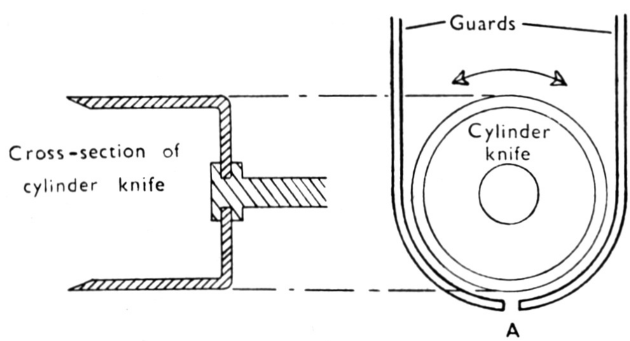


Figure 232. The cylinder knife used for side flap trimming. The edge of the flap passes between the guards at A.

level some differences exist some preferring a simple shoe knife whilst others use a kind of two-pronged fork or 'V' and cutting at the bottom of the 'V'. The machine method incorporates a small cylinder knife mounted at the end of a shaft, and in front of the knife are mounted two guards shaped to fit round the knife but leaving a narrow gap for the surplus flap to pass (Figure 232). The knife can move in anti-clockwise and clockwise directions so that the flap is always trimmed from the front of the heel, *i.e.* from the grain and towards the flesh of the flap to avoid cutting the cover (see Figure 233).

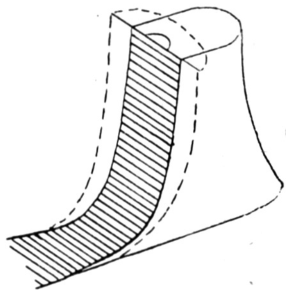


Figure 233. Side flap trimming. The dotted lines show the flap before trimming.

Broadly speaking, it may be stated that where Vienna edges are required the flap-trimming machine does a better job because it leaves the flap just proud of the cover and square, whereas when batted edges are required, hand methods are better as the knife can be tilted inwards slightly and assist in producing the wafer-like edge.

Tab Forming and Sleeking

This is also the subject of controversial opinion, two methods being used; a third 'method', not having a tab at all, is also in use.

(a) The machine methods are at least two in number and the first consists of cutting away the flap above the top edge with the exception of a triangular piece to go under the top-piece. This piece or tab is scoured very thinly.

Another type of machine cuts away the surplus and leaves a skived tab which is also cut in the centre to form a kind of double tab. This cut allows the tab to fit quite snugly when pressed flat.

(b) When done by hand the operator usually leaves a tab occupying about one third of the width of the front located in the centre the rest of the flap being cut away flush to the top edge. It has also been observed that there is a tendency to disregard the tab altogether and remove all the flap above the top edge of the heel. The sleeking is important to improve the curve of the breast and to flatten the surface from waist to facilitate bottom scouring. The sleeker consists of a shaped rod of highly polished steel revolving at high speed against which the shoe is rubbed.

Slugging is carried out as referred to in Chapter 27 (p. 389).

FINISHING

The operations in finishing that have special significance for Louis heels are those which apply to the front of the heel and the ironing of the sides of the flap; otherwise the finishing is as for other kinds of shoes.

The sequence for finishing is as follows:

(1) top-piece trimming;
(2) edge trimming (forepart and waist);
(3) edge colouring including side of flap if Vienna edge;
(4) top-piece setting;
(5) edge setting and flap setting;
(6) edge brushing (polishing);
(7) bottom scouring and breast scouring;
(8) bottom making;
(9) taking-off;
(10) polishing-off;
(11) slipping.

Flap Setting

This is usually done by machine and simply consists of an appropriate heated setting iron oscillating in the usual way. Wax may be used.

Breast Scouring

Since the introduction of the No. 10 Bottom Scourer (see p. 419) with its specially designed pneumatic rim fitted to a naumkeag pad, the use of the cone has largely disappeared. The moulded abrasive band fits well into the curve of the front of the heel and the distance from the edge of the rim to the centre spindle allows 3 in. heels to be scoured without the heel fouling the top-piece.

It is suggested that pre-scouring of the waist and seat of the sole assists in front scouring but there is a greater difficulty in cleaning the soiled surface.

CONCLUSIONS

The character of a well-made Louis heel shoe must inevitably lie in the heel section and every effort must be made to obtain perfection of line of heel in relation to the back, perfectly fitting flap, accurate blending of heel to sole; small details which if correct produce beauty of line but if incorrect spoil the shoe completely.

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FINISHING ROOM MANAGEMENT

IT IS MOST DIFFICULT to formulate a set of rules for management which might be considered general for all factories, as conditions vary with each factory. The following factors are typical of the variables:

(1) quality of work;
(2) size of plant;
(3) nature of output;
(4) type of supervision and welfare;
(5) method of payment;
(6) method of transporting work;
(7) purchase and usage of grindery and findings.

(1) **Quality of Work**

This again is most difficult to assess, as there are so many standards of quality and the work of one district would not be accepted by another. However, whatever quality is decided upon, there should be some attempt made to maintain that standard and the departmental manager will have to be vigilant to detect any lowering of the standards. The number of inspectors and their positions in the department will generally depend upon the output and the selling price.

Where two inspections are carried out, the first should be immediately before putting the edges into colour. Any faults with heels and edges can then be more easily corrected. The second inspection would be best placed before last slipping so that faults with edge setting could be properly dealt with.

Quality must also affect output because our machines are normally only moving tools which will work as fast as the operator will allow and, although there may be exceptions, it is nevertheless true to say that in general speed and quality do not mix. Many faults appear when speed is demanded but in many cases these faults have crept in so insidiously that they have become accepted as normal for the particular standard of quality. Clearly, all shoes cannot be of high standard but far too much quality has been sacrificed for increased output.

The increasing efficiency of machines in other departments of the shoe factory, such as the automatic toe and seat lasting machines, has not occurred to any extent in the finishing department and only the automatic edge setter has materially increased output, but even that has not improved quality. There are, of course, automatic edge trimming, inking and setting machines for use in cheap cemented shoes, but no critical customer would buy such shoes. Finishing machine improvement has taken place but the improvements have usually made the machines faster and smoother; the degree of skill remains as high and as much time is necessary to produce a good result. In this connection the range of trimmers and other finishing machines made by Fred Hawkes (N.V. Engineers) Ltd., is noteworthy. They are characterised by their large diameter bearings, more bearing points on the spindles and their method of assembly from a number of easily replaceable units, this last factor reducing servicing time, and therefore production delay, to a minimum. In order to increase productivity or to reduce the price of finishing, many hand processes have been eliminated and fewer two-colour finishes are used. The trend has been to produce a very plain simple finish but even so, skill and craftsmanship is rewarded by the production of good shoes.

(2) **Size of Plant**

This question has never been satisfactorily solved and as the target figures of certain automatic and other machines keep going up, it becomes increasingly difficult to decide just how big the plant should be. It seems impossible to base output on any one machine or group of machines, although some consideration is bound to be given to machines which are expensive to run and maintain. The following comparative outputs indicate the nature of the problem—1,200 pairs per day for heel trimming, 240 pairs per day for men’s welted edge trimming and 720 pairs per day for men’s bottom scouring; this shows the difficulty of building up a plant to interlock and produce efficient use of all machines. The usual solution to this problem is to utilise the spare time of any operator who is not fully employed by giving him subsidiary jobs such as corner squaring, colouring, side ironing or any similar operation.

Another disadvantage of shoemaking by mass production methods is that duplication of small units, *i.e.* single machines, is inevitable for increasing production, consequently where the output of a firm reaches say 24,000 pairs per week, twenty combination edge trimmers will be required, each producing 240 pairs per day for five days. This means that the shoes must travel a considerable distance from the nearest heel scourer to the furthest trimmer. This will lead to another problem, namely the dispersal or collection of dust from scouring, paring and polishing machines. Considerable thought must be given to the selection of the most suitable type of equipment, but where the space is available an outside cyclone system is preferred. Where the department is large and the amount of extraction is rapid, some compensatory intake of air might be necessary to prevent accidents due to doors suddenly closing on a person entering or leaving. This, of course, applies especially during the winter months when windows are closed. The practice of fitting filter bags to individual machines or groups is frowned upon as the air, still containing very fine dust in suspension, is discharged into the department and in any case is seldom as efficient as a main trunk. The bag system has a great economic advantage, however, during the winter as expensively heated air is kept within the room and not discharged to the outside as is the case with the cyclone separator.

Finally, careful planning is essential when installing the dust extraction system owing to the cost of fitting machines to the trunk and conversely, the trunk must be adequate for any calls made upon it as nothing hinders line finishing more than a dusty atmosphere, quite apart from its effect upon health.

(3) **Nature of Output**

This must lead to a consideration of the methods used to deal with a variety of work, such as men's shoes with leather bottoms, men's shoes with rubber bottoms, ladies' shoes with leather heels, ladies' shoes with covered heels and ladies' shoes with rubber bottoms.

Firstly, where the output is large enough, it is better to separate entirely men's shoes from women's shoes especially if the latter are cemented and with covered heels. One firm has developed a system of finishing the women's shoes in the centre of the room and the men's around the edge or walls and both have their own supervision. The technique of heel trimming and edge trimming 1adies' shoes differs considerably from men's and best results are obtained from operators having time to concentrate on one type.

However, this is not the only problem. The seasonal demand of rubber, both crepe and vulcanised, upsets the working of the finishing department as this type of work needs no bottom scouring, bottom making and little 'taking-off'. These operatives must be found alternative employment or it might be better to plan the making of rubber bottoms to spread them over the whole year. One firm at least has solved the problem to some extent by having the bottoms of shoes fitted with resin-rubber soles buffed and gummed. It is claimed that this treatment is necessary after the bottoms have collected the usual factory dirt. Also black and coloured work are better separated or routed to special operatives. 'Regal' edge setting is a good example of the type of machine operation demanding special consideration in connection with coloured work, because the shoe has to be held firmly by both hands and perspiration can soil a shoe quickly. An operator should thus be chosen who has cool hands or alternatively gloves should be provided. Padding and brushing machines, both hot and cold, must be specialised for either black or coloured and some firms do attempt to have two distinct channels of work after superfine heel scouring.

(4) **Type of Supervision and Welfare**

The days of the bullying foreman have, we hope, gone for ever, but, nevertheless, many firms are very apathetic in their regard for their employees, paying little attention to their suggestions, and assessing their ability no higher than the manner in which they perform one machine operation. Some attempt is being made now to train young operatives more thoroughly both in factories and technical colleges and it is hoped more co-operation will result from this. Tea breaks, canteens, hygienic toilet facilities, casualty room, cheerful surroundings and cleanliness must, if added to efficient technical management, produce more and better shoes. An austere management invariably results in lack of harmony and very often produces shoddy work; this, the department foreman must detect and control. Another feature of supervision is to give the lead in matters concerning quality. Where the factory manager has a thorough grasp of all departments and the departmental manager has a complete practical ability in all operations in his department, a feeling of confidence is established and good work results.

(5) **Method of Payment**

Most jobs in the finishing room are paid by results and, as a rule, the system in general operation in the industry is the supplementary system which guarantees the day rate whilst in attendance, and several percentages above the rate according to the grade of work. In other words, prices per dozen for edge trimming should be fixed to enable the operator to earn about 37 per cent above the minimum rate, whilst bottom scouring prices are fixed to secure for an operative 25 per cent above the minimum rate. These percentages have varied since 1939 owing to the minimum rates being tied to the cost of living index figure and prices per dozen have remained unchanged. There is no doubt that this form of piece-work has proved a definite incentive to earn more money and has increased productivity enormously. Snags do arise, however, especially when day workers are sandwiched between piece workers and much tact must be exercised by the executive to obtain harmony. Also, the arbitrary fixing of prices has led to many anomalies and many cases are reported of inking ‘boys’ earning more than edge trimmers and bottom painters earning more than the foreman. These variations are bound to cause ill-feeling and often a lowering of quality. Any system of payment by results will bring with it a greater need for inspection.

(6) **Methods of Transporting Work**

A considerable amount of study has gone into the question of moving the shoes in work from one operation to the next and there is no doubt that considerable time is taken up by operatives pushing and pulling heavy racks of shoes. The type of rack has also been investigated and one ‘must’ for the finishing department is a rack which isolates one shoe from another, retains pairs and holds the shoes bottoms up. There are many types of racks available but they all seem to have one disadvantage or another, such as lack of manoeuvrability over rough floors, space wasting, or three or four levels from which shoes must be taken.

It would seem then that a system which allowed the work to proceed in an orderly manner at the correct height and in the best position for working would be an advantage and yet many experiments have been made, and generally discarded, in the use of conveyors. The mistake generally has been to have a travelling belt which gave workers a feeling of frustration and slavery and any type of conveyor which does that is bound to fail. One of the more recent ideas is to have a light but sturdy framework, the track of which is light angle-iron, the width between outside walls of the track being slightly more than the width of the tray. The tray, having pegs for last thimbles, holds three pairs of shoes and is fitted with a small wheel at each corner and the tray is easily pushed along the track by the operator. The fixing of the wheels to the trays simplifies the construction of the 'conveyor' enormously and consequently lowers the cost. Also, it is comparatively easy to have several tiers so that work of various importance, urgency, colour, *etc.,* can be accommodated separately. Where this 'static' type of conveyor is used, it is normal to have two or three stations to hold accumulated work caused by any of the usual bottle-necks, machine breakdowns, illness, shortage of components *etc*. which reduces friction to a minimum.

(7) **Purchase and Use of Grindery and Findings**

One of the most serious errors any executive may commit is that of complacency in the acceptance of the traditional methods and materials. It is difficult to decide how and when introductions will be made and for how long a trial can be extended. The use of cheap (in price) materials especially waxes and abrasives, is seldom economical eventually.

The selection of bottom finishes from natural gums to opaque paints must be related to quality, market and leather but some safeguards may be taken with the heavier finishes to maintain consistency; mechanical agitators are essential in this connection.

Some firms will spend thousands of pounds on advertising and remain parsimonious about allocating bottom makers sufficient clean cloth to keep work clean.

Finally, judicious buying is essential to prevent waste—gums may go sour, abrasive papers may lose their grit owing to the softening of the glue *etc.*—but alternatively, it is fatal to allow stocks to fall below a minimum safety level.

PART VIII

SHOE ROOM

E. J. CLARKE

INTRODUCTION

There is now an increasing awareness of the importance of the work done in this department. Coming as it does at the end of the manufacturing processes, it has not been generally recognised as a productive department, and planners have been apt to think that the moment goods left the finishing room, very little remained to be done and almost immediate despatch could be easily arranged.

It is, of course, quite true that some types of shoes are easily and quickly dealt with and can be despatched quite expeditiously. Others involve more work, require treatment other than normal, or perhaps have to be delayed through circumstances beyond the control of the shoe room foreman.

Very often the department suffers from lack of space and it becomes imperative that the work should pass through in the shortest possible time. Any hold—ups, therefore, become the cause of serious congestion and may quickly affect the productivity of other departments. For instance, where the factory uses racks for the transport of work, a bottle-neck in the shoe room, even though there may be special racks for that department, will soon cause a slowing down, or perhaps a stoppage of work in the lasting department, due to the fact that they no longer have empty racks upon which to place the freshly lasted shoes.

Quite an appreciable part of the shoe room needs to be set aside for the storage of boxes, a factor not always understood by those allocating floor space to various departments, but a fact nevertheless which quickly becomes apparent if not allowed for, and results in either a congestion of space or a frequent hold-up of work awaiting the delivery of boxes.

These, however, are general remarks and in order to study the department in more detail it would be better to start with the work as it enters the shoe room and follow through each succeeding operation until the shoes are finally despatched to the customer.

It is assumed that the lasts have been slipped already and that all the finishing room processes have been completed.

A normal sequence of operations would be as shown below; there may of course be minor variations due to the type of footwear manufactured.

Sole stamping
Insole tack removing
Socking
Lining edge reducing
Cleaning
Treeing and hot blasting
Pigment finishing

Quarter reforming
Dressing
Spraying
Ornament attaching
Repairing
Examining
Fellowing
Lacing and tagging
Boxing up.

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EXAMINATION AND PRELIMINARY OPERATIONS

EXAMINATIONS

THE WORK SHOULD NOW be examined and checked. It is the custom in some factories to leave the examination of work until the stage immediately before boxing. This is, indeed, very necessary, but an inspection at first can often save a lot of extra work later on. Whatever happens, however, the line of shoes should certainly be checked for quantity and an incomplete lot should not be accepted. Many complications may arise later if lines of work are sent through short of an odd shoe or single pair, and moreover, the finishers will more readily push an oddment along if a whole ticket is held in their department awaiting completion, than will be the case if the work is allowed to pass through regardless of any shortages.

This process of examination can be the cause of much discord between supervisors, but after all, it is the responsibility of the shoe room foreman to see that the work is sent to the customer in a presentable condition, and fully up to the particular firm"s standard of manufacture. Whilst it is admitted that much can be done in the shoe room to remedy other departments' shortcomings, any defects that may be remedied should be sent back to those concerned for rectification. This returning of work has a salutary effect upon those to blame and tends to remind the responsible supervisor of the standard that must be maintained.

A practice adopted in some factories, that has much to recommend it, is to have the examiner stationed to pass the work, after it leaves the finishing department and before it enters the shoe room. This examiner is responsible for accepting the work or rejecting it, in accordance with the standard required at that stage. He is subject to the authority of no departmental supervisor but is answerable only to the works manager.

The examiner should check that the work has been made to specification, see that no seams have been burst, ensure that eyelets have been properly clenched and are all complete, see that the insoles and linings are not defective. If for any reason a shoe has to be returned to be remade, the line of work should be retained to await completion.

An item of great importance, concerning welted shoes especially, is the examination of insoles for nails. A nail left in the shoe can be the cause of much trouble if discovered only when a person is trying on the shoe in the store; such incidents must be avoided at all costs.

It is not always possible to see a tack inside the shoe or boot, and even the hand pushed well down to the toe and drawn back across the insole may not locate one. On the other hand of course, the examiner may tear his fingers quite badly on some of these tacks, which, incidentally, have been the cause of septic fingers to some operatives. The obvious answer to this is to ensure that all tacks are withdrawn in the making department but, of course, it sometimes happens that the heads of tacks break off leaving the tack itself standing proud on the insole.

The Research Association have given considerable thought to this matter and a cabinet has been devised to locate nails inside shoes by means of x-rays; their comments are quoted from the Research Bulletin of August 1948:

‘We have recently completed the construction of an x-ray inspection cabinet which has been designed for the special purpose of detecting the presence of tacks accidentally left in the forepart of Goodyear welted boots or shoes. The need for a device of this kind was suggested to us by a member firm and we undertook to design and make a prototype instrument. The idea is not new and it has been commercialised in America, but we decided to tackle the job ·on rather different lines, and a very useful and efficient piece of equipment has resulted.

Any risk of tacks being left in the insoles of welted shoes is serious since the goodwill which can be lost by a customer cutting his foot on a sharp projection can be out of all proportion to the magnitude of the injury itself. The usual hand method of searching for tacks cannot be completely certain, whereas the x·ray inspection makes the chance of failing to notice a tack remote, unless the operative’s attention wanders entirely, since one glance suffices to take in the whole area of the forepart of a pair of shoes and the presence of any stray piece of metal immediately strikes the eye. The seats can, of course, be visually inspected without difficulty and an x-ray view is unnecessary; nor would it be practicable because of the mass of metallics normally present in the heel. Another advantage of the x-ray device is that it makes the job a much less unpleasant one for the operative.

The general arrangement of the instrument is shown in Figure 234 which illustrates the machine with the carriage open; when in this position a pair of shoes is taken from the shoe rack and positioned on twin platforms which form part of the carriage. The carriage, which is balanced for easy opening and closing, is then pushed in and the inspection is carried out. Whilst the shoes are under observation the twin platforms can be partially rotated by means of the handles seen in the photograph. This allows the shoes, which are first seen in plan, to be turned into an edgewise position and thus makes it easy to tell whether a tack is protruding through the insole or lying in a harmless or inaccessible position. With the aid of this "two-view" device tacks can be located exactly, and their subsequent removal is facilitated. The twin platforms are fitted with adjusters which enable them to receive anything from children's shoes to full-sized ankle boots. No adjustment is needed except when a big change of size is made.

Careful consideration has been paid to the protection of the operative from radiation, and adequate screening has been incorporated in the design. Even the slots through which the handles controlling the platforms pass are protected by a sliding screen. Furthermore, a switch is incorporated so that the tube does not emit until the carriage is closed; this

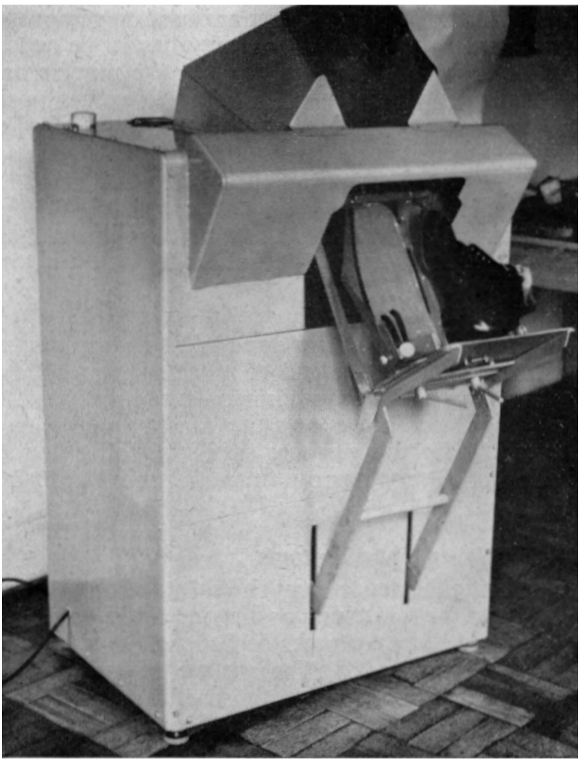


Figure 234. X-ray inspection cabinet developed by the Research Association.

makes it impossible for the operative to place his hands within the zone of emission, either by accident or through carelessness. With the usual circuit arrangement this safety feature would entail a wait of several seconds for the x-ray tube to warm up and start emitting after the carriage is closed, but a transformer and circuit has been used which allows the tube to come to life instantly.

The tube life is lengthened by a device which reduces the filament to half power when the carriage is fully opened, this being its normal rest position.'

Another method of tack detection recently introduced is a 'mine detector' in miniature. A probing tool, electrically connected to an amplifier, is pushed into the shoe and, if it passes over any metal, an audible buzz is made.

Tack Cutting

Long-handled tack cutting nippers are used to remove or cut off tacks from the insole. A certain dexterity has to be acquired with this tool. When the tack has been located the nippers are pushed down with the cutting jaws open and when in such a position that the tack is between the cutters, gentle pressure is applied to the handles so that it can be held without being cut. It is sometimes possible then to lever the tack out completely, otherwise it must be cut as close to the insole as possible, any metal still standing proud being rasped down smooth or hammered out on an iron last, taking care, of course, not to damage the bottom finishing.

Singeing

Now that knot-tying is seldom done in closing rooms, strands of thread very often show at the end of stitching rows. These threads look untidy and are not always trimmed successfully with scissors; they can be singed off however quite quickly and completely. A handy instrument for this purpose consisting of a handle with a gas jet producing a very narrow flame is produced by Livingston and Doughty Ltd.

Protection of Finished Shoe Bottoms

All shoes entering the department should stand on suitably covered surfaces to prevent the scratching or dirtying of the finished bottoms. Often paper is used to cover racks or benches for this purpose, but this cannot be recommended. The surface of most paper is very hard and can quickly spoil the wax finish of the shoe bottom. Good cloth is the most suitable material, but this must be kept free from dust and grit to retain its usefulness.

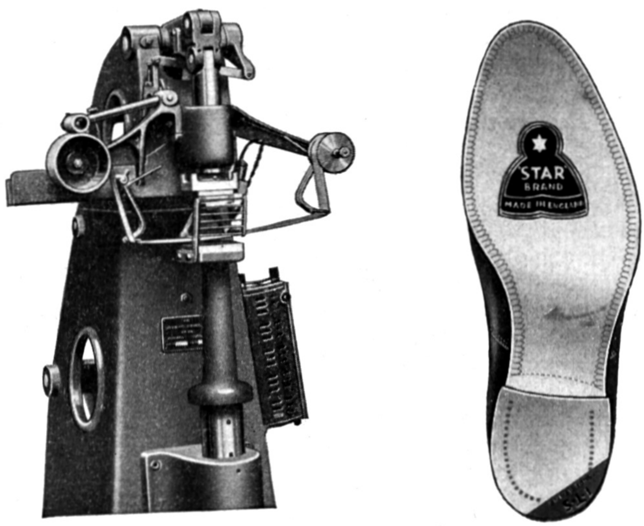
SOLE STAMPING AND EMBOSSING

Sole stamping is usually the first actual operation and if done properly can enhance the appearance of the bottom finish. It is important that when branding the forepart, the stamp should be in the centre and straight to the toe. The amount of pressure used must bear relation to the substance of the shoe bottom, otherwise a very light impression will not mark properly, or a too deep indent will mar or even damage the sole.

The type of finish and the temperature of the stamp must also bear close relationship with each other. An ordinary waxed bottom will take a hot stamp well, although even this should not be so hot as to burn the hand.

A painted bottom however, will quickly spoil if the brand is hot, the best result being obtained when the stamp is nicely warm. No precise temperature can be stated, experience being the deciding factor.

Painted bottoms readily lend themselves to the use of embossing papers. Papers are obtainable in a large number of colours and tastefully



a *b*

Figure 235. *a* **Standard Trade Mark Embossing Machine. It is shown with a paper feed attachment for embossing in gold or colour. For flat work (loose soles** *etc.***) a table is used in place of the horn.** *b* **Embossed sole.**

used can be quite effective in enhancing the appearance of the shoe. It is necessary when using them, however, to have a rather hotter stamp to obtain a good transfer of the colour.

A machine worthy of mention in respect of this operation is the Trade Mark Embossing Machine (Figure 235) produced by the Standard Engineering Co. This machine incorporates a toggle movement which eliminates adjustments for different thicknesses of leather. After the initial adjustment for the required depth of impression the machine automatically adjusts itself to give the same impression on substances within a range of $\frac{1}{2}$ in. A paper feed attachment can also be supplied and adapted for the stamping of socks *etc.*

SOCKING

This operation, though in itself quite simple, involves many variations according to the type of work, the kind of sock and the method of pasting.

For instance machine-sewn shoes, shoes with common or fibre insoles, and practically all fleecy-lined bootees, need a long sock, that is, a covering for the whole of the insole.

Welted shoes need only a seat sock to cover the grindery at the heel, although a half-sock covering the seat and the waist is often used on high grade footwear.

Heavy riveted, screwed and stitched footwear has usually only a seat sock, and not even that sometimes, although so much metal is used in the attachment of the bottoms. The fact that this type of boot is generally levelled in the making room on iron feet ensures that the insoles are quite smooth.

Slip-lasted shoes, children's veldts, and handsewn footwear usually have no sock whatever.

The sock itself may vary according to the quality of the shoe from cheap paper, cork, leather skiver *etc.*, to good grade calf or goat cut from the same material as used in the quarter lining, thus making an ideal match of sock and lining.

It should always be the aim to have the same colour sock as lining. The exception to this, of course, is when the shoe or boot is unlined, in which case cork socks may be used or the matter left to the good taste of the supervisor.

There are various ways of decorating the sock. Very often it is stamped in some way either in gold, silver or colour. It is usual for export work to carry the merchant's name and the source of production in gold lettering on the sock.

Socks may be gimped and/or perforated with quite good effect according to the type of footwear. A man's conventional shoe is of course best with a plain sock, perhaps merely skived at the front to make a smooth blend to the insole. On the other hand a suitably gimped and perforated sock will much improve the appearance of a lady's shoe.

Methods of applying the paste to the sock also vary. In some cases a grid, that can be submerged into a tray containing the paste, is used. Upon emerging from the paste, the grid being completely coated, socks are drawn across and then inserted into the shoes; when all the paste is used, the grid is again submerged.

Rollers, caused to rotate in a tray containing paste, are also used. The rollers may be power driven or merely rotated when the sock is placed to the roller for pasting. In other cases paste is poured on to a flat plate and the sock brought to the paste and dragged across a dry portion of the plate to eliminate surplus paste before insertion. This method is wasteful and dirty, as there is a tendency for the paste to get on the bench and thus spoil the bottoms of the shoes.

The choice of paste is very important. Glue, flour or latex are the main items in various preparations used for socking. Of the three, a latex compound is the most suitable owing to the fact that it will hold the sock more permanently in position during wear. Adhesives of the glue or flour paste type tend to soften with perspiration particularly when the wearer has a hot foot; the sock then begins to slide about on the insole, sometimes ruckling up in the waist and causing great discomfort. Grindery will also be exposed and cause staining of the feet and hose and may quickly damage a lady's stocking especially.

Another disadvantage with paste of this type is the fact that mould may also develop inside the shoes, especially if they are stored in a damp or closed cupboard. This tendency may however, be overcome if the paste is antisepticised in the first instance with alum or borax. This apparently simple operation is worth a little thought; for instance in the Research Association Monthly Bulletin for October 1947, a report is made concerning dermatitis from socking materials. In three separate instances, shoes were alleged to have caused dermatitis and the manufacturer was unable to obtain an unqualified assurance that the shoes were definitely free from suspicion. It was stated that the rubberised socking material showed the presence of free sulphides and though this was not likely to have caused the trouble it could not be entirely ruled out as an impossibility.

A final word on the operation itself. When inserting the sock after pasting, it is essential that the lining of the shoe should be kept clean. The sock then must be almost folded together between thumb and linger with the pasted side innermost, then placed in position and smoothed out flat. Long socking, particularly with bootees, needs special care. Even ordinary seat socks in welted shoes are not entirely fool-proof, for in this case if the sock is not located in its proper position upon the immediate insertion, the paste will cause an unsightly stain on the insole wherever the sock has been.

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UPPER CLEANING, IRONING AND DRESSING

UPPER CLEANING

The extent to which this operation needs to be done depends a great deal upon the type of footwear and on the amount of care exercised in other departments to keep the work as clean as possible.

Dirty workmen are usually shoddy workmen and it will generally be found that the cleaner the work is when it enters the shoe room the higher the standard of workmanship will be. It is obvious that it is difficult to keep Goodyear welted work equally as clean as stuck-on work, owing to the extra handling and the stitching operations involved in the welted process; that is no excuse, however, for indiscriminate smothering with wax, water stains, oil etc., that ultimately cause a great deal of trouble in being removed.

The aim of the shoe room is to restore that clean, fresh, attractive appearance that characterises the upper material in the first place whether it is leather or fabric.

Machines such as the BUSMC Stitch and Upper Cleaning Machine and the Standard Shoe Cleaning Machine shown in Figure 236 are frequently used, especially for box calf and black glacé kid. The machines usually have a stiff bristled circular brush for cleaning the welt, a wider, softer brush that can be fed with a regulated amount of cleaning fluid, a mop for drying off, and a final brush for polishing up (Figure 237).

Coloured leathers can be successfully cleaned on the machine, but care needs to be exercised to prevent bruising or removal of pigment finishes.

Patent shoes must also be treated carefully, otherwise if too much pressure is put on the brush, the heat so generated by the friction of the brush on the upper will cause the enamel to soften and become completely removed.

Some firms take advantage of the heat that can be generated in this way, to smooth out the uppers of glacé shoes, especially ladies' footwear. For this purpose the shoes are cleaned while still on the last and thus the original lines of the last are retained, no further ironing or hot blasting being necessary. This method is very useful where little or no distortion of the upper occurs in last slipping.

The cleaning fluid is usually a weak ammoniacal solution and may contain some soft or liquid soap and colouring materials although some of the modern detergents could well be used as they assist in the spreading power of the liquid and also help to retain the colour in tan shoes. The welt brush will generally clear any wax, solution or dried ink stains, leaving the damp brush for the general cleaning.

When cleaning by hand, a small blunt knife is used to scrape away any dried ink in the leather or surplus wax around the seat. Petrol or benzoline is used to remove wax or slight oil stains, an odd piece of crepe rubber is kept handy to rub off any solution, and a fluid, similar to that used on the machine, for general cleaning. It

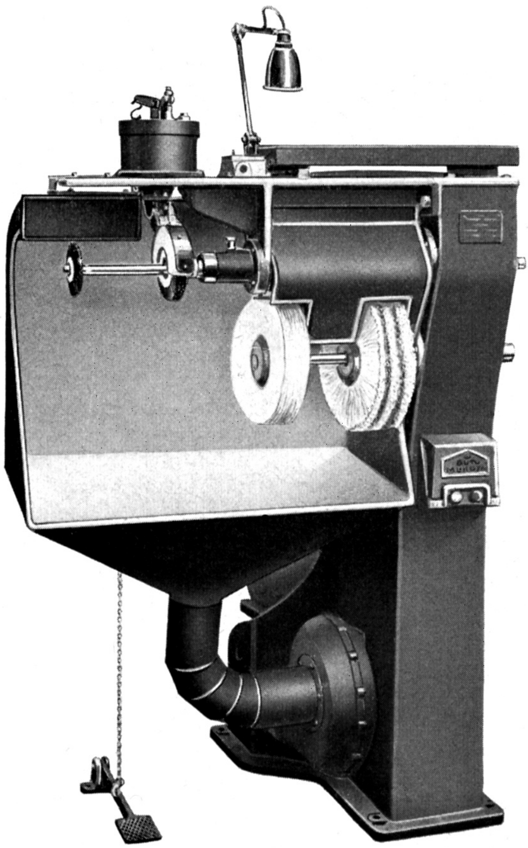
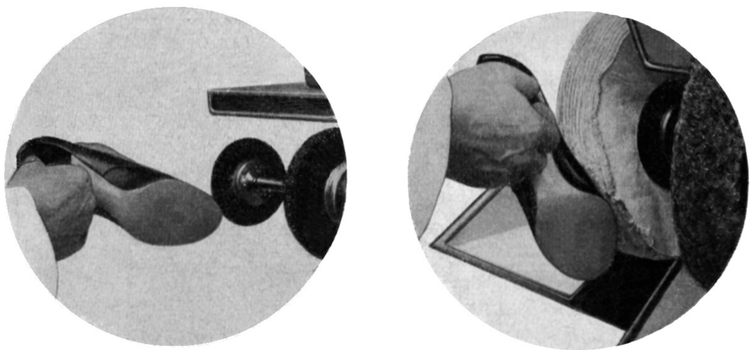


Figure 236. Standard Shoe Cleaning Machine.

often happens that small amounts of celluloid are transferred to the upper from the fingers of the worker inserting celastic toe-puffs. These marks do not show very plainly in the cleaning stage but appear very prominently when the dressings are applied. It is important therefore, that they be completely removed and the tendency is for operatives to try and scrape them clear with a knife or finger nail.

This spoils the surface of the leather and must be stopped. The only way to remove the marks is to use some of the spirit supplied for the softening of the puff itself.



a b

Figure 237. *a* Welt cleaning. *b* Rubbing-off.

Coloured Work

Very little of the coloured leather now used in shoe manufacture is straight dyed. It has become almost general practice to apply a pigment finish after dyeing to give a uniform shade of colour over not only the whole skin but over the complete batch.

Some tanners produce leather with a good fast finish; other leathers quickly lose their finish and require special treatment in the shoe room.

In the first place, care must be taken in cleaning and for this purpose it will be found that a spirit cleaner will usually be the best. Solutions containing ammonia will generally make matters worse and must therefore be avoided. The use of water to damp a cloth or sponge, which is then rubbed on some saddle soap for cleaning shoes with a loose finish, often helps to level up the colour and may eliminate the use of a pigment to restore the original even shading.

However, if the uppers are patchy after cleaning it will be necessary to refinish the leather. There are two main types of finish that may be used, either a water pigment finish or a cellulose finish.

The water pigment is easily applied and can give good results. It will generally be found most convenient to keep a small number of shades from which a suitable match can be blended for the particular requirement. It is advisable to thin down the finish with a good shellac dressing; this will help to bind the colour to the leather.

When selecting or mixing up pigment finishes, it is a good practice to obtain pieces of leather of the identical type from which the shoes have been cut, and by trial and error find the exact shade of finish required.

It must be borne in mind, however, that the leather pieces will appear very different from the uppers that have suffered the strains and stress of lasting and the handling throughout the factory. Furthermore, if they have been through the mulling process, the leather will need extra care as it will usually be found to be rather on the 'hungry' side. The cuttings of the leather must therefore, be used as a guide to what must be the appearance of the finished article.

Table 12. Cleaners which may be used to remove different types of stains from various materials
(based on *ABC of Shoe Science*—SATRA)

Stain	Type of material	Cleaning agent
Grease	Smooth leathers	*2, 3, 4, 5, 6, 7*
	Reversed leathers or suede splits	*4, 5, 6*
	Rubber combined fabrics	*2*
Wax	Suedes or splits	*9* + *4*, *5*, 6
	Other leathers	*13* or *14* + *3*
General soiling	Smooth leather (cellulose finish)	*1*
	Smooth leather (casein or water pigment finish)	*2*
	Suedes and splits	*5, 12*
	Leather linings	*11*
	Linen	*3, 4*
	Satin (crepe-de-chine)	*2, 4*
	Rayon	*3, 5*
Tarnishing	Silver tinsel	*15*
	Gold tinsel	*16*

Key to Cleaning Agent Column

1 10 per cent watery ammonia cleaner—with or without detergent
2 Acetone
3 Benzine
4 Carbon tetrachloride
5 Ligroine
6 Methylated ether
7 Oil remover. (Thin solution of crepe rubber pieces in carbon bisulphide)
8 Wood naphtha
9 Sharp knife
10 Emery cloth
11 10 per cent watery oxalic acid
12 Pumice powder
13 Cleaning machine welt brush
14 Blunt knife
15 Potassium silver cyanide plus precipitated chalk
16 Potassium gold cyanide plus precipitated chalk

'Flexomel', supplied by the B.B. Chemical Co. is an example of a cellulose finish. This is highly inflammable and care must be taken to comply with the appropriate regulations concerning its use.

It is best applied with a camel-hair brush, making as few movements as possible and as quickly as possible. This method is more permanent but needs more skill in its execution. Whatever the type of pigment finish is used, however, it is better to apply two thin coats instead of one heavy coat.

The first coat must also be left to get thoroughly dry before the application of the second, otherwise the whole effect will be ruined. A heavy painted look must be avoided.

Suede or Buck Leather

Shoes of these materials need especial care in manufacturing in order to keep them as clean as possible, for they seem to pick up oil and dirt much more readily than other leathers and are more difficult to clean. The brushing, so necessary, causes a great deal of dust which is most unpleasant to the operative. Cabinets have been designed to obviate this and a dust extracting system is embodied. This makes the job cleaner and also prevents dust settling on shelves nearby.

Wire brushes intelligently used are of great assistance in the cleaning of suede, although if used too vigorously the fibres of the leather will be excessively roughened up. This is particularly the case with suede splits. A piece of emery cloth rubbed round the leather will clear any ink stains, but care must be taken to keep the bottom and edge finish unspoiled. Spots of wax or rubber solution should be cleaned off dry. If a solvent is used, the dirt merely spreads over a larger surface and becomes more difficult to clear. It will be found that a razor blade delicately handled will remove a blob of wax or solution and leave no trace of anything having been there. Oil stains require especial care. A solvent such as ligroine, benzine, or methylated ether should be used and applied to the centre of the stain with a piece of cloth wrapped around the finger, then with a quick circular movement the area is widened until the solvent is perfectly dry. This process is repeated until the stain is entirely removed.

The continual rubbing over a widening area until the solvent dries, is necessary to prevent a ring forming. If a wet patch is allowed to dry naturally it will be found that a clear mark will show exactly where the solvent has been. This mark will be exceedingly difficult to remove or cover. Powder of a matching shade is used to even up any patchy shoes but the least amount of powder used the better, for it must remain loose on the leather and makes rather dirty handling when taken from the box. This can cause a bad impression upon the customer who is bound to be suspicious of the colour if a lot of coloured powder is seen to be in the box and on the tissue, perhaps also spoiling the hose when trying the shoes on. It is sometimes advisable to use a liquid colour stain to even up the shades of suede, but the shoes must be left to get thoroughly dry before finally brushing over to raise the nap. It is advisable to use dry cleaning methods as far as possible and fine emery paper, pumice powder and art gum will be found of much assistance for this purpose.

Should the leather fibres appear too rough, due perhaps to excessive brushing with the wire brush, or even to the inferior quality of the material, it will be found that the use of a gas jet or the hot blast, specially adjusted with a low air thrust, to singe off the long fibres, will greatly enhance the shoe. The leather will need brushing after singeing, but no vigorous treatment should be necessary.

Spray equipment is often used to improve the appearance of suede, and Velvetta Spray supplied either black or colourless by the B.B. Chemical Co. is produced for use in this way. This spray does not put new colour into the shoes but does seem to put some life into the material.

Of course many factories use covers of various types to protect suede or white buck, but as the shoes are not usually thus protected until after lasting, they are not perfectly clean. The covers themselves also present problems in the shoe room. If of paper, the feather line must be made absolutely clear. Should the cover be cut out, then care must be taken that the upper or welt is not cut. The best procedure is first to slit the cover from the back of the seat to the top of back-strip, and from the vamp point to the toe; then by holding the cover in the hand and at the same time pressing the index linger firmly to the feather line, the cover should be pulled away. The feather line should thus be absolutely clear of paper fragments, but if any should remain, they can be pressed back into the seam with a blunt knife. This method can be done quickly and involves no risk of damage to the shoe. Sometimes adhesive paper is used, but very often when torn off, some of the colour comes off with the paper, or the paper peels away from the adhesive, thus causing more work in the shoe room than would have occurred had no covers been used at all.

Suede protectors are also sprayed on. These are of a latex base and should, if properly used and applied, give excellent results. The spray sets as a coating of rubber and should peel off easily in the shoe room, leaving the upper perfectly clean. Unfortunately, things do not always go according to plan. Variations in the chemical properties of the spray, different upper materials, and insufficient attention to required thickness of the coating by the operator tend to make the process more trouble than it is worth, because if something does go wrong it is almost impossible to remove completely the cover from the upper. The shoes have therefore, to be rejected. It is obvious that a great deal of trouble could be avoided if suede shoes could be handled cleanly by operatives without the use of covers. It can be done, and in fact is done in some establishments.

White leather can be protected by the application of a suspension of powdered pipe clay in water with a little detergent added to assist in the flow. This coating is purely temporary and can easily be cleaned off in the shoe room with a rubber sponge or a fairly stiff brush.

Whilst on the subject of cleaning, the use of fabrics for uppers must not be overlooked. Cotton and linen do not usually present much difficulty as petrol, benzine or soap and water, or a weak solution of salts of lemon, can safely be used. Care must be taken however, if the fabric should be of combined material, so that the bonding of the two fabrics shall not be disturbed. For instance, if the fabrics are cemented together with a rubber adhesive then obviously, petrol, benzine, carbon tetrachloride, etc., will weaken the bond and cause the materials to come apart. Acetone may also cause this especially when the fabric is backed with P.V.C. Rayons will also suffer much damage from the use of acetone.

Tinsel Shoes

W. D. John in his book *Modern Shoe Dressings* gives the following instructions in this matter: 'Gold and silver tinsel shoes frequently become tarnished before they come to the shoe room, this being most pronounced over a backing of fabric lining, the salts of which react with the metal filaments and alter the original lustre and colouring. For restoration, the surface is rubbed with a long-handled brush dipped in a solution of the simple cyanides of sodium gold cyanide and potassium silver cyanide, usually in conjunction with a suspension of precipitated chalk.

These cyanide solutions are deadly poisons and only well-trained, intelligent operatives should be trusted to use them. Rubber gloves must be worn and no eating allowed until the hands have been washed thoroughly.

Silver tinsel restorer.

1 quart 5 per cent solution of potassium silver cyanide.
$\frac{1}{4}$ lb. precipitated chalk.

Gold tinsel restorer.

1 quart 5 per cent solution of potassium gold cyanide.
$\frac{1}{4}$ lb. precipitated chalk.'

Satin Shoes

Again, quoting from *Modern Shoe Dressings:* 'Shoes made of satin and similar materials require rather careful treatment in the shoe room; to clean them is frequently a tricky operation, as the natural lustre is easily impaired in the process. The ordinary shoe room cleaners are of little use, and anything containing water should be avoided, as it quickly soaks through the surface and stains the linings. Methylated spirits 74° o.p., if handled carefully gives a fair result but the material "par excellence" is rectified white wood naphtha, used either alone or with a small proportion of benzol; it not only thoroughly cleans all types of satins, but materially maintains and restores the original lustre. Only a very small amount is required and it is most suitably applied on a piece of clean soft flannel, which should be first moistened and any surplus squeezed out. It is rubbed lightly and evenly over the whole of the shoe, and when dry the shoe should be rubbed with an old silk handkerchief. The rectified wood naphtha is colourless and can be used on the most delicate shades, but to develop the sheen on black satin to the maximum, a trace of black spirit dye can be dissolved in it.'

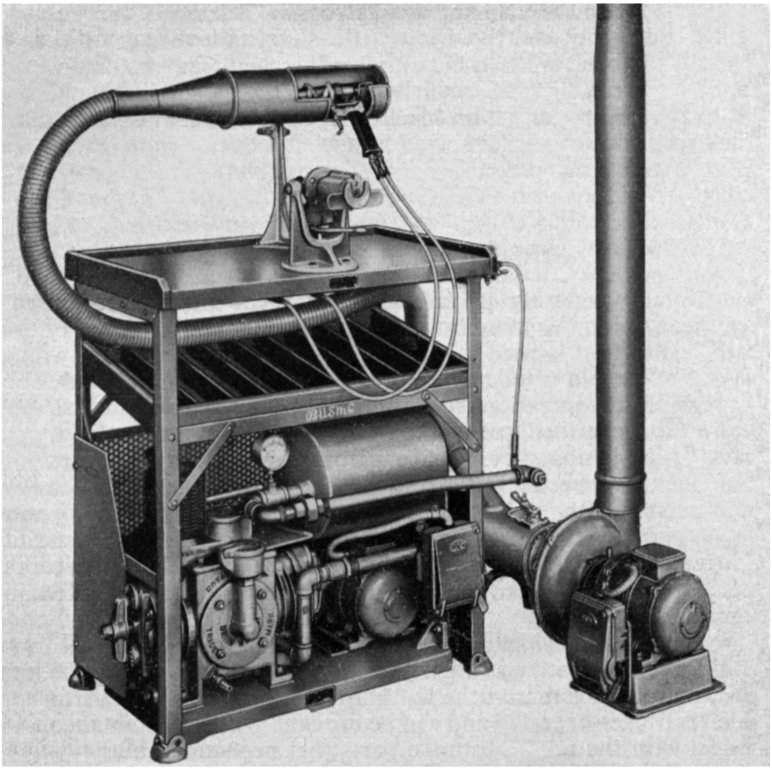
IRONING OR HOT BLAST

It is usually necessary to give leather uppers some form of heat treatment to remove wrinkles and tighten up the grain surface of the leather. The heat is used in conjunction with the treeing feet which may be of the old wooden type or the modern pneumatic kind. The purpose of this operation is to iron or hot blast the shoe whilst it is held on a shape identical to the original last, so that no distortion may appear in the shoe as it is prepared for the final process of boxing up. The treeing feet are so made, that they can be withdrawn from the shoe without disturbing in any way the freshly treated upper. It will be found that only the lighter types of shoe, such as glacé kid, are treated in this way, and that box and willow calf are ironed or hot blasted on the hand. Hot blast equipment is illustrated in Figure 238.

Hot irons, of which there are various types, will remove wrinkles and smooth out the legs of boots much better than the hot blast, and for this reason the hot blast tool is fitted with an iron tip which is trigger-operated and can be brought into use instantaneously to deal with the more obstinate parts that need smoothing out. Of course, if the leather is printed the grain will be simply smoothed out if heat is used, but even so there are times when some ironing has to be done to obviate serious wrinkling. The aim in such cases must be to act in moderation and try to clear the defect without entirely removing the print of the grain.

When using heat on leather it must also be borne in mind that serious damage may be done to the upper by excessive heat. Full chrome will stand a higher temperature than semi-chrome, and vegetable tanned leather, of course, will burn with very little heat. Care must be taken then merely to smooth out the leather and not to shrivel it up. The hot blast also needs particular care in operation to prevent scorching, as, if the blast is too fierce, not only will the leather be burnt but the upper stitching, and probably the finish of the heels and edges also ruined.

Incidentally, an advantage the hot blast tool has over the iron is that the shade of coloured leather is not spoiled by blast as it sometimes is by the direct contact of the hot iron. Also when properly used the hot blast tool will also singe off any loose threads without causing damage to the seams.



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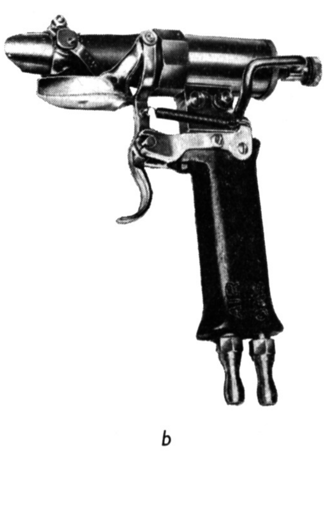

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Figure 238. *a* BUSMC Pneumatic Treeing Machine with hot blast tool. *b* Close-up of hot blast tool.

DRESSING

This is really the main operation in the shoe room and, of course, is done to make the shoe presentable and attractive to the customer. Nevertheless, if the previous operations have not been properly carried out the best results will not be obtained. Dressing is usually split up into two parts; firstly the application of fillers, normally by sponge; secondly the final dressing which may be applied by sponge or spray.

No hard and fast rule can be made as to how many coats of fillers are required as this varies according to the type and tannage of the leather, and also the degree of brightness that is finally required It will be found that even similar leather from two different tanneries will require different treatment to give the same degree of brightness in the finished article. The supervisor has therefore to arrange for a varied treatment of similar shoes according to the type of leather and to the result of his previous experiments in dealing with it. When he is faced with leather from a new source of supply, he must find the dressing to give the required result. lt is most important, therefore, that work tickets should clearly state the tanner's name in order to simplify the arrangements for dealing with the dressing. Another factor that has a bearing on this is whether the leather is full grain, or snuffed or corrected grain, as the latter type will most likely need either a heavier filler or perhaps two coats of filler, whereas the full grain leather will need only one coat.

Coloured leather may also need some treatment to rectify patchiness. Most coloured leathers are finished with pigment, the fastness of which varies a great deal according to the source of supply. Here again it will usually be found that full grain leather holds its colour better than the corrected grain.

However, whatever the type of leather, if the shoe has become patchy either in the making or from the cleaning, it must be restored to a level shading. It is best to inspect the complete line and to apply first to the affected parts by sponge, camel-hair brush, or spray, a coat of finish of the required colour. It is better to apply two thin coats than one heavy coat as there will then be less likelihood of getting a tear mark or an obvious painted look.

This patching process should then be followed by the application of a coat of uniformer over the whole of the shoe; indeed it is best to pair the shoes up and thus treat the pair. This uniformer may be a water pigment mixed with some shellac dressing to assist in bonding and applied by sponge, or a liquid cellulose renovator, such as B.B. Chemical Co. 'Flexomel', could be used and applied with a camel-hair brush.

After these base coats have been applied, the shoes are ready for the final coat, which may be shellac, liquid polish, or synthetic resin, and can be applied by sponge or spray.

Shellac dressings on some leathers have a tendency to crack and give rise to adverse comment from retailers who find that after the shoes have been tried on or merely handled, the finish of the upper has badly deteriorated, and shows a whitish flaking wherever the leather has been only slightly wrinkled. On the other hand, this type of dressing suits some leathers admirably and because of its ease of application, its varying degrees of gloss, and smooth clean feel when dry, still holds a strong place among the finishes now used.

Liquid polishes do not usually crack so readily, but do not give the same degree of lustre as shellac, but where a high gloss is not so important these dressings are very useful.

They dry, giving the shoe a “calfy’ feel without the stickiness that is evident after the use of cream or wax polish.

Of course, in the case of all dressings that are sponge applied, the condition of the sponge itself is of first importance. It must be of fine texture; if there are large holes, an uneven flow will result from the sponge and unsightly streaks will show. It must also be thoroughly clean. New sponges contain a large amount of sand, much of which can be lightly hammered out whilst the sponge is still dry, after which thorough rinsing in water should clear the remainder. Should the sponge be used whilst still containing sand, the surface of the shoe will dry with a coarse gritty, finish, and will feel very harsh, and similar to a fine emery cloth. The same effect will result if the sponge is not thoroughly rinsed each day, otherwise the dressing previously used will dry whilst contained in the sponge, and emerge when the sponge is used again, in fine particles similar to grains of sand.

Liquid polishes and shellac dressings at times also tend to froth, particularly in hot weather. This frothiness makes dressing very difficult, but can be entirely overcome by the addition to the dressing of a small quantity of milk, a dessertspoonful to a pint of dressing generally being adequate.

Synthetic resins have recently been developed for use in shoe dressings and are usually applied by the spray method. They are flexible and can be supplied in various degrees of brightness. It is obvious that in the general application by spray, the dressing must be colourless, otherwise the linings and edges will become stained. Even so the utmost care must be exercised in order to prevent the dulling of the waxed heels and edges. A colourless dressing, however applied, leaves the leather with a rather raw, hungry look and for this reason it is essential that even when the final coat of dressing is sprayed on, the coats of filler must be sponged on.

The System of Spray Dressing

Spray dressings are becoming almost universally used in shoe rooms, and the equipment is very similar to that used for spraying leather or motor cars, although a cellulose dressing is rarely used. There are, of course, special regulations to be complied with if cellulose dressings are used, and as there are a number of suitable shellac or synthetic resin dressings available, that can be freely used, and give good results, there is no need to bother with cellulose.

It is necesary, however, to have a cabinet with an exhaust fan to take away the surplus spray (Figure 239). The shoe is held at the open end of the cabinet and the jet blown on to the shoe, and the unused mist is thus drawn away. The gun itself can be suspended on a spring, sufficiently

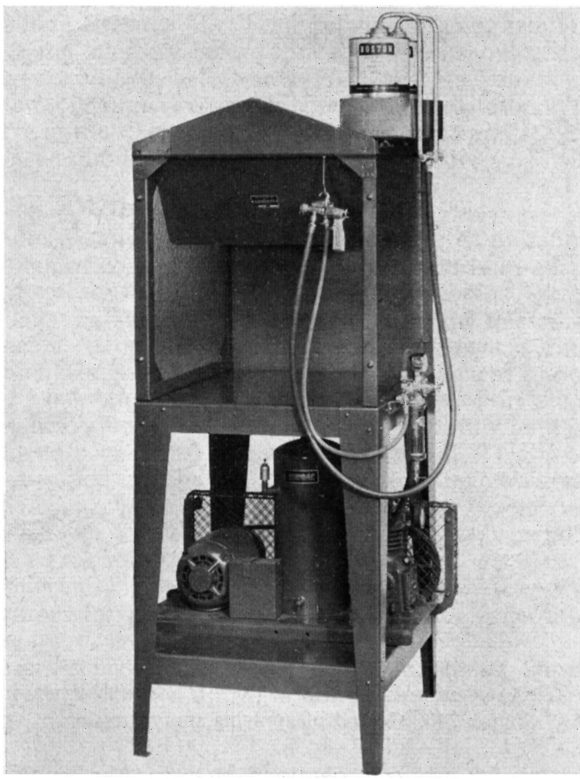

Figure 239. Boston Spray Cabinet.

strong to carry the weight of the gun, but not so strong that an effort is needed to manoeuvre the instrument when spraying is in process.

As in the case of many other processes, good preparation is essential for good spraying. Firstly, the leather must be well cleaned. All factory dirt, ink, solution, *etc*., must be completely removed. Greasy leather or oil marks should be cleaned with a spirit cleaner. Whereever coloured leathers have come up patchy, a uniformer must be applied to restore level colour throughout. Most leathers will need at least one coat of filler applied by sponge. Fillers of various strengths can be used, light, medium or heavy, although better results are obtained by using two coats of light filler than one heavy coat. Should experience show the need for "bloom' prevention, special fillers for this purpose may be used.

After the fillers have become perfectly dry, the spray may be applied. Dressings can be obtained to give degrees of gloss from a light matt finish to extremely bright.

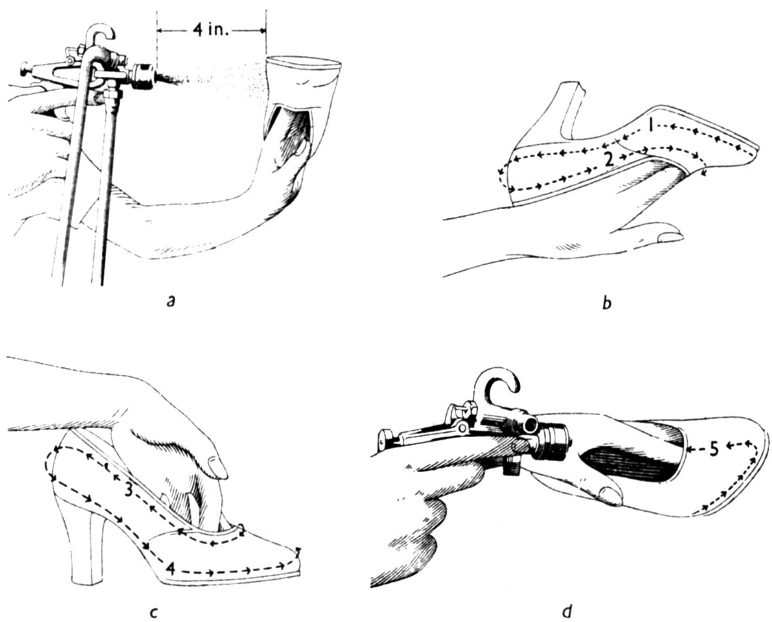

Figure 240. Method of applying spray dressing.

The best results are only obtained by using the spray carefully and by moving both the shoe and the gun in the correct way. It is also of the greatest importance that the air pressure to the gun is maintained at 50 lb/sq. in.

The left hand is first inserted into the shoe, and at the same time the spray gun is held in readiness in the right hand. The shoe is lifted from the rack and by spreading the fingers open, it can be turned about as required. Whilst holding the shoe bottom uppermost, with the whole of one side facing the operator, the spray is applied from the gun held about 4 in. away (Figure 240*a*) and by moving the gun and turning the shoe as in Figures 240*b*, *c* and *d*, (the arrows showing the direction of the spray) making sure that the back is properly treated. When the toe is reached a half turn of the left wrist brings the shoe front directly in line for the finish off.

If oil or water is allowed to get into the gun, a spotted finish will result. Slow movement or too close an application will cause the shoe to become too wet and unsightly marks will appear as the dressing will tend to "run’ leaving a blotchy uneven finish.

A ‘pebbly’ finish will result if the pressure is too low or it may be caused by insufficient grease removal at the cleaning stage, or by leaving too long after the filler has been applied. Whilst it is important to have the filler dry before spraying, shoes should not be left too long, *e.g.* overnight, before spraying. This also applies in cases where the final coat of dressing is sponge applied, otherwise some of the grease in the leather may rise to the surface and make it very difficult to get a good clear finish when the final dressing is applied.

The Cleaning and Dressing of Heavy Boots

There is not usually any elaborate treatment given to boots of this kind, although of course they may vary enormously in quality and price. It is not always a good thing to grease such boots, even though they may later be subjected to excessive wear in wet conditions, because once a coating of grease has been applied it is difficult to get anything like a good polish afterwards. A shepherd’s boot could be safely greased, but a coat of filler and one coat of dressing would suffice for a heavy work boot. A gentleman’s shooting boot or a ski-boot would be better wax polished and brushed. This is a rather laborious operation but has the advantage of giving a water-resisting finish to the leather without spoiling the boot for further polishing. Boots of this type are usually expensive and justify a little extra labour in the shoe room.

Heavy splits and kip boots are best greased with the grease warmed up. This allows for easier application and better penetration into the leather.

In some cases heavy boots are merely cleaned on the cleaning machine and well brushed up, without applying wax, grease, dubbin or dressing.

Antique Dressings

This type of finish although not new is now widespread, but needs to be done properly to give the best result. Usually, heavily punched and gimped shoes of either grain or smooth leathers are so treated but even plain shoes are also antiqued especially if made from some of the lighter shades of brown. The purpose is to remove the ‘newish’ look from the shoes, especially with regard to men’s wear. The process is as follows:

The uppers must first be cleaned in the normal way, otherwise the antique dressing will ride on any surface dirt and give a patchy finish.

The antique stain or dressing is then applied with a sponge taking great care to see that all gimped edges and punched holes are thoroughly soaked. The whole of the shoe must be coated and immediately the dressing has been applied, the shoe must be wiped over with a dry cloth to remove all surplus dressing. This leaves all the raw edges properly darkened, the crevices of the printed surface suitably lined, and the shoe slightly darkened all over. A final dressing of the required lustre is afterwards applied either by sponge or spray to complete the operation. The shoe should then have a well cared for and polished look, rather like that of well kept harness leathers.

Bloom

Sometimes a bloom or spue appears on the uppers even after the shoes have been boxed up. It may be due to any one of several causes, perhaps to inferior oils used in the fat liquoring of the leather, or to the presence of sulphur in the tanning. It can also be caused in the shoe room by the use of cheap soap in the cleaning process, or by using a ‘wet’ sponge, that has been washed out in water, perhaps soapy water, and used to apply dressings whilst still containing a quantity of the rinsing water. A bloom so caused, while not being obvious for several days, will clearly show a number of streaky markings, indicating the directions the sponge was taken. Blooms having their origin in the shoe room have their obvious remedies, but in other cases the use of ‘Raflex’ anti-bloom wash, as supplied by the Research Association is of great assistance.

Spirit dressings can also be obtained, and applied by spray or camel-hair brush, which have the effect of preventing the bloom from coming through. It may well be that new developments taking place with silicone polishes will also be of assistance in this respect in that they clean and polish without any appearance of haze.

35

OTHER OPERATIONS

PANEL TRIMMING

‘Boothco’ Trimming Machine

This machine is installed in many shoe rooms, particularly where ladies’ shoes are dealt with, and is used to trim out the fronts of court shoes and others that have rather open fronts. It can also be used to clear the linings of quarters showing Cut-Out designs although where the pieces to be cut out consist of a number of small sections it may be better to cut out by hand with a clicking knife, as the operator may damage the shoes through cutting too far on the machine.

Where a fairly long cut is required, the machine is quite satisfactory but with very short cuts it may be more trouble than it is worth, as any damage done at this stage, of course, damages a whole shoe and means the rejection of a pair.

ln some factories this machine is used to trim quarter linings also, but it can only trim to the edge and not undertrim, thus the full substance of the lining shows at the edge, and to obviate this the BUSMC No. 2 Lining Edge Reducing machine is installed. This machine is used to hammer the edge and cause the freshly trimmed lining to be reduced in substance so that it becomes barely visible.

ORNAMENTAL ATTACHMENTS

Many ladies’ shoes of the plain court type are given a most attractive appearance by the attachment of suitable accessories. Many shoes are made with old patterns that appear modern only by reason of the newly designed bow or trimming. The production of trimmings, although sometimes done in the shoe room or closing room, has given rise to the addition of a new industry ancillary to the shoe trade.

There are some firms in existence solely for the production of these accessories and the designs they produce are both varied and attractive. The changing of these bow or buckle styles is of great assistance to the ladies’ trade in enabling apparently different designs to be produced each season.

Although the fittings are purchased separately, they must be attached in the shoe room and are usually stitched or stapled on by machine, although in some cases they may be stitched on by hand. If a stapling machine is used great care must be exercised to ensure that the staple shall not be able to contact the hose of the wearer, otherwise a ladder in the stocking will quickly ensue. It is for this reason that stitching is generally preferred and that in some cases the stitching is done by hand. It is now possible, however, to staple from the inside of the shoe so that the points cannot touch the stocking.

QUARTER RE-FORMING

The 'Compo' Shoe Forming Machine

This machine supplied by the Standard Engineering Co. is used to:

(1) shrink and press the top edge of the quarter lining in under the top edge of the upper;

(2) turn or roll inwards, towards each other, the top edges of the shoe along the lining;

(3) iron or shrink out any fullness in material at the top edge of the opening.

The machine is composed of a number of shaped moulds, similar to the top of a last, with a manually operated clamp which is used to press the outside of the quarter firmly on to the mould. This being electrically heated and thermostatically controlled causes the shoe to take the shape of the mould round the top of the quarter and giving a neat snug appearance to the shoe.

The BUSMC No. 2 Shoe Quarter Re-forming Machine does the same work.

REPAIRING

Patent Repairing

Patent shoes require rather specialised treatment for the repair of damages. There is always a larger proportion of these shoes needing repair, due in the main to the large amount of cracking of the enamel that occurs especially at the toes. For minor repairs special patent repairing crayon may be used to fill in, polishing off with a fine cloth. In other cases it is necessary first to remove the damaged enamel. This is done by scouring with line emery cloth, either by hand or machine but there is no doubt that the result by a tip scouring machine is much the best. The scouring is liner and the scoured surface smoother. These machines are quite simple having merely a flexible drive directly off a small motor. Various shapes of tip scourer can be easily attached to the shaft. The machines may be placed in a convenient bench and plugged in to an ordinary light socket.

Whatever the method of scouring, however, it must be thoroughly done and not confined merely to the damaged part, otherwise a definite hollow will be formed; instead, the area around should be lightly scoured to give a gradual deepening to the bottom of the damage. Should the cracks be really too deep, a first filling may be made with a repair crayon, and then the normal scouring proceeded with. It is important that the leather fibres shall not be roughed up, otherwise it will be impossible to effect a smooth repair. All scoured dust must then be removed from the shoes, and the new enamel may be applied. This is done by taking a little of the enamel on to a fine cloth held on the finger tip and quickly rubbing it into the scoured area. It is better to take small amounts and rub in until dry, than to try to cover the damaged area with only one or two applications of enamel, as it will then tend to become blotchy. When the whole surface has been covered and built up to the original substance a fresh piece of cloth is taken on the finger tip and moistened with a small quantity of thinner; this is used to smooth over the newly repaired area and removes any streaks and helps to blend in the new enamel with the old. Finally, a coat of varnish is quickly applied with a camel-hair brush. This must be done to a nicety with as few strokes as possible and covering the whole piece of leather in which the damage is contained, *i.e.* if a part of the cap is damaged the whole of the cap must be varnished. Spray equipment may also be used for the repair, special enamel and varnish being produced for the purpose, but the preparation for the repair must be done in exactly the same way as that already outlined.

Repairs to Gold or Silver Kid

Advice in this respect is given in The A.B.C. of Shoe Science (British Boot and Shoe and Allied Trades Research Association) from which the following extract has been taken:

'*Repair—Silver*. The ideal form of repair would be to renew the metal by a further application of the leaf. As the breakages are often scattered in a patchy manner over a considerable area of the shoes, this becomes a difficult matter to accomplish without leaving definite traces of the repair. Better and more practical results are obtained by the use of silver or aluminium powder. For this method petrol, powder and beeswax are required.

The repair can be best carried out with the bare linger. Dip the finger into the petrol and rub over the block of beeswax. Next rub the finger over the areas needing repair, repeating once or twice to ensure a fair deposit of beeswax upon the leather. Then dip the dry finger into the powder and rub gently on the leather. Repeat until the area is satisfactorily covered and dust off loose powder with a fine brush. Dexterity at this operation can soon be achieved, and remarkably neat repairs made. lt is not always wise to use bare fingers, for in the case of some operatives, who are susceptible, dermatitis may develop.

This form of repair is not suitable for shoes intended for export. For some reason not yet ascertained, a repair of this nature is made visible by a green discolouration after a sea passage.

Repair—Gold. Repair in the case of gold kid is best carried out by application of gold leaf after dressing the bare area with gold-size, or it may be made with powder as described for silver.'

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FINAL INSPECTION, PACKING AND DESPATCH

EXAMINATION

THE SHOES MUST BE submitted for a final examination before boxing. Any damages to the upper must be repaired if possible, or the shoes rejected or returned to be pulled up and put in order. If a damage is of such a nature that a part of the upper is shown to be peeling up, this should be firmly stuck down with a glue, such as Croid or something similar that is contained in a tube ready for use. Rubber solution must not be used as it leaves a slight ridge at the edge of the tear, which when rubbed may cause the damage to open up again.

After the glue or cement has thoroughly dried, the area around the defect should be finely scoured and the surface filled in with a repairing crayon of an identical colour to the original leather.

Scratches or cuts that are not too deep can also be finely scoured and filled in in the same way taking care, of course, to brush away any surplus scourings before using the crayon. Damages in the feather caused by the stitching machine, usually because the leather guard has worn and allowed the awl to contact the upper, are difficult to repair, but are best dealt with by melting some crayon on the end of a hot knife and filling in the incisions. The surplus wax is rubbed off with a cloth wrapped around the end of the finger. Sometimes a series of grinning holes appears round the toe due to bad welt sewing. These can also be filled in in the same way. Damages are not the only things to be looked for; sometimes an eyelet is missing, and even a row of stitching may have been missed. Heel breasting may be the cause of many returns, if the knife has been allowed to go too deep, particularly in rubber soles. This, therefore, requires constant vigilance.

It is also not only the outside of the shoe that must be examined but also the inside. There must be a final check to see that no nails are left sticking through the insole. Torn linings, burst seams, damaged insoles due to the welt sewer striking through, are other points that must be checked. The Research Association have developed an Optical Inspection Device marketed by Cox and Wright Ltd., for the examination of the interior of shoes. The device is comprised of a lamp with a shield fitted to protect the eyes from glare and a mirror so constructed that upon bringing up the shoe so that the mirror rests on the seat sock, the whole of the inside of the shoe is clearly reflected and any defects can immediately be discerned (Figure 241).

It is also usual to pair the shoes up at this stage and a check must be made to ensure that the correct size is marked up. Length of cap or front, height of quarter and back, matching of colour, must also be checked. The general standard of craftsmanship must also be

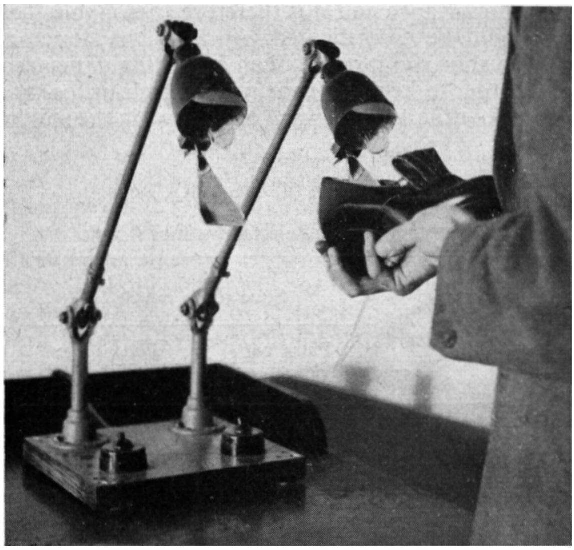

Figure 241. Optical inspection device developed by the Research Association.

watched, as well as the work done in the shoe room. Concerning this matter of final inspection it is interesting to study the SATRA Report on *Productivity Comparisons between the Making, Finishing and Shoe Rooms of Twelve Factories making Women`s Shoes* (R.R. 116). A relevant extract follows:

'Shoe Room Rejects

The records of quantities rejected by the shoe room reached the higher management much more frequently than did the records of lasting damages. The reasons for rejection were assessed with the utmost care by some firms, whilst others were satisfied with a report on the quantities only. In some cases, the shoe room foreman, working closely with the manager, took the responsibility for passing or rejecting doubtful shoes; in other factories the bulk of this heavy responsibility fell upon the examiners.

The numbers of pairs of rejects per 1,000 dozens of output for each factory is shown in Table VII (ii) (Table 13 below).

The firms making the best grade shoes tend to have the greatest number of rejects. On the other hand, those with the fewest were far from being the least particular, so that special scrutiny of the causes of rejects by those firms with high figures might enable reductions to be made without loss of quality.

From a cost point of view, shoe room rejects and lasting damages are similar in importance and it is therefore reasonable that control over them should be co-ordinated. At R.19 the directors kept a closer watch on shoe room rejects than on lasting damages, with the result that, in order to keep the shoe room rejects as low as possible, a quantity far above the average was "pulled up" in the making room.'

Table 13 (Table VII (ii) of SATRA Report)

Quantities of Shoes Rejected by Shoe Room

Factory	Shoe room rejects	
	Pairs per 1,000 dozen	Percentage of output
R.17	60	0·50
R.13	68	0·57
R.14	82	0·68
R.22	103	0·86
R.19	104	0·87
R. 5	128	1·07
R.15	166	1·38
R.18	171	1·42
R.16	192	1·60
R.11	215	1·79
R.12	543	4·53
Average	167	1·39

FINAL OPERATIONS

Final Mopping and Polishing

After the final examination and repairing, the shoes are given a last polishing up of the edges and bottoms, which may have become slightly dulled, during the various shoe room processes. The B. U. S. M.Co. have a special machine for this, the Shoe Cleaning Machine Model 'A'. Two motor-driven, quick-change mops are provided and also an attachment for edge cleaning and polishing. Simple self-contained dust collecting apparatus is also available. This latter accessory is really essential, otherwise the operator will be bothered with fluff and dust.

Lacing, Tagging, *etc.*

Men's lace-up shoes are usually supplied with the lace threaded through the bottom two holes only, although sometimes for quickness the pair of laces is threaded through two top holes of a single quarter of the right shoe, and the ends loosely knotted together.

The lace should be of a type suitable for the shoe. Blinded eyelets need a thin round lace, large eyelets a wide flat lace, grain shoes a round corded lace or perhaps a leather lace. The colour should also be something of a match for men's shoes, but with ladies' the colour of the lace may be part of the design and may be of the same shade as some part of the shoe or perhaps of a contrasting colour. The length of the lace must also bear relation to the shoe, for instance a man's five or six eyelet shoe will obviously need a longer lace than a two or three eyelet shoe.

The lace for the lady's shoe will not only vary in length, thickness and colour, but may also be of mercerised cotton, silk, nylon *etc*., and will most likely carry an adornment at the end. Thus the lady's shoe must be completely laced and the fringe, tassel, acorn, or bow *etc*., then affixed to the ends of the lace.

Tags of various kinds are sometimes attached to the shoes at this stage; some may extol the virtues of the special upper leather or soling material, or it may be the policy of the particular manufacturer to make some publicity in that way concerning that particular brand of footwear.

It is at this stage, too, that some ladies' shoes are fitted with a small cane. A piece of tissue paper is pushed up inside the toe and the cane inserted; being a little longer than the length of the insole it is sprung to wedge at the seat of the shoe. Thus the shoe is kept straightened out and almost as if it were fitted with a shoe-tree.

PACKING AND DESPATCH

Boxing

Boxes, of course, vary in size according to the types and sizes of shoes which they are to accommodate. They may also vary according to quality, whether lined or unlined, and according to the paper covering the board. Where a factory is supplying its own shops, usually a standard type of box will be used, which naturally simplifies the matter of ordering and storing boxes a great deal. If however, the manufacturer is supplying a number of factors or multiple firms, then it will most likely be necessary to have some quite different boxes for similar shoes according to the customers" requirements. Shoe boxes are bulky articles to store and as most shoe rooms have an inadequacy of space, they cannot be ordered very long before they are required. It is very necessary, therefore, for the supervisor to be well informed of the progressing of work so that he can make sure that he has the right cartons at the right time. He neither wants work to stand on racks awaiting the arrival of the required boxes, nor a quantity of boxes, occupying floor space, possibly for quite a long time.

There is also the matter of the label. In some cases the boxes are supplied already labelled and then marked on a machine with the size and style number, as and when they are needed. Others merely rubber stamp the size and style number, but this is really a poor job and not at all neat. A most satisfactory method is to have the boxes delivered without labels, and either print the labels or order them to be printed to cover the sizes, styles, and descriptions as the goods are put into work. The labels can then await the arrival of the work and be stuck on to the boxes when required.

In an endeavour to standardise the sizes of shoe cartons and thereby avoid the waste contingent upon the manufacturer of an enormous variety of sizes to suit individual requirements and tastes, the Incorporated Federated Associations of Boot and Shoe Manufacturers of Great Britain and Ireland have issued the following list of suggested standardised sizes. It is estimated that if all shoe manufacturers and distributors employed the standard sizes a saving of many tens of thousands of pounds would be effected to the trade annually. In addition to this cash saving, uniformity would benefit all sections of the industry.

Sizes of Boxes Recommended

(*all outside measurements* (*in.*) *without lids*)

(1)	Men's boots		
	5 to $7\frac{1}{2}$	. .	$11\frac{1}{2} \times 7\frac{1}{2} \times 4\frac{1}{2}$
	8 to $9\frac{1}{2}$	. .	$12\frac{1}{4} \times 7\frac{1}{2} \times 4\frac{1}{2}$
	10 to 11	. .	$12\frac{3}{4} \times 7\frac{1}{2} \times 4\frac{1}{2}$
(2)	Men's shoes		
	5 to $7\frac{1}{2}$	. .	$11\frac{1}{2} \times 6\frac{1}{4} \times 4\frac{1}{4}$
	8 to $9\frac{1}{2}$	. .	$12\frac{1}{4} \times 6\frac{1}{4} \times 4\frac{1}{4}$
	10 to 11	. .	$12\frac{3}{4} \times 6\frac{1}{4} \times 4\frac{1}{4}$
(3)	Men's slippers		
	5 to 8	. .	$11\frac{1}{2} \times 5\frac{1}{4} \times 4\frac{1}{4}$
	$8\frac{1}{2}$ to 11	. .	$12\frac{1}{4} \times 5\frac{1}{4} \times 4\frac{1}{4}$
(4)	Women's shoes		
	all sizes	. .	$11\frac{3}{8} \times 6 \times 3\frac{1}{2}$
(5)	Women's slippers		
	without heels		$11 \times 4\frac{1}{4} \times 3\frac{1}{2}$
	with heels		$11 \times 5\frac{1}{2} \times 3\frac{1}{2}$
(6)	Youths' shoes		
	2 to 5	. .	$10\frac{3}{4} \times 5\frac{1}{2} \times 4$
(7)	Youths' boots		
	2 to 5	. .	$10\frac{3}{4} \times 6\frac{3}{4} \times 4$
(8)	Boys' shoes		
	11 to 1	. .	$9\frac{3}{4} \times 5 \times 3\frac{3}{4}$
	7 to 10	. .	$8 \times 4\frac{1}{2} \times 3\frac{1}{4}$
(9)	Boys' boots		
	11 to 1	. .	$9\frac{3}{4} \times 6\frac{1}{4} \times 3\frac{3}{4}$
	7 to 10	. .	$8 \times 5\frac{3}{4} \times 3\frac{1}{4}$
(10)	Maids' shoes		
	2 to 5	. .	$11 \times 5\frac{1}{2} \times 3\frac{1}{2}$
(11)	Girls' shoes		
	11 to 1	. .	$9\frac{1}{4} \times 4\frac{1}{2} \times 3\frac{1}{4}$
	7 to 10	. .	$8 \times 4\frac{1}{2} \times 3$
(12)	Infants' shoes		
Veldtschoen	4 to 6		$6\frac{1}{2} \times 4 \times 2\frac{3}{4}$
,,	7 to 8		$7\frac{1}{4} \times 4 \times 3$
Pump edge	0 to 3		$5\frac{1}{4} \times 3\frac{1}{4} \times 2\frac{1}{4}$
,, ,,	4 to 6		$6\frac{1}{2} \times 4 \times 2\frac{1}{2}$
,, ,,	7 to 8		$7\frac{1}{4} \times 4 \times 2\frac{1}{2}$

Depths of Lids

Boxes of a depth of 4 in. and over to have a lid $1\frac{1}{8}$ in. deep.
,, ,, ,, ,, ,, 3 in. and up to 4 in. to have a lid $\frac{7}{8}$ in. deep.
,, ,, ,, ,, ,, less than 3 in. to have a lid $\frac{3}{4}$ in. deep.

The sizes of cartons quoted above, however, are not always acceptable to overseas buyers and even some firms in England insist on their own special sizes. The reason for this is that the shop fittings are also made to special sizes and if the cartons vary in size, disorderly shelves result; thus for men's shoes, for instance, whatever the size of shoe only one size of box is required. Should any variation be allowed at all it is in length only, to accommodate probably sizes 12 or 13. Of course the use of only one size of carton simplifies the method of packing for export.

There are many ways of placing the shoes in the box, three of which are illustrated in Figure 242. Sometimes the shoes are each completely wrapped in tissue paper before boxing, or a layer of tissue paper placed between the shoes and folded over the top. The toes may also be

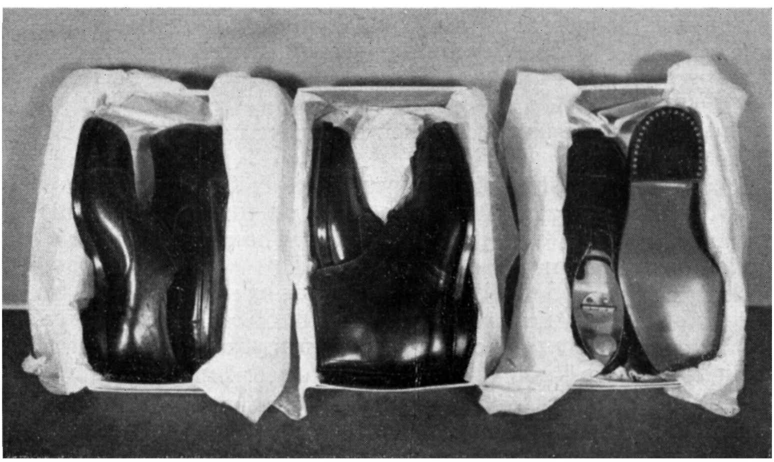

Figure 242. Three methods of packing footwear in boxes.

prevented from rubbing on the other. shoe by placing a strip of thick paper between or a padding of tissue paper. Also instead of ordinary sulphite tissue paper, cellulose wrappings of two or three ply are used for the better quality productions.

These wrappers may also be printed with the brand name of the product or supplier.

Ladies' tinsel shoes are best wrapped in black paper, as the metallic threads sometimes tarnish with light and the black paper helps considerably in keeping the fresh appearance that is so desirable.

Stock Room and Despatch

The shoes, having been boxed up, are passed to the stock room to await completion of the order, to be put into stock if an ‘in-stock’ service is operated or for immediate despatch.

The work ticket must be sent with the complete batch which is again checked for quantity and should not be accepted in to stock if there is any deficiency. When the goods have been placed on the stock room shelves, the sizes are entered on to the appropriate stock card and the work ticket is then returned to the office.

One large organisation runs a shuttle service of transport from factory to central warehouse. The finished shoes are placed on racks after boxing and the complete racks are wheeled into the lorry and taken away, the lorry returning with a load of empty racks. This method of despatch is delightfully simple and involves no packing whatsoever, but of course, is far from being the general practice; in any case the ultimate sorting out of orders and despatch has, of course, still to be done by another section of the organisation.

Packing for Despatch

Shoes may be despatched in their boxes tied in bundles, or packed in cartons or cases.

Men’s or ladies’ shoes are frequently tied in six-pair bundles with a cardboard protector at the bottom and top of the bundle to prevent the cord damaging the boxes. These bundles are then loaded on to the lorry and taken away. This is a quick method of packing but is not used when sending goods by rail or by road transport, if changes of transport are involved. Shoes packed in such a way are very easily tampered with and many losses in transit may result. If the lorry is going direct from factory to destination however, the risk of loss is clearly very slight.

Fibre-board cartons are frequently used and may contain six, twelve, eighteen or twenty-four pairs of men’s shoes. Men’s heavy boots are not usually placed more than eighteen pairs to a carton otherwise the package becomes rather too heavy for normal handling. Ladies’ shoes are packed in up to thirty-six pair lots, and cartons may hold from sixty to seventy pairs of children’s shoes.

The cartons when packed are usually sealed with strips of adhesive paper and finally bound with rope or fastened with wire. Should the carton be tampered with in course of transit it will be obvious from the damaged paper strips or binding that all is not well, so that the consignee will then not give a clear signature upon receipt of the goods.

Wooden cases are also used, and may contain up to 72 pairs of men’s shoes, or up to 108 pairs of ladies’. The lids are fastened down, the case wired or roped around and sometimes in addition eyelet holes are put at the corners, through which a tell-tale rope is threaded and knotted and cut close to the knot in such a way that once undone, there is insufficient rope to tie a knot again. The tell-tale rope is so called because it has a single strand of a special colour woven into it that clearly identifies the source of supply. Such rope is not generally available and if once removed the corner must then be secured by new rope thus clearly indicating that the case has been tampered with.

Packing for Export—Strong wooden cases are essential for this type of trade and should be lined with strong waxed paper. The goods must be tightly packed and securely fastened. The case must be clearly marked with the destination, gross weight, net weight of the goods, and the name of the ship that is to carry the consignment. It must be borne in mind that no goods are accepted at the docks after about 36 hr. before the boat is to sail, so that transport must be arranged for in good time. It is advisable also to forward by Air Mail all relevant papers concerning the consignment, so that the goods can be cleared from the Customs immediately upon arrival, otherwise a delay of several days may result before the consignment is released.

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SHOE ROOM MANAGEMENT

STOCK CONTROL

In-Stock Service

This service is given by many manufacturers of branded lines dealing direct with retailers. Stocks of regular running lines are built up to meet the demands of retailers and the idea is to give delivery by return of orders of large or small quantities. It is of the utmost importance to store these shoes correctly in sizes, fittings, and style numbers. It is the practice of some manufacturers to use differently coloured boxes or box labels for each fitting and this helps considerably in seeing that the shoes are put away properly.

A correct record must be kept of the state of the stock, not only of the bulk quantity but of each particular size, so that a proper balance of sizes can always be held and good service given. To do this, therefore, as each line of shoes is put into stock the sizes must be added to the stock card, and a daily reduction must be made of all sizes taken from stock.

Made-to-Order Work

It is obvious with work made to order, whether for a factor, multiple, or retailer, that the customer will require delivery of a complete range of sizes.

As each work ticket comes round, therefore, the shoes should be stored until the order is complete. There may be a number of such orders in course of completion at the same time so that careful check must be made of the exact location of each batch to avoid any mixing of orders. When dealing with this type of business it often happens that identical shoes are being made for various customers. It is unwise however, to bulk the shoes together in stock and send an order away as soon as there is a sufficiency of sizes to cover a particular customer's requirements, for it very often happens that although the shoes are similar, some customers may have a seat sock inserted, bearing their own particular name and address. Obviously then, these shoes must not be mixed with others, and to prevent such mishaps occurring the principle of keeping each order self-contained should be strictly adhered to.

SUPERVISION

The shoe room supervisor usually has to contend with a wide variety of work. Even the difference between black and brown involves a difference in method.

The black work will proceed much more easily through the department. The brown work, of course, involves greater care in cleaning, probably extra work in colouring, more difficult repairing of damages, and a further complication in pairing-up, because not only must the shoes match in measurements but also in shade.

Suedes require different treatment and take much longer to clean, unless of course, care is taken in other departments to ensure cleanliness in all stages. It will usually be found that Goodyear welted shoes are much dirtier than those made by other methods.

Patent leathers also involve greater numbers of repairs and certainly take much longer than most other types to progress through the department.

Antique finish also lengthens out the shoe room processing and cannot be skimped over quickly.

It frequently happens that shoes requiring extra work enter the department in large batches and a bottle-neck or hold-up here may quickly affect the progress of work in other departments by causing a shortage of racks.

Whether racks or conveyors are used it is obvious that to keep things moving freely the racks or shoe containers must be emptied and returned to the finishing department. If, due to a hold-up in the shoe room, the finishers have no means of transport for the shoes, the makers will soon be halted and may have to curtail the quantity of work pulled on the last.

The shoe room supervisor has, therefore, the responsibility not only of keeping his own department clear, but of also ensuring that a stoppage is not caused in other departments. It is essential that most of the operatives in the shoe room shall be able to do more than one particular job, as it is only possible to cope with the many types of work by switching the available labour to wherever the bottle-neck may be.

The supervisor must also try to prevent any hold-ups arising due to lack of incidentals. In some factories, ornaments and bows are made in the shoe room, and they must be ready by the time the work arrives.

The delivery of boxes must also be arranged so that regular supplies of the required sizes are available.

Boxes take a large amount of storage space and it is not usually practicable to hold a large quantity in stock.

In addition to problems of the different leathers to deal with, a tactful handling of the labour force is necessary. There are usually a number of both sexes in the department and the supervisor must be scrupulously fair in his attitude to the work people and in the allocation of the different work to them.

He also has the responsibility of keeping the standard of workmanship of the factory at the required level. Should he allow matters to grow steadily worse without taking steps to have things tightened up, the standard will quickly fall. The shoe room is the last checking place and whereas other departments stand a chance of having any faults they may have missed being spotted and rectification made, the work of the shoe room has to be right and there can be no second chance.

The supervisor has the added responsibility of deciding whether shoes that are imperfect or damaged can either be allowed to go through or be rejected.

Organising ability, tactful administration, and decisiveness are attributes that are clearly required for successful supervision of the shoe room.

DEPARTMENTAL LAY-OUT

As in all departments, the flow of work should be continuously forward with no back-tracking and as little side-tracking as possible. The list of operations in the shoe room already given on p. 445 is the sequence in which these should be placed in the room. It may be asked whether racks or conveyors would be more suitable for this department. There does not appear to be any reason why conveyors should not be successfully used, especially in factories con- fined to straightforward types of work. Where large quantities of suede shoes or patent leathers have to be processed, complications may ensue, but even so these operations could be so placed that work could be diverted from the track until it had been dealt with. In such cases, great assistance can be given to the shoe room if the planning department is able so to adjust the input of work that a steady flow of shoes made of these leathers shall enter the department, and thus allow proper organisation to get them through.

PART IX

SLIPPER MANUFACTURE

J. W. JOHNSON

INTRODUCTION

THE MANUFACTURE OF SLIPPERS has been carried on in Great Britain for many generations. It is really a continuance of the old handcraft days when, in the eighteenth century, ladies' slippers were the vogue for outdoor wear, covered by a patten for travel through the mud of the roads.

Prior to the seventeenth century, footwear of the light type had been worn by ladies of leisure for street wear. It was not developed on popular lines until the reign of George III (1760), after which, with the introduction of improved means of travel, because of the making of better roads throughout the villages, and with more development of city life by the condensing of industry, and extra maritime activities in the ports, there came a call for heavier types of street walking shoes. The slipper was thus relegated to the more fashionable occasions of balls and parties and the comfort of the home.

The development of machinery made it possible to manufacture slippers on mass production lines. Consequently, towards the close of the nineteenth century we find factories being set up to cater for slippers for the people of the world.

Before the introduction of mass production in this country there had been a vast trade carried on between the Continent and Great Britain, but in the later stages of the nineteenth century the slipper industry received a new impetus by the introduction of the Blake sewing machine (see p. 334). From this date onwards we find that certain sections of the country have specialised in slippers and particularly is this true of the Rossendale Valley in Lancashire, where, in the early l920's, the annual production of slippers was estimated to be twenty million pairs.

From the manufacture of slippers the trade of the district turned over to cheaper types of footwear which are still being made on mass production principles. Consequently the manufacture of slippers declined and now the production, whilst being somewhere near the same amount, is shared by other areas of the country.

To the uninitiated in the craft the term 'slippers' would probably mean lighter and more flexible types of footwear than those usually worn on the street, although to some 'slippers' embrace evening shoes and casual sandals. To the craftsman, slippers have a distinct meaning according to the type of manufacture and in the pages that follow an attempt has been made to separate the different categories of manufacture and in so doing to point to the special characteristics that each particular method has retained for special purposes throughout past centuries.

It is worthy of note that whilst footwear has been bought and worn for varied occasions, the choice of slipper is generally made with an eye to the practicability of the slipper for its purpose. The character of the slipper is assisted by the choice of materials and these are blended together with the skill of the craftsman, the method of making being devised in keeping with the purpose the slipper has to serve in wear.

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THE ‘ DOWIE ’ SLIPPER

THE FIRST TYPE OF slippers to receive our attention will be the ‘Dowie’, the principle of which was established in the early days of mankind’s history when men would pierce the hide which they were to wrap around the foot and thread a cord through the hole so made. They would draw up the cord tightly and thereby hold the skin to the foot (see p. 22).

In the making of the ‘Dowie" slipper the position is reversed. The upper is laid over the last, the string is passed through the lasting edge and when drawn tight moulds the upper to the last. At this stage the bottoming work is carried out. There is no metal attachment required in the construction; consequently, the result is a very flexible slipper. This type of footwear has soft uppers cut from leather of fine glazed kid, light goat, or sheepskin, and is equally suitable for camel-hair cloth or other woolly fabric.

The principle of lasting is that of a gentle caressing of the upper over the last, giving a soft flimsy pocket for the foot without in any way impairing the stretchability of the material. Footwear made on this principle keeps the shape of any embroidered patterns or directional lines on the upper.

Where the attaching of the sole has not impaired the flexibility of the uppers, the ‘Dowie’ method is ideal for footwear for such use as cleaning in the home which necessitates kneeling and bending of the foot, suitable choice of materials being made for the purpose. The principle has also been applied to the manufacture of handmade slippers in which case adhesive lasting is co-related with it and attaching strings are taken out afterwards.

Shearling and wool sheepskins are often used for this type of slipper; the wool sheepskin can either be used with the wool side inwards to the foot or with a suede-backed finish inwards to the foot. For comfort and warmth the wool inwards is to be preferred, and when the top edge is turned over the result is an attractive collar.

Many fabrics are employed for this type of manufacture, the chief amongst these being wool cloth woven on the double warp principle with a connecting thread combining the two together, which we receive as camel-hair cloth in various patterns, and these are often substituted by a combination of wool cloth. Worsted fabrics are sometimes used laminated to a wool cloth to give a cheaper, yet hard wearing fabric. Felt is ideal too for this type of manufacture.

The upper is generally of the zip-fastener bootee type (see Figure 254*a*, p. 521) or the more popular camel collar type whilst other varieties are the anklets for children and the Albert tab slipper for men.

Design

In using wool material the design is much improved by having higher quarters at the back-seam than is normal with other types of slippers. The curving of the back-seam is of paramount importance and this should follow the shape of the ankle bone much more closely than is customary on many types of slippers sold. Where the back curve follows the shape of the foot the leverage of the foot on the sole is assisted and the slipper fits much better and gives longer service in wear.

The appearance of this type of slipper is improved by the use of a front centre seam. By cutting to fit down at the comb of the last, the slipper stands up much better in wear and the appearance is enhanced.

When the design of the slipper has been chosen, the next problem is to choose the last. Lasts for 'Dowie' purposes are best made from maple, the hard wood serving as a useful foundation for the strains which are set up in string lasting processes.

lt is customary to bevel the feather edge of the last slightly in order to assist the fabric to come over the edge more easily. The inside line of the bevel requires a sharp outline. No metal plate is required on the last, solid wooden lasts being acceptable, but the last with a forward break is to be preferred for leather slippers made on this principle. A forward break last allows the heel portion of the last to move forward in slipping and shortens the line from the toe-puff point to the counter point, thereby assisting in the removal of the slipper from the last.

Pattern Cutting

Pattern cutting is carried out on the usual method of standard construction (see p. 66).

The mean forme taken from the last can be of the straight pattern, which is used for soft fabric slippers, or of the right and left type, which is more customary for the heavier fabrics and leather varieties.

Having taken the mean forme to the inside edge of the bevel on the sole shape, the standard is now constructed by the addition of the making allowances for the respective materials. The allowances for uppers are the customary ones used for shoe-making, and for lasting allowance we require a minimum of $\frac{3}{8}$ in. for leather uppers and a maximum of $\frac{5}{8}$ in. for heavy wool cloth, but for wool sheepskins we require $\frac{7}{8}$ in. in order to allow for the greater margin of substance through the pile of the wool striking the last.

The insole or sock shape offers no problem and is taken to the net line of the inside bevel on the last.

Leather uppers are cut by the normal methods of hand or machine (see pp. 117-33), but fabrics are often cut on the band knife machine. Due to the bulk quantities of slippers generally made the machine process is an economic proposition and is the usual practice.

For leather materials special care has to be taken for the irregular substance of some of the materials used and in order to overcome this tip skiving is carried out, whereas for wool sheepskins the last edge is generally shaved with a shearing machine. Other fabrics offer no problem for special treatment, and the work is passed over to the closing room for assembly.

Closing

Much use is made of chain-stitch machines in the closing department for fabrics, but where these are not used extensively the circular wheel feed is preferred to the step feed for ordinary flat machines (see p. 177).

A major principle in closing is to make as many seams as possible on the flat bed type machine, remembering that all closing is best done in the sequence which results in the upper gradually taking the shape of the finished slipper until the final operation. Twin-needle machines are used for silking the back-seams and woven narrow fabrics are used for taping seams.

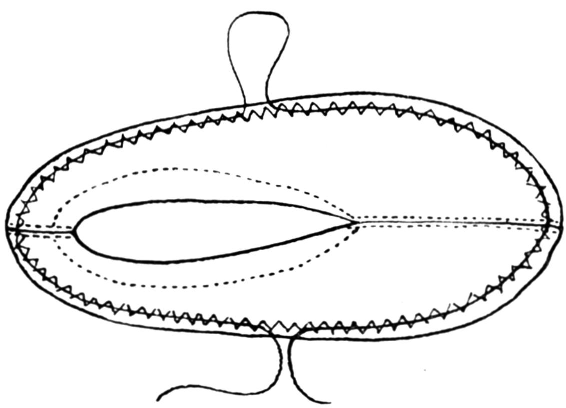

Figure 243. 'Dowie' upper with thread zigzagged round lasting margin, ready for closing.

After assembly of the upper the lasting edge has a cord stitched around it on the 32W or 107W class machines (Figure 243). For a whole-cut pattern one loop is formed at the opposite side to the finished edge of the cord, so that in starting on zigzag stitch the operator begins around the periphery of the lasting edge at the inside waist, the stitch being carried round to the opposite waist and the operator stops the machine to lift over three stitches, and recommences sewing, finishing off within $\frac{1}{2}$ in. of the starting point. Approximately 5 in. of cord is left loose for the string lasting operation.

On slippers with a back and front portion it is customary to start sewing half-way between the joint and the toe and having travelled around to the opposite side, to lift the foot for the three stitches there. Then sewing is continued around the heel portion, lifting the foot twice for this purpose at points opposite each other at the heel seat and then finished off again where the cording commenced between the toe and joint position.

Later, in lasting, the cord is carried across the sock diagonally resulting in separate lasting of the vamp and quarter whilst on the last.

For slippers it is the general practice to sew into the quarters a previously lined composition stiffener. This may be of rubberised fabric or it may be a matching lining fabric with a composition stiffener inserted into a counter pocket. This principle is often followed too in the case of toe-puffs. Should these be necessary they are inserted prior to the attachment of the lasting string.

Effective use is made of chevron, galloon or braid binding in the closing room, for the finishing of slipper edges. Rosettes or silk poms are attached on the zigzag or bar-tacking type machine in the closing department and, when completed, the uppers are passed forward for lasting.

Lasting

Previously prepared socks are laid on the last, preparation consisting of assembly of such materials which have to be used. In some cases the sock is of matching material to the upper lining and is combined to stiff board. In other cases the sock is of rayon or a silk nature with the edge folded over a board or leatherette interior. After preparation by the insertion of tags bearing the manufacturer's brand mark, the edge of the sock and the inside edge of the upper are both treated with an adhesive.

The string lasting is often carried out with the aid of a treadle machine. This machine consists of a lasting jack together with pincer grips at the end of cords which by a series of levers are pulled up by the action of a treadle. This machine leaves both hands free for the lasting operation.

The upper is placed on the lasting jack, then the last is placed over it. The sock is laid face downwards on to the last and the upper is brought up to the last with both hands. The pincer grip takes hold of the lasting margin and then the treadle is depressed and the upper pulled tightly to the last. At this stage the operator pulls the lasting cords tight and in so doing lifts the slip stitch opposite with the aid of a hook and secures the ends of the cords across the insole or sock by knotting, so holding the upper firm to the last (Figure 244).

Another type of lasting jack has no pincers for the upper material, but instead it has a series of grips which take hold of the cord and so pull up the string tightly. In each machine the object is to leave both hands of the operator free for manipulative purposes.

When attaching mules by this method it is possible to put an attachment on the machine which gives automatic spacing for the vamp length and holds one end of the lasting thread until such time as the string, being

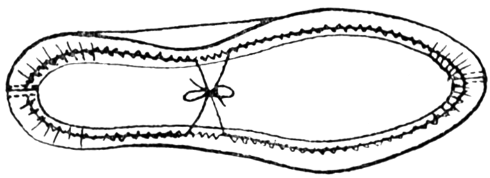

Figure 244. Lasted upper, showing string drawn tight and knotted across sock.

pulled tight, has moulded the upper to the last.
At this stage the upper is hammered fiat to the last and then the string is removed from the holder on the quarter positioning plate of the machine. After tying the cords the lasted upper is removed from the machine and passed on to the next operation which consists of pounding and knocking down the upper so that the feather edge of the upper is clearly defined and no bumps are present to hinder the attachment of the sole.

Bottoming

The bottom filling for this type of slipper is generally composed of hair felt which acts as a cushion for the foot and adds to the comfort of the wearer. Hair felt for slipper making has been greatly improved during recent years by a process of rendering the fibrous materials sterile and actively antiseptic.

The choice of sole to use is varied. A popular one is of vulcanised rubber made by a moulded process. These moulded soles require roughing on the inner edges to remove the sulphur or protective film which is present after vulcanisation. Then an adhesive is coated on the inside of the sole, and after drying, either by infra-red or turbulent air, the soles are ready for attaching. The upper edges are also treated with a suitable adhesive and passed through the air drying chamber.

At the correct time the soles are placed on the uppers and welded together in an air press, great care being taken in the timing of these operations. This is assisted by a conveyor installation in the factory. Various components are fed on to the conveyor under controlled timing. This ensures uniform results and prevents mistakes in the welding process. The air drying chambers are best positioned along the conveyor.

Many types of presses are available but the most uniform one is that working on a controlled pressure of 50 lb/sq. in. The timing of this machinery varies with the type of material handled but it is customary to leave the slippers in the press for a maximum of 12 min. for rubber-type adhesive, although the process can be speeded up by pre-drying and by the use of activators on the adhesive used. It is also possible to get instantaneous bonding with pressure-sensitive latex adhesive.

Hot Vulcanised Method of Sole Making

This is done by using a para rubber sole, placing this in a mould and vulcanising it on to the upper in a heated chamber. This results in a longer wearing slipper and the rubber is impregnated into the fibres of the upper material forming a complete weld. Care must be taken in the making of the mould to prevent air pockets, and the timing here is again important. The time taken for vulcanising rubber of this kind on slippers is generally about 17 min.; consequently a battery of such machines is required to keep an adequate size range moving in a mass production factory.

Further patented developments have been made recently using extruded plastics inside the moulds, and it has also been found that high frequency electric currents passed through specially prepared moulds will give satisfactory work instantaneously, but the cost of such installation is beyond the savings made on the old method. Most of these soles give a long life and the resultant cheapness is welcomed by the public.

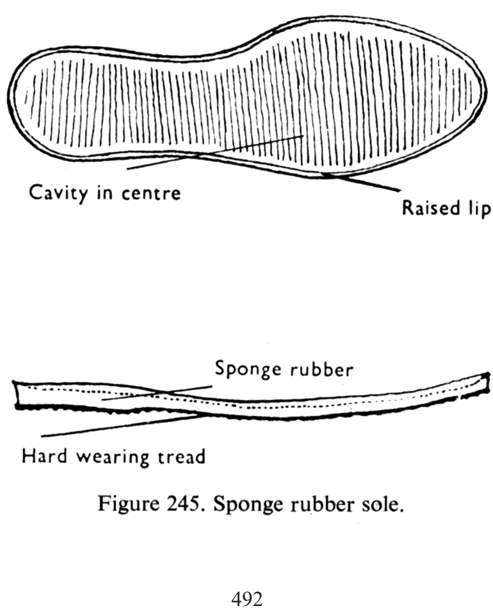

Figure 245. Sponge rubber sole.

Other types of soles are sponge rubber (Figure 245), leather, leather substitutes, and also hair felt sewn to a leather outer covering.

There are also other platform units and crepe units which are attached to this type of slipper and in each of these cases the method of manufacture is that of welded footwear, the resultant slipper being a combination of a sole member to an upper by a permanent bond.

The object of the ‘Dowie’ process is to give shape and outline to the upper and to mould the upper to the last. The sock is a covering for the thread lasting and the preparation of the sock is to produce a padding which will be resilient to the pressure of the foot. Properly carried out these processes result in an attractive and flexible slipper which gives long life in wear.

VARIATIONS ON THE ‘DOW1E’ METHOD

Cement Lasting

A variation of the method of ‘Dowie’ manufacture is that of cement lasting which follows practically the same routine as ‘Dowie’ making, without the aid of string lasting.

Cement lasting requires a stronger sock or insole than in the ‘Dowie’ method but in all other respects the slipper follows the same process. This method does not result in quite as pliant and flexible a type of slipper as the ‘Dowie’ process, but it is cheaper to produce, the equipment required for cement lasting being small, whether it be cement lasting of the hand or of the machine variety.

The operations followed are practically the same as for the ‘Dowie’ and the materials and combinations of design, pattern cutting, and colour, are the same.

By this method the sock is temporarily held on to the last and having been treated with an adhesive the upper is brought into contact with it, and lasted over by means of an adhesive, after which the slipper is pounded or the pleats hammered flat. After time setting the slipper follows the same process as for the ‘Dowie’, and the choice of soling material is the same as for those previously described.

Bag Method

The bag method of closing an upper is another useful variation and derives its name from making the upper in the form of a ‘bag’. This has developed into the slip-lasted process which we shall consider at a later stage in Chapter 39 (see p. 496).

The making of a bag from the upper is a process which has long been carried out for some felt and camel-hair slippers. To commence this method a line is drawn on the plantar or sole surface of the last parallel with the feather edge. This is generally l in. inwards on a woman’s last and continues_ right around the last. The small portion within the centre of the last is cut out in a fabric material to which is added $\frac{3}{16}$ in. seaming allowance. The lasted edge of the upper is designed to this insole mark and the upper is stitched to the fabric insole (Figure 246).

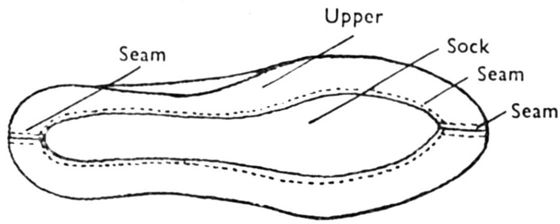

Figure 246. The bag method, showing lasted upper.

There are various points to remember in pattern cutting but the chief of these is that the line of the lasting edge has to be reduced to the exact measures of the line on the canvas or fabric insole. This is accomplished by using seam-to-toe patterns on which a large sweep has been taken away at the toe and heel, and also by springing the bottom edge of the pattern, resort being made to cutting straight the curved portion, thereby shortening the bottom line. Whatever is done in this respect it is necessary first to choose the design line of the upper and then to fix constant points around the lasting edge at frequent intervals so that any corrections made to the upper are automatically balanced by the time a new 'constant' is reached.

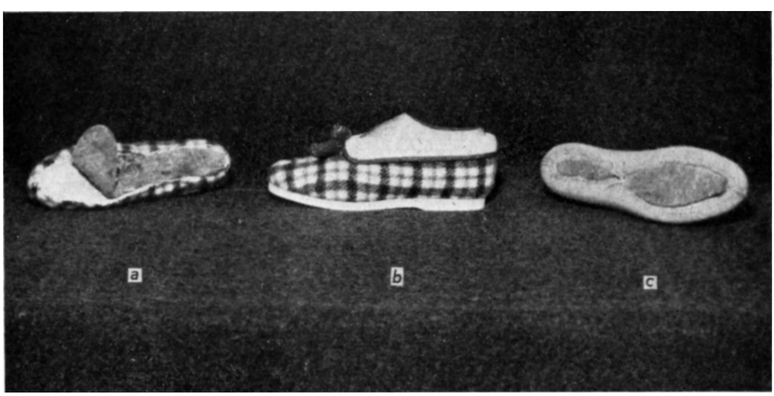

Figure 247. 'Dowie' slippers: *a* The bag method of completing the upper, showing the separate bottom filling. *b* The finished lady's camel slipper made by the bag method or by the 'Dowie' method of lasting. *c* 'Dowie' method of lasting.

This method is only suited for materials which have a good stretch in them, such as loosely woven textiles.

In lasting, the last is forced into the bag formed by the upper and then the operative pulls the centre canvas sock lining straight (Figure 247*a*). The upper is then pulled tight and after attaching the sole by an adhesive the upper is steamed into shape. No packing is used for this method and the result is a cheap and flexible slipper, soundly constructed, for bedroom wear (Figure 247*b*).

39
SLIP-LASTED SLIPPERS

THIS METHOD OF MANUFACTURE of slippers has been termed 'randed turn' for many generations in the North of England. Slippers of this character were made up without lasts and then re-formed over a shoe tree with a horizontal stitched seam on the platform cover. The platform filler was generally of flock and hair mixture and the outsole of soft kid handsewn around the edge.

A later development of this manufacture was to sew the platform outer sole and then, reversing the platform, to stitch the upper to the rand whilst inside out and, after turning, to pack the filling in the bottom material, sewing in the sock by hand around the seat afterwards.

Machinery development, however, has brought this modern so-called 'Californian' method to the front. We therefore turn from the delightful fabric, often hand-embroidered or hand-woven from the genteel ladies' book of needlework, to mass production methods as practised today, noting the similarity of designs with examples of eighteenth-century work, the broad rands of which period resemble both the platforms of our day and also those of Stuart and Tudor times. The fine handsewing of the rand has given place to adhesives but the soft padded soles of fine suede buck leather still remain.

The method popularly described as 'Californian slip-lasted' is but a development of centuries-old tradition on newer mass production lines.

In 1925 mules were made on this principle in contrasting colours reminiscent of Turkish inspirations with gold crested moons embroidered on black velvet, red silk linings and $2\frac{1}{2}$ in. heels.

Not very dissimilar were the polka dots of 1948, the gay stripes of 1950, and the faille linings, rayon checks and tartans of 1951.

Lasts

The choice of lasts is most important for this type of work. A flat bottom is to be preferred and, because the footwear is flexible, very little toe spring, if any, is required. A cross section of the lasts would reveal the forepart almost flat; this is done both for the shape of the footwear to be made and also for the ease of manufacturing, relying on the resilience of the fillers for comfort. This creates a broad tread area and gives added comfort to the wearer.

The inside joint should be well defined to create an anchor for the foot in order to prevent wear on the toe of the platform. A broad seat is necessary to carry the weight of the body without a forward thrust. A shallow upper on the outside and deep wood over the great toe is helpful and gives attractive comfort in appearance and also assists good pattern making and ease in closing. The ‘range’ of the lasts should fall gently away on the outside whilst the sharp fall on the inside joint assists the fitting properties, makes for ease in lasting, and prevents the breaking away of side pieces on open-back models.

Pattern Cutting

Pattern cutting is all-important; the portions to be cut and assembled are to fit around a definite line, coincidental with the feather edge of the last. Once this line has been decided upon the upper and sole pattern must be synchronised with it.

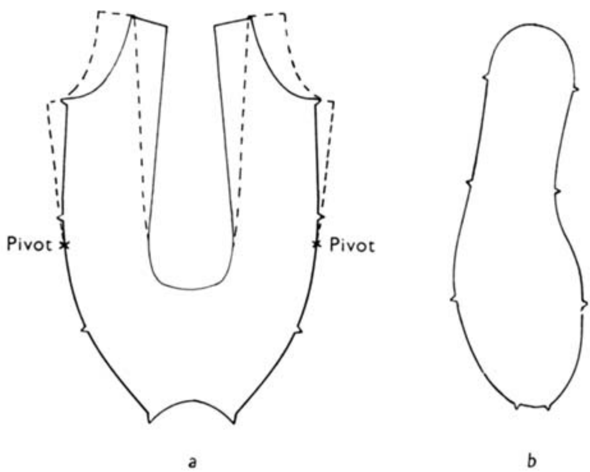

Figure 248. Master patterns for slip-lasted slipper, showing location points. *a* Normal (dotted) and sprung upper patterns. The location points are shown on the sprung pattern. *b* Sock pattern.

In order to avoid many alterations for change of material and style a master pattern should be set up and fixed location points selected between which variations may take place but at which all fittings must be accurate (Figure 248). The location points are generally successful if placed at the point of each side of the sole and upper pattern where the open-toe shape would come should the pattern be made for this type of slipper, and also at the points where open waist on vamp and quarters would come and where open-back point would be located.

This makes eight points in all towards the centre of each open space. The patterns may be sprung to avoid excess of material for the sock stitching operation. Between these points seam allowances may be varied. These points are known as ‘constants’ and provide a series of location points between which the closing machinists have straight runs of stitching without any necessity to take up slack in the upper material. This is achieved by aligning the finished line of the pattern with the designer’s intention.

Should any spring be placed in the pattern it is essential that the outline of the pattern be in keeping with the original curve.

Some failures have been caused by too much skiving on these points. The full substance of material should be sewn in order that the opening of seams may be done without the curling tendency of reduced portions.

Having fixed these points the pattern cutter varies the feather-edge line to give character to the finished product in keeping with the designer’s intention. He must bear in mind that the measures of his upper patterns must coincide with such portions of measures of the feather edge line which he intends to use.

The designer can fix his design centres according to this plan knowing that the finished result will be a faithful replica of the original.

The last, therefore, is used for the design of the upper and for obtaining foot measures therefrom, but when the upper portion has been machined together in the closing department the last is only used as a foundation for the making because all shapes have been given in the closing room. It is only necessary in the making department to carry out faithfully the strains of platform making to their original plan using the last as a base for holding the work.

Materials

These points must be borne in mind in choosing materials for the slippers and wherever there is a tendency to stretch, the materials must be reinforced to give a fixed result.

In the same way, where pleatings or frills are required, it is necessary to make these in the upper prior to the attaching of the backers or linings. Consequently the finished upper has the fine appearance of dressmaking and needlework much more enhanced than is customary in other types of slippers.

For slippers of this type there is a choice of leather of the more mellow varieties, many of which are embossed or finished with high glazes. Leathers with deep-set designs can be used because they are not distorted in the strain of lasting. Such leathers are generally lined with attractive fabrics or with pastel shades of leather, resulting in pleasing tones in the finished slipper.

ln fabric slippers there is a choice of many materials, either for the body of the slippers or for style or ornamentation purposes. Almost any fabric can be used as a slipper fabric but the treatment given to each must be in keeping with the balance required in the finished article. Consequently, great care is taken in the choice of an adhesive for combining two or three layers of fabric together to give the required substance.

Amongst the fabrics used are canvas materials which have been treated either with dyes or embroidery interwoven. They are generally made of cotton, flax, hemp or similar fibres, whilst many popular canvases have been made from jute for the cheaper class trade. There are also brocades, rich decorative fabrics embossed with patterns which give the effect of stitching or embroidery. The ground fabric is usually silk and the raised design may be of silk, silver, gold or metallic thread. In the cheaper varieties many varieties of woven cotton fabrics are used to give similar effects.

Coated fabrics or any fabric which has been impregnated with paint or lacquer or similar finishing materials are sometimes described as artificial leather and are commonly used. Attractive designs are made up from coated yam woven together to give a firm and homespun type of weave which lends distinction to the slippers made therefrom. Raised nap cotton fabric has been particularly useful f or interlinings, vamp linings, and in some cases, for the outsides of slippers.

Crepe fabrics with wrinkled or wavy surface appearance have been found very useful for pleated and dress material types of slippers. They are particularly attractive for evening and afternoon wear, and dyeable crepes are often used to match or contrast with dress materials. Elasticised shoe fabrics have been used for goring on the court type of slipper. Many other types of satins, sateens, worsteds, wool fabric, and printed fabric are used. Coloured yarns woven in the form of network are very attractive when combined to rayon in pastel shades, as an interlining, with a raised swansdown lining next to the foot.

Such then are the materials, which, used in association with each other, provide a great deal of novelty in the designs of finished slippers. For the cheaper varieties where a straightforward design is required resort is made to combining materials together with an adhesive. The adhesives are of the paste or rubber solution variety. Each of these has to be tested with samples of the cloth to ensure that they have no harmful effect on the appearance or on the life of the fabrics themselves, and will not spread in an absorbent material.

For interlining, rubber. backing cloth is used, this being a thin coat of rubber on a cheap cotton backing. It is applied to the leather or fabric by a heated iron passed over the uncoated side.

For the more complicated designs where pleating, ruffs, tucks, loops and overpleating are required to enhance the beauty of the slipper, the outer cloth is sewn into position as a single cloth and afterwards the lining is combined to the upper in the preparation department adjacent to the closing room. Attractive footwear has been made in this manner with velvet uppers and wool sheepskin linings. The subtle elegance of these types of slippers is well known and the service they give to the wearer is outstanding.

In the making of uppers many reinforcements are used both under seams and at fitting points where stays are attached to give extra strength. For bindings on the edges of slippers we have the choice of rayons, braids, pure silk material, and cotton tapes, narrow fabrics and ribbons *etc*. all adding their quota of elegance to the finished result.

Platform covers are generally of two-ply material as against three-ply for most upper fabrics. Contrasting colours, and stripes running in the opposite direction to the upper give a pleasing effect.

Clicking

The clicking department puts first emphasis on finished appearance of slippers rather than on the interlocking of patterns which is customary in shoe manufacture. It is also more important in slipper manufacture to have the lay of the fabric or leather in the correct direction than to make a saving on the interlocking.

Consequently, in the clicking room the off-cuts on materials which are used for the bodies of slippers, are stored away to make attractive fittings, ornaments, bows *etc*. for other types of slippers.

The lay of the patterns on the design is more important than the stretch of the material, cutting becoming a matter of lay-out of pattern rather than any other consideration.

Another exception to the general rule in the clicking department is the shape of cutting blade when cutting by hand to a card pattern. The straighter blade is chosen because of the softness of the weft thread when the material is of an unbalanced nature such as in raised fabrics and pile finished fabrics. The warp threads are usually harder and cut more easily. The shape of blade is equally important for rubberised fabric such as suedette, suedene, and plastics coated material.

All other details in the clicking room are similar to those experienced in ordinary shoe factories.

Closing

The closing department has an extra section attached to it in the form of a preparation department, where pleating, cord stitching, embroidering, bow making *etc*. are carried out. With these reservations the normal type of shoe machinery is used in making slippers. Multi-needle machines are often in evidence and for quilted linings and velvet uppers machines with up to sixteen needles are in common use. Some specialist firms, however, produce these materials in the roll for slipper manufacture, thus. saving much complicated work inside the factory.

To impart a softer feel in the more exclusive type of slippers, cotton wadding is used for padding between the lining and the upper, giving added comfort to the wearer. It is customary for fabric seams to have Frenched or welted seams according to the design of the slipper.

Having closed the various parts together similar to the sample provided by the designer, the platform rand is now sewn to the upper with a $\frac{1}{8}$ in. seam for most light-weight material and a $\frac{3}{16}$ in. seam for the heavier types.

After this the rand is turned back to the upper and a previously prepared sock is sewn in. Should the sock be of leather or other variable material, it will be necessary to reinforce this either with a thin coated rubber backing cloth or with a canvas backing.

Making

After closing to the location points previously described the uppers are passed forward to the making department. Success in this department comes from the correct choice of lasts and materials, together with a balanced routine of drying processes under modern methods of adhesive assembly.

In the making department the choice of cement will depend upon the type of material used for the upper. Latex adhesives are used in many cases but there comes a time when these have to be localised in their effect because of the spreading that takes place in absorbent materials or because of the chemical reaction which is set up when the latex is absorbed by some types of fibres. Research in this respect has provided a wide range of adhesives to meet modern conditions.

Since the assembly of the footwear is mostly a hand process and the parts are prepared outside the department, the major problem in the making of the slippers is the timing of the operations with correct procedure for drying processes; for this we have infra-red and turbulent-air drying as our assistants. Sprays are used for the coating of the upper with cement around the platform edges, and pressure brushes for the platforms.

The platforms are generally made from wood flour and latex mixtures rolled into sheeting form, from foamed rubber, or from hair or jute felted materials which have had a gas treatment to render them antiseptic and free from germ contamination. For the more rigid type of slipper, platforms of cork combined to canvas or pulp board are acceptable. They are lighter in weight than a wood-flour base, but have a greater tendency to crack up in wear unless they have a canvas reinforcement.

After the laying-over of the rand and the cutting away of small pleats that are formed, the sole is attached by the usual adhesive method. Soles for slip-lasted slippers can be cut from light-weight suede-finished upper leather, the reverse split from furniture hide or from specially prepared curried shoulders which give long life and good appearance.

Slip-lasted slippers in fabric are used for most of the 'dressy'

Figure 249. Ladies' slip-lasted slippers. *a* Quilted velvet, fur-trimmed court slipper. *b* Mule with shearling lining.

occasions in office, home and club, and have wide scope for attractive style and design for ladies` work (Figure 249).

For men they are ideal in the club or home, and the style is useful for children for novelty types of footwear such as replicas of ducks, rabbits and other animals that give delight to the world`s children.

The cost of production is low compared to the value of the material in the slipper and, when necessity demands, material can be used in keeping with the size of the purse of the purchaser so that the finished range of prices is suitable for any customer.

40

SLIPPER TURNSHOES AND INDOOR TURNS

SLIPPER TURNSHOES

Ever since the early shoemakers became separate craftsmen, hand-lasted and handsewn turnshoes have been a feature of the slipper trade. By this method slippers of dainty materials, much lighter in weight than by other methods, can be worked, and materials so delicate that only handwork can mould them carefully into the shapes they will retain after the lasts have been withdrawn.

In this category we also find many types of travelling slippers and special indoor footwear which has often been made for invalids who spend long months indoors. All the daintiness of the glittering court footwear of the past has been retained in the manufacture of hand-lasted slipper turnshoes as carried out at the present time.

In this method, a single sole is used producing a flexible slipper which derives its name from the fact that the sole and upper are sewn together with a horizontal chain-stitch, whilst wrong side out on the last. The shoe is then removed from the last, turned right side out, re-lasted and finished. Its chief benefit is its light weight and flexibility.

Materials

Only the best grades of materials are used for hand-lasted turnshoes and these are thoroughly conditioned before they are used, to render them mellow, soft and pliable.

For ladies' indoor footwear, for ballrooms and state occasions, soft glacé-kid leathers are used, especially those with glittering finishes such as silver, gold and opalescent kids.

Soft slippers lined with an all-wool lining form beautiful travelling slippers, and are ideally suitable for sick rooms. In the men's variety goatskins and pig grain leathers are used for uppers, and with these leathers an all wool lining can again be used since 100 per cent pure wool will last almost as long as the upper itself. The requirements are flexible leathers, which will withstand turning without cracking, and although use is made of mulling, heavy pigment or enamelled surfaces on the leather are to be avoided.

Processing

Design offers limited scope in these kinds of leathers, and best results are obtained by shorter vamps than is customary, and by a lower yet closer fitting quarter lining. In pattern cutting, great care must be taken in grading to see that the extreme sizes have satisfactory restrictions on the grade to prevent distortion.

Clicking and closing follow the usual routine but in lasting it is customary to allow a much smaller lasting allowance than usual on other types of footwear.

The completely fitted upper is assembled by hand or machine and is pulled over the last the reverse side out. The sole has previously been prepared with a shoulder cut around the outside edge, against which the upper is lasted, and opposite, and parallel to this shoulder a channel is cut into in which the stitches are embedded (see p. 229). (*Note:* A more complete description of turnshoe making will be found on pp. 368-72.)

The shoe is lasted and the tack heads are left standing out. A horizontal chain-stitch is then made either by hand or on the slipper turnshoe machine. This gives the loop on the outside of the shoulder edge. After the stitching operation the tacks are removed, and the surplus material of the upper is trimmed away.

The seam is now smoothed out on a pounding-up machine designed for the purpose and with a rotary hammer to turn the seam flat.

The last is then removed from the shoe, and after the shoe has been turned right side out with the aid of a jig and treadle machine the shank and seat insole are inserted; it is re-lasted and is re-formed by the use of heated irons or a jet of warm air.

After re-forming, the last is once again slipped and the heel is attached by the use of an inside heel attacher and the finishing operations are carried out in the usual way.

Special care is taken in the fitting of the sock which is cut from materials which blend with the character of the slipper.

There are many variations of this type of making. The first variation consists of the insertion of a toe-puff and heel stiffener; these are chosen from flexible materials and can be of leather, composition, or celastic material.

Care must be taken in making the pockets holding these fittings, particularly when we remember that the curve of the outside lining is larger on its first application to the last than it is on the second application.

These difficulties are overcome by the use of humid air currents in the re-forming process, and can be guarded against by cutting the patterns tight to the last on the original model.

Another variation is the soft filled, wedge-heel design. In the old days dextrin-bonded cork dust was used for this purpose but in later years impregnated hardened felt has superseded this.

No problems arise in turning and the heel is conformed to its shape on a heated machine for this purpose. This principle is used for the making of what are commonly called S.T.S. (Slipper Turn Shoe) lines in soft fabric slippers. These are made from velvets, velvet cords, felts, camel-hair materials and sateens.

One variation has been to make a padded sock with an uptumed lip to which the upper is sewn on the S.T.S. machine, and then after levelling the uptumed edge of the slipper is sewn on a whipping machine to an inner lining. After turning, the slipper is re-formed on the last, the first inserted sock now becoming the sole.

This type of sock has often been made of leather fibres impregnated with latex and rolled out into sheet form, and also plastic sheeting or cellulose sprayed fabrics.

Further use has been made of felt and leather soles, and also of pre-vulcanised soles for this method of attachment.

INDOOR TURNS

The modern mass-produced versions of the handsewn type of tumshoe are now known as 'indoor turns'. This type of manufacture is ideally suited for travelling slippers and also for bedroom slippers (Figure 250). Many attractive types are manufactured and when made in felt have ribbon trimming and other drawn-thread embroidery.

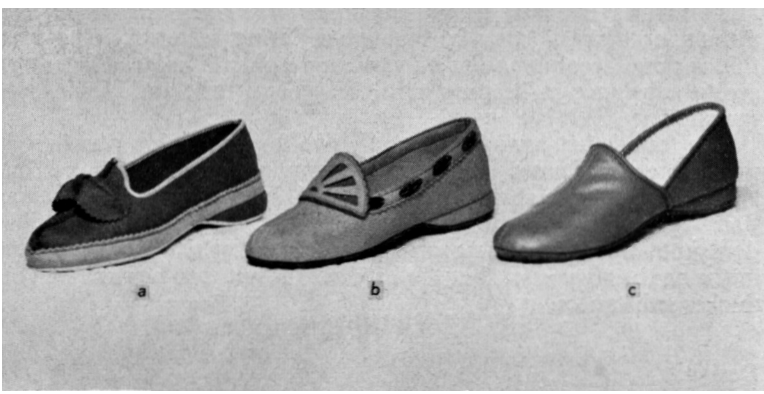

Figure 250. Ladies' slippers. *a* Felt 'cozy' slipper with sewn-through platform. *b* Felt indoor turn slipper. *c* Indoor turn slipper with nylon lining.

The soles of these slippers are mostly from chrome split leathers although in the cheaper varieties cellulose-finished fabrics are used, and sometimes plastic coated cloth. Between the sock lining and the outsole is placed a cushion of soft hair felt and the combination of resilient materials results in a long-wearing yet comfortable slipper.

A further development of this slipper is the men's and ladies' leather grecian with soft flexible soles (see Figure 253*c*, p. 519).

It is a principle requiring very light machinery and consequently has possibilities for high-class trade where the combination of calf leathers with chrome soles results in long-wearing, dignified slippers.

Further combinations of silk fabrics and velvet corduroys are often used.

The manufacture of ‘indoor turns’ is a specialised trade and is generally carried out in factories devoted to this one type of construction.

Felt

Shoe materials are described in Part I of this book but this is a convenient place in which to discuss felt as it is one of the most extensively used slipper materials.

The felt for most slippers ranges in weight from 24 oz. to 40 oz. for slipper bodies, these weights being the average weight per yard of 60 in. wide material.

For slipper trimmings the weight will vary from l6 oz. to 28 oz. whilst the insoles or socks are made from 10 oz. to 16 oz. felt.

Where slipper soles are made of felt then a very much heavier variety is chosen, and compression of the fibres succeeds in giving firm and solid cutting edges.

Sometimes felt has to be combined with itself in order that attractive contrasts may be created in lining material. Whenever this is done a combination of various weights is used sufficient to give a substance in keeping with the general tone and purpose of the slipper.

It is found that a weak latex adhesive for combining purposes is preferable to a paste under most manufacturing conditions, but where considerable shrinkage is expected from the steaming operation then a paste combining is preferable. The paste combining does not impart the gentle plump feel to felt which is so pleasant in the cheaper varieties, but the hardened result is to be preferred on thicker substances.

Design

In designing these slippers it is important for the designer to remember the limitations of felt. Consequently sharp comers are best avoided; equally interesting designs can be made by avoiding acute angles. Top edges of materials are attractively finished and serve their purpose for wear when completed with small gimped designs around the edges.

In choosing ribbon for threading through felt it is important to use a latex combining for the felt, or else to thread the ribbon through a felt overlay or to design the curve through which the ribbon is threaded in such a manner that allowance is taken of the effect of shrinking in the steaming process.

It is also important to see that the balance of substance is heavier in the body of the trimming than in the actual interlacing which is passed through it.

Pattern Cutting

Basic lines for pattern cutting for 'cozy' slippers are on a different standard of construction from shoes (see Figure 251). It is essential for this type of manufacture that 'constants' are remembered for further treatment.

The first 'constant' is the length of the line around the edge of the last feather. The length of this line is very important for the attachment of skirting and for the attachment of the sock. The pattern cutter, therefore, must place around this line location points for such things as seam fixing, and balancing points for curves.

These location points then become fixed points around the edge of the cut upper, so that any stretch or slack to be taken up in the material is automatically corrected by the time a new location point is reached.

In like manner the profile of the last is repeated in the mean forme taken from the last. The first principle to bear in mind here is to decide where

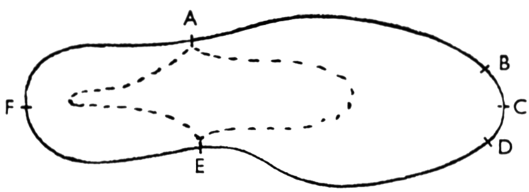

Figure 251. Sole pattern for indoor turn. The length of the perimeter is unalterable. Location points A, B, *etc.* are chosen according to the design. They must be coincident on sole and upper patterns.

shall the centre line be for design purposes along the front of the vamp. Having decided this, it is important that the location point for the centre line of the pattern is fixed in close proximity to the centre line of design.

This means that, in closing the upper, any alteration by variation in material is automatically corrected by the time the location point is reached.

In the development of this method of pattern cutting, the base line of the last is very important and any alteration in the design must be done within the limits prescribed by the location points. The situation occurs frequently that the design of the upper, whilst not immediately fitting the last, nevertheless fits the other portion of the slipper, and the actual shape of the last is embodied into the slipper in the steaming operation.

When the slipper has been designed on the last and the location points transferred to correspond with the sole shape of the last, a set of patterns can be created by orthodox methods.

Lasts for turned slippers are not required until shaping and steaming after the slipper has been completely made. Consequently, the tit of the finished slipper depends on the accuracy of the pattern cutting.

Clicking

In cutting felt slippers resort is made to band-knife cutting where up to twenty-four sheets of felt are ranged to the pattern width and then cut into twelve pairs of uppers at once around a wood forming pattern.

Where bulk production, however, is not required then the normal light-weight steel cutting dies and metal edge wood clicking block cutters are used (Figure 252).

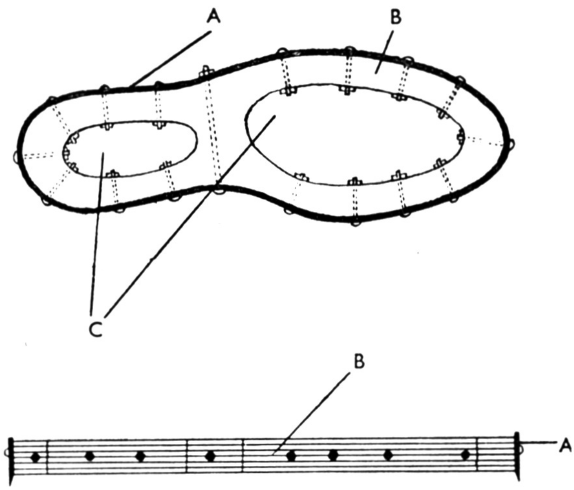

Figure 252. Plan and elevation of wood cutting die used on clicking press for cutting uppers, socks, *etc*. A metal strip A ($\frac{1}{16}$ in. thick and $\frac{5}{16}$ in. deep) is attached to a block of specially hardened plywood B, which is cut away at C to facilitate screwing.

Where regular strips of felt are to be used, varying from $\frac{3}{8}$ to $1\frac{1}{2}$ in. in width, they are easily cut on the strap cutting machine which can be adapted by the use of serrated cutters to give a gimped edge if this is desired.

Sole cutting is generally done on the clicking press with the usual knives.

Closing

The closing department for felt slippers has a different appearance from one making leather shoes.

In felt slipper manufacture, bulk quantities are to be dealt with, and consequently work transportation becomes a major problem. The transport of work is generally done in fibre cases on castors although some factories have made a success of overhead travelling belts carrying wire rods on a wooden base which carry twelve pairs of uppers each between the rows of machinery.

The actual closing room operations are of a simpler nature than for shoes although accuracy here is most important.

The type of sewing machine used for stitching is often the chainstitch machine which, by its increased speed and the flexibility of the stitch gives a satisfactory slipper for general purposes. Where, however, the lock-stitch is required for stronger seams or for taping seams then it is important to use a softer thread than is normally used for shoes. Allowance must be made in the type of thread chosen for the shrinkage that takes place in steaming in order that the thread shall not cut through the materials which are being used.

In sewing felt to felt nine stitches per inch gives a satisfactory pull on the material without breaking into the fibres of the felt.

The actual closing operation becomes a series of sewing runs from point ‘A’ to point ‘B’ which, in practical closing, means that experienced shoe operatives have to forget much of their skill in order to treat this as a straightforward sewing operation rather than the assembly of a slipper. The reason for this is apparent when we remember that the various parts are sewn together inside out. Consequently the turning operation will reveal the finished result in a different light from that in which the sewing machine operator sees the work.

In the assembly of the slipper the upper must first be closed in the usual manner and then any attachments which are required for heels or platform covering are added to the upper. When the heel covers have been sewn to the upper then the whole of the upper is turned inside-out and the lasting edge is sewn to the outside curve of the chrome split or substitute sole that is to be used.

When this stitching of the sole to the upper, which is normally carried out on a post type machine, is completed the bottom of the slipper is filled with such filler as may be required. In general practice this will be a simple hair felt filler to act as a padding for the thin felt sock which is attached in the next operation.

After the heel receptacle and forepart have been filled, the light-weight socking felt is placed over the filler and sewn on a special overlooking machine around the edge of the upper. After this the whole of the slipper is turned inside-out with the aid of a turning machine. This turns the toe first in order to avoid any damage taking place and then having turned the heel portion, the last is inserted into the completely finished upper. The slipper on the last is then passed through a chamber containing steam and from the steam cabinet to the drying chamber. After drying, the last is removed from the finished slipper.

Steaming

One of the objects of steaming is to restore the nap finish on pile material but in felt slipper manufacture a further use is to impregnate the felt with the steam in order to moisten the fibres; this is followed by rapid drying, thereby giving a firm and stiffened appearance to the finished slipper.

It has been found possible to use a felt stiffening compound for this purpose although great care must be used in the selection of this so that no chemical action shall be set up with a starch solution which may have been used for combining felt together.

The steaming operation is carried out by the insertion of the last into the slipper and then the passing of the slipper through a jet of steam. There is a patented conveyor-type machine for this process which also makes use of the exhaust gases expended in the heating process for drying purposes. The conveyor passes through the wet and dry chambers in turn, returning the finished slipper to the starting point in a condition suitable for removal of the last.

Further developments have been also made with a fibre last of a porous nature. The use of maple-wood lasts has one disadvantage in that a slight shrinking takes place when the lasts have been used for a long period whereas this fibre is now impregnated with a plastic material which prevents such shrinkage. These lasts are not yet satisfactory because of the uneven drying which takes place after the removal of the lasts through the forming of water globules on the inside of the slipper.

A further disadvantage has been a slight reaction of latex combining, forming a deposit on the outer surface of the slipper. This is easily removed, however, with a weak solution of ammonia which restores the bright nature of the felt used.

Another method of steaming is in process of development. This employs an aluminium last through which a jet of steam is sprayed from the inside to the outside of the material.

After the completion of the steaming operation it is customary to fix a loose fitting sock inside the shoe by an adhesive. Sometimes this sock is reinforced underneath in order to give an added cushion effect and the cushion is often made of various thicknesses of material. Under the arch of the foot multi-layers of material have been used, and also under the seat for the resting of the os-calcis or heel bone. The surface of the sock generally has a decorative appearance with a fancy overstitched edge and name tags are often sewn on this type of sock. It is also possible to perforate socks of this nature and to allow air pockets to form giving added comfort to the wearer.

The manufacture of indoor turn slippers of this felt variety is looked upon as a balance of harmonious colours and materials in order to give the suggestion of pleasure with leisure to the wearer. The success with which this has been done is reflected in the large export trade that Britain has for this type of footwear.

Other Materials

Although the manufacture of a felt turn has been described at length it is important to note that the manufacture of this same slipper in other materials presents certain problems which must not be overlooked in the original pattern making. The chief of these is in deciding the amount of allowances to make for the respective seams that are used when different substances or textures of materials are used. It is, therefore, important to remember that any allowances that are made must be corrected between the fixed constant points of pattern cutting as previously outlined.

The special features of leather turn slippers are largely dependent upon the properties of the leather itself.

Such properties as plasticity and air permeability (see p. 12) add comfort in wear and suitable leathers are chiefly found amongst goatskins and light calf-skins. Kid-skins and sheepskins are not as suitable for this type of manufacture, but goatskins and calf-skins are ideal, providing that care is taken in reinforcing the leather at the back with a suitable textile backer.

The adhesive properties of the backer are very important and great care should be taken to see that in the application of heat from the steam no chemicals are set free from the adhesive which might react with the upper. Should this occur, then a wash in benzine followed by a weak solution of ammonia will clear the surface of the leather sufficiently to prevent a recurrence of this chemical reaction after the dressing has been applied to the upper.

A felt lining is generally acknowledged to be the best for this type of footwear, and has the added advantage of clinging to the last in the shrinking operation, whereas if a woven textile were used then the difficulties of controlled shrinking would depend very largely upon accurate placing of the patterns on the lining in the cutting process due to the diversity of strength between the warp and weft threads.

Sometimes it is desired to give a plump and pliable appearance to the upper by the use of an interlining, This interlining, which is often used in addition to the backing cloth of the upper, is best chosen from material which is almost neutral in the steaming operation. Therefore, the choice would lie between jute fibres and heavily raised swansdown.

Having fitted the upper together in the closing room the processes follow much the same direction as for felt, but when it comes to the insertion of the last a last is used from which the heel portion can be removed. The forepart of the last is inserted first and then, having used a mechanical aid devised for the purpose to press the forepart of the last forward into the toe, the rear portion of the last is inserted on a forced lasting machine.

The last, so inserted with the minimum of disturbance to the lining, allows the shrinking process of steaming to be carried on exactly as for felt. The timing of the conveyor through the drying chamber is varied in order that the steaming process may mellow the fibres and allow a slight natural curl before the drying process takes place. The time taken for drying is longer for leather work than for felt and consequently the lasts stay in the upper a much greater time. When the uppers are partially dry it is an advantage to pass over the slippers the glossing iron which succeeds in putting the finer curves on the outside of the upper, reproducing more nearly the character of the last. Sometimes in the steaming process a reaction from tannic acid in the shoe uppers affects the suede-finished soles and in case of stains of this kind a weak solution of oxalic acid on the sole will remove such stain. It is advisable, however, to give a wash over both soles afterwards with a weak solution of ammonia to neutralise the effect of the acid on the fibres of the leather.

Platform-type indoor turn slippers are a development of the indoor turn slipper of orthodox pattern. These came into fashion in 1938 but were a revival of centuries-old footwear. In this development there is built into the shoe a cushion of resilient material adding height to the wearer and insulating the foot from the ground. This raised type of platform gives an added flair to the designer's occupation and results in gay and cheerful contrasts being made. When carried out in felt the effect is one of balance in design and has sales appeal in the atmosphere that the slipper creates. In the men's variety the added height gives dignity to the deportment of the wearer.

There are many ways by which this result can be obtained. Much depends upon the insulating material which is used in the construction of the platform. Some manufacturers use a patented method of construction which uses as a platform a soft spongy hair felt or similar substance having the properties of hardening under the steaming operation. Others are content to use a soft and resilient filler which does not harden. These fillers are inserted into the pockets made at the operation between the closing of the upper and the insertion of the sock lining.

In other constructions cork and rubber-bonded materials are used resulting in a firm and insulating base. For this process it is advisable to fill the upper as previously described for an ordinary turn slipper and then to lay over the curtain of the platform in the same manner as slip-lasted footwear is now made.

Another method of making slippers with platforms is to build the platform from the sole upwards, closing the seams that are attached to the sole first, and having filled the cavity between the platform and the ribbon curtain covering, the upper is then sewn together on specialised machinery.

Whichever method is adopted it is vital to remember that all seams must be carefully planned and location points made on the pattern so that any twist or stretch of the material is corrected within known limits.

A further development of this platform type of slipper is the insertion of varying types of heels, some of which show on the outside by the arrangements of the seams or pleats but others of which are of the hidden heel construction, the heel being inserted into a previously made pocket from the joint position on the sole before the slipper is turned. Slippers of this kind are ideally suited where kneeling operations in the home are involved and particularly so when travelling to and fro between corridors with tiled or rubber floors.

One slipper of this type is manufactured with a latex foam platform. The total outside surface of the slipper is made complete, as a glove, and then the latex foam platform which has previously had a sock attached is inserted and the walls of the platform are fixed to the outside platform by the use of an adhesive.

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VELDTSCHOEN, WELDED AND MACHINE-SEWN SLIPPERS

VELDSCHOEN SLIPPERS

SLIPPERS MADE BY THE veldtschoen process are ideal from a flexibility point of view. They are not waterproof but will give long life for ordinary purposes.

The principles of veldtschoen making and the machines used have already been described (Chapter 25, pp. 361-68). Here we are more concerned with the variations for the slipper trade.

The easiest type to make consists of a single sole and an upper. The lasting edge of the upper is turned outwards instead of being turned in as when it is attached to an insole. The upper and outsole are joined together with an adhesive, in position on the last before sewing. The two parts are then stitched together on a lock-stitch machine with the seam carried completely around the slipper. After sewing, the surplus is trimmed away and this leaves a raw edge of upper and sole showing around the edge, and resort has to be made to finishing to cover this and prevent spreading in wear. Consequently, the range of suitable materials is limited.

Fortunately, the number of manufacturing operations is smaller than for machine-lasted and machine-sewn slippers, and the quality of material from a manufacturing point of view is not so important. It is possible to make good, cheap veldtschoen slippers, and equally possible to make expensive ones from good materials. For casual wear the cheaper materials and methods are satisfactory.

There are further developments of the single upper and the single sole construction, such as the use of a lining in the upper which complicates the question of edge finishing. Therefore, alternative variations of this construction have to be employed in making. Further improvements have also been made by the use of a middlesole, or middlesole and insole combined, and also by the use of ordinary lasted seats and counters and veldtschoen foreparts.

The purpose of veldtschoen slippers is to produce a wide welt in keeping with the heavy leathers such as sandal sides for Albert tab shapes (see Figure 253*d*,p. 519) or bootee models and also to give the additional width required for older men for swollen feet; for this type of slipper a broad last is required.

For boys' work there is a tendency for the customer to demand these for growing children in order to copy father's slippers, but whilst the appearance is of a substantial nature, the single substance of the sole is not good and often causes disappointment if the customer expects the thick substance of the finished edge to give a commensurate amount of wear.

For women and girls the broad welt is not in keeping with the slim dainty look so often expected for leisure footwear, although this method can be used with great success for manufacturing thick woolly materials into comfortable broad fitting slippers for them.

To sum up, the veldtschoen method is recommended for Albert tab slippers for men and boys, for heavy bootees for indoor wear, for recovery from accidents and for patients suffering from rheumatism or gout, for Cambridge elastic gusset sided slippers for use inside schools and similar places, for women's and girls' shearling type of slippers or for materials which will not stand heavy strain in lasting.

Materials

The materials chosen for these types of slippers must be in keeping with the length of life expected. Harsh finished leathers and fabrics are to be avoided, but for the cheaper grade of slippers plastics coated cloth, heavy suede splits and grained shoulders from hides are suitable. For better quality slippers made by this system, goatskins, sheepskins and side leathers are satisfactory, whilst for soles, for cheaper grades, bellies are generally used. The better grades have soles from squared shoulders or from composition latex and leather fibre boards.

When stiffeners are used these are generally of fibre composition, but for the sewn-round seat method the lip has to be turned outside whilst the usual lip turned inside is suitable for lasted seats.

It is also necessary to consider the shape of the corners on the stiffeners or counters to bring these in close alignment with the finished appearance of the slipper. Consequently we find that the lasting allowances on the stiffeners which are turned inwards are rounded away at the corners when seats are lasted, whilst for sew-rounds the extra extension of the stiffener without lip gives added strength and prevents bulky corners in the stitching operation.

Where puffs are required they should be in keeping with the general quality of the other substances in the slipper, and heated puffs will be preferred for heavy grain slippers, whilst the canvas-dextrin types are used for finer fabrics. Spirit solvent puffs and cellulose puffs both have their place under controlled conditions.

For lasted seats it will be necessary to use an inside seat support generally cut from fibre or pulp board. Due to the large area involved in broad fitting slippers it is generally considered necessary to use a three-quarter sole with a graft piece joined underneath the heel of the slipper.

Lasts

Lasts for veldtschoen are of full dimensions with plenty of wood over the instep and also of broad heel contour. This is in keeping with the purpose for which the slipper is designed. In addition to the extra wood required through the cross section of the last, the feather edge of the last is chamfered at an angle of 45° (see Figure 202), for a width of $\frac{1}{4}$ in. all round the feather edge up to the heel fitting line for lasted seats, but right round the last for any other type. The object of this is to allow the platform of the lock-stitch sewing machine to come up close to the last and give a broader outstanding welt. Heel plates are required on the last for the slugging of heels, but no plate is required on the forepart.

Patterns

The production of patterns follows the usual routine of ordinary shoemaking patterns. Close reference to the design centre line on the last is required since the extra wood gives a balance of inside and outside shape on the last so that only under rare conditions are right and left patterns necessary.

The lasting allowance on this method varies with the type of leather used but is generally from $\frac{1}{2}$ to $\frac{5}{8}$ in. around the lasting edge.

Making

In order to clarify the method of making we shall study the making of a slipper with a single substance of upper. Therefore, if a lining were required it would be combined to the upper material before cutting and the finished upper would be of one single substance of material throughout with the exception of the toe-puff cover and the counter lining.

After the customary method of clicking and closing the making is commenced (see p. 361) by paste fitting the stiffeners inside the counter pocket. When this has been done the heel portion of the slipper is put into the seat Hanging machine which presses the upper outwards in keeping with the moulds on the stiffener. This operation is now carried out on the toe, the toe-puff being inserted at the same time. Having then formed the shape of the toe and the heel on the toe and heel forming machine the upper is placed over the last to which has been previously attached the out-sole, by the aid of temporary wire grips. The toe is then placed in position aligning the sole and upper and the two are assembled together with temporary wire-grip fasteners on the veldt assembly machine. Having corrected any faults which have occurred up to this stage the shoe is then presented to the veldt stitching machine, and using a lockstitch the operator sews the upper to the sole through the channel previously cut on the sole. The stitching continues right round the shoe and, after channel solutioning and closing, the shoe bottom is levelled on the veldt levelling machine.

At this stage the wire grips are removed and, after levelling, the edges are trimmed; thereafter the slipper follows the usual routine of finishing. This will include slugging on the heel, heel trimming and finishing, and the removal of the last. After the last has been removed it will be necessary to insert a sock inside the slipper.

Variations

The first variation to this simple method comes by the use of linings inside the slipper, particularly linings of raised fabric construction. It will be readily seen that where the edges of the fabric show on the outside of the slipper then finishing with a clean line is difficult. This edge treatment is overcome by the use of a narrow welt or randing usually cut from textiles, pressed fibre materials, plastics or leather. This randing is prepared or purchased by the gross yard length and is fed into the stitching machine through a guide, around the feather edge of the slipper in stitching, so that the upper and lining is sewn between the rand and the sole. Consequently, after trimming, the finished result gives a stout edge appearance and this edge is fed into the edge setting irons to give a solid, hard-wearing, resistant edge.

The second variation comes from the lasted seat type of veldtschoen. In lasted seats, the seat flanges, which on sew-rounds were attached to the flesh side of the outsole, are now attached temporarily to the last and at a later stage the heel is ‘Consol’ lasted in the usual manner in order that the lasting allowance of the forepart of the slipper may be turned outwards. The benefit of this type of seat lasting comes from the closer fitting counter. Should this method be employed, the shape of heel seat of the sole requires care in designing so that the rear view of the slipper is a pleasing one with a gentle ranging from the broader forepart to the scat shape so that the mannish appearance is continued from the back view. Care also must be taken in the alignment of the sewing operation to give clean finished comers, particularly when a rand is employed as a mock welt.

Another variation comes in the temporary attachment of the upper to the sole. Some people prefer an adhesive method of attaching rather than the wire grip method with its consequent wear upon the cutters of the surplus upper trimming machine.

Should this adhesive method be employed, care must be taken in the preparation of the sole edge so that the adhesive is in the correct condition when brought into contact with the upper, avoiding pleats in the lasting operation.

A further variation to this veldtschoen method is achieved by using a thinner type of midsole and sewing aloft in the stitching operation. Then, after insertion of a shank in the waist, an outer sole is applied by the ordinary welded attachment procedure. The advantage of this method of making is seen when the slippers are required to be repaired after wear.

Yet another variation of this method is carried out by the making of a lining complete with sewn-in sock, and attaching the outside of the slipper to the completed lining. In the veldtschoen process the lined upper is placed over the last and a fibre seat-piece attached to the heel seat of the lining as it faces the outsole. The upper is then lasted by turning the edge outwards all the way round the shoe. The upper and sole are now stitched together by the sew-round process, after which the trimming operations are carried out and the resultant slipper has a very pleasing effect inside. This method is usually employed where linings are heavy pile fabrics.

If made by any of these methods, the finished slippers are flexible and have very few metallic fastenings left in them, apart from those used for the attachment of the graft piece on the sole, for the attachment of the heel lift, such as slugging wire, nails for the loose nailing machine, or 'Consol' lasting tacks around the seat. For all these methods of veldtschoen making, the use of heavy fabrics with raised pile linings is satisfactory and the soft heel and broad measures inside the slipper are a great comfort to the wearer.

WELDED AND MACHINE-SEWN SLIPPERS

The manufacture of slippers by machinery has brought special purpose footwear within easy reach of the purse of even the poorest of the population of the world. This mass production method of assembly has given the comfort and ease of slippers to those who otherwise could not have afforded the speciality footwear required.

In machine lasting there is virtually no limit to the types of materials that can be used and the purposes to which the slippers can be put. With stout sturdy uppers, slippers made by this method are used for pottering about in the garden, for the manual operations around the home or workshop and their utilitarian purpose is in sharp contrast to the heavy working boots, which are discarded on arrival at home. The sturdiness and stoutness of this machine-sewn footwear will respond to the strong masculine development of the foot which has taken place through the manual labour of the populace.

Machine lasting has been a boon to many people in so far as it has been possible to create a slipper which, being flexible in wear, and having sturdy materials will give plenty of foot movement inside the slipper for the more laborious type of work. Also under this category we can include the whole of the activities of growing juveniles and the fuller necessities of household duties of man and woman alike. We can widen it still further to embrace nurses' shoes for hospitals, special footwear for people in canteens, kitchens, bakehouses, and inmates of institutions. Footwear of this type is also manufactured for use on ships and for work in the paddy fields in hot countries; also for gymnasium footwear and for games such as bowls, cycling and the like.

Whilst the operations of manufacture are very similar to those for the cheaper class of walking shoes as described in Chapter 22, nevertheless in the slipper the requirements of bottom filling, the correct choice of lining materials, and the application of strain to the variety of materials used are of paramount importance. Consequently, this section calls for special treatment as distinct from ordinary footwear.

The choice of lasts is most important for this type of manufacture. The usual type of gap spring last with a metal plate will be used but the shape of the bottom is very important. Whereas in shoes it is permissible to have a rounded plate on the bottom of the last, for machine-sewn slippers there are great advantages in having a more fiat bottom and particularly a fiat plate at the seat. The amount of toe spring required is greater for this

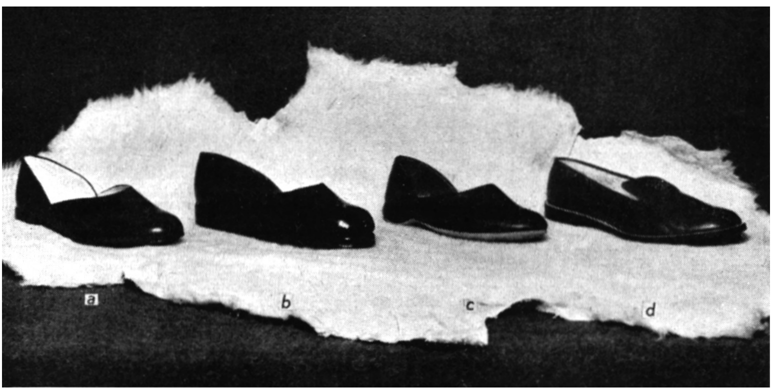

Figure 253. Men's slippers. *a* Machine-lasted Grecian slipper with welded sole. *b* Machine-lasted Grecian slipper with platform collar, force lasted. *c* Grecian indoor turn. *d* Veldtschoen Albert tab slipper.

method of manufacture than for normal shoes or other types of slippers. The comb of the last should be well defined with extra wood so that a centre line is central over the comb of the last independent of whether the last has a straight inside line or a more balanced uniform toe shape.

In designing footwear on this type of last it is necessary to design a tight top line. This is made easy by the wood on the last being plentiful on either side of the heel bone and also the high comb previously mentioned. In pattern cutting it is necessary to draft or spring the patterns towards the high front in order to assist the lasting operations. Footwear made on this type of last is generally cylinder bound with galloon type binding, or a folded edge is used on leather linings. In either case it will be necessary to reinforce any corners on the patterns such as low vamp curves on a man's Albert slipper.

Upper leathers are generally made from kip or sides, in attractive imitation (printed) reptiles or else from whole skins such as sheep or goat. The goatskin bears a familiar grain pattern which is retained in the finished slippers. Sheepskins can either be embossed or plated plain. If they are to be finished smooth then the opportunity can be taken in the finishing processes in leather dressing to give a starch finish on the reverse side which helps greatly to prevent opening of grain in lasting.

Where fabric linings are used these are generally of raised swansdown, velours or wool cloth. In every case it is better to have a well-balanced cloth with equal strength in the warp and weft in order to avoid breakages due to the amount of springing put in the pattern.

For men's slippers the most popular patterns are the Albert tab and the Grecian (Figure 253 *a*, *b*). The Albert tab slipper generally has a whole-cut swansdown lining and a galloon bound edge. The Grecian slipper usually has a folded or bagged edge and orthodox methods of closing are employed. The majority of operations are the same for slippers of this class as for shoes.

Imitation moccasin fronts are often used on ladies' slippers and for the pleating and cording special machines are available. In ladies' slippers with a low heel it is customary to sew a leather cover for the wooden heels to the upper before lasting, thereby forming a pocket for the insertion of the heel.

Ward and hospital slippers made on this principle are generally cut from glacé kid. Owing to the stretchy nature of the material it is found necessary to reinforce the kid on the back with an adhesive backer which is attached by the aid of a heated iron plate.

After assembly of the uppers in the closing department we turn our attention to the bottom stock required. Most important is the insole which does not need to be strong in itself since the upper and sole will be welded or sewn together into a complete whole, yet the insole must support the slipper until such time as the sole has been attached. It is necessary, therefore, to test such materials as are used whether pulp boards, fibre compositions, combinations of leather layer, or belly leather. The material must be tested for its ability to hold the stitches which are later to be used or to hold the lasting tacks or cement without laminating.

All other components are of grade equivalent to the life the slipper has to endure for the purpose for which it has been designed, and so manufacture of this slipper proceeds on orthodox lines of ordinary shoemaking as already described in Part VI of this book.

Lasting machinery is employed, the pull-over first pulling the upper over the last and temporarily attaching it to the insole, after which the 'Consol' and seat laster are used for attaching the upper permanently to the insole with lasting tacks. Variations of this method are available, such as cement lasting, or staple side lasting, or wire bracing around the toe and heel.

After lasting, the bottom is filled, wood shanks and composition generally being used. Bottom filling should be firm so as to resist the movement taking place in wear.

The method of sole attachment chosen will depend upon the purpose for which the slipper is being made. There is a choice of a variety of methods according to the nature of the material, and these will now be considered.

The use of vulcanised rubber composition soling materials, whether vulcanised on or off the shoe, has to be considered as they give a hard wearing yet soft and springy cushion tread; the use of this type of footwear for purposes requiring a great deal of bending and kneeling must also be considered. These soles can be attached to machine-lasted footwear but are not ideal for sewing purposes. They are more suited to camel-hair and felt slippers already described in Chapter 38 (Figure 254*a*, *b*).

Figure 254. Men's slippers. *a* Camel cloth zip bootee with welded pre-vulcanised sponge rubber sole. *b* Felt and leather machine-sewn house boot. *c* Machine-lasted welded sole zip bootee.

Welded sole materials are a development of the system of adhesive attaching which came into popularity around 1929. This method of attaching soles, replacing as it did the machine-sewn attachment, resulted in a far daintier appearance in the finished article, and yet by choice of materials it has been possible to give to the wafer sole edge the same wear that otherwise was achieved by one of much stouter appearance. Welded or cemented footwear, therefore, is to be found at popular functions such as dances, cocktail parties, and on other formal occasions where light fashion shoes are essential. It is also the popular choice for men's slippers for indoor use, and whilst not carrying the substance of the machine-sewn attachment which is more suitable for garden wear, yet the gracefulness of the line and comfort is expressed in slippers of this type and is appreciated by the wearer (Figure 254*b*, *c*). Soling material for this type varies from latex-bonded leather composition boards, to specially prepared and specially tanned shoulder leathers.

The requirements for any of these types of materials for slippers is flexibility. This is generally embodied as an integral part of the material itself but can be artificially produced by the use of slashing on the reverse side of the sole providing the substance is satisfactory for this purpose.

When the sole has been prepared to the pattern designed to lit the upper, there is a choice of using pre-finished soles or finishing on the slipper itself. A combination of these two is mostly used by rounding the soles to the close approximation of the finished slipper and then roughing the reverse side of the sole on automatic machinery. The coating of the sole and upper after roughing is a standard method employed for any other type of footwear and the adhesives used vary with the type of material, but either the pyroxylin cellulose or latex types are suitable. Having attached the sole the normal method of finishing shoes is employed through various stages of trimming, setting, staining, polishing, socking and boxing.

The machine-sewn method of attaching is exactly the same for slippers as for shoes. Greater care must be taken, however, of the correct tension in Blake sewing due to the flimsier types of insoles used, and also to the correct fitting of feet and forms on the ‘Cyclops’ Levelling Machine in order that the toe spring shall be maintained and that the arch line shall be such that the flatter type of wood shanks that are used shall not be distorted in levelling.

It is customary to attach heels on a slugging or loose nailing machine from the outside of the heel. This means that the insole must be reinforced at this point, or else be made of such a compactness in fibre that the burr of the slug or rivet will hold without damage to the hose of the wearer. The stouter kinds of footwear including those made for public institutions are made on this principle.

42
MOCCASIN SLIPPERS

THE SOFT SOLE MOCCASIN was worn by the North American Indians and other inhabitants of cold northern regions. As has already been described in Chapter 3 of this book, its simplest form consisted practically of a single piece of soft leather fashioned to wrap round the foot. The Indians of the Western plain preferred a moccasin made of two pieces of leather, the rougher, harder type forming the sole, and a soft flexible type of upper thonged together. This version was also popular in Lapland, and other Scandinavian countries. In many cases the leather has been embossed or heavily decorated with glass beads, ivory tusks, and textile trimmings. Brilliant colour and strong leather thongs and cords have also been a feature of trimming. Some of these embellishments still give an aesthetic value to this soft comfortable type of slipper as used at the present day.

Moccasin slippers may be made from a single piece of leather or with a separate attached sole.

SIMPLE MOCCASIN SLIPPERS

The description that follows is of the simplest form of moccasin with an outer shell of leather around the foot into which is enclosed a soft lining for hygienic purposes (Figure 255).

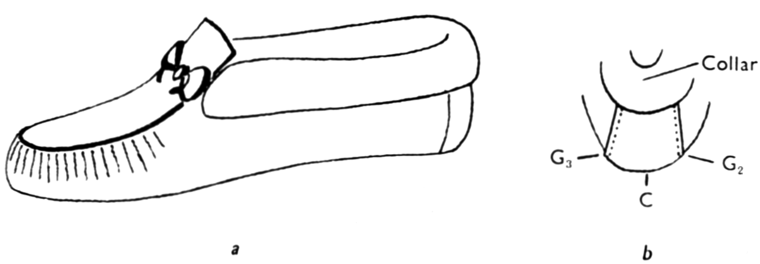

Figure 255. *a* Simple moccasin slipper. *b* Rear view.

The manufacture consists of cutting the parts and closing them on sewing machines, and after various stages of turning and returning, the upper is finally brushed and steamed and forms a foot muff. It can be easily turned inside out for washing the lining or chemical sterilisation, and the value of the article for wear purposes depends upon its soft resilient padding inside known as an interlining.

Patterns

In order to make this slipper, a last is used which has had a design previously drawn upon it (Figure 256*a*, *b*). The method of taking a forme will be around the construction line previously drawn on the last and will be taken by the aid of adhesive tape which, when removed from the last, is laid flat upon a sheet of paper on which is drawn a geometric base.

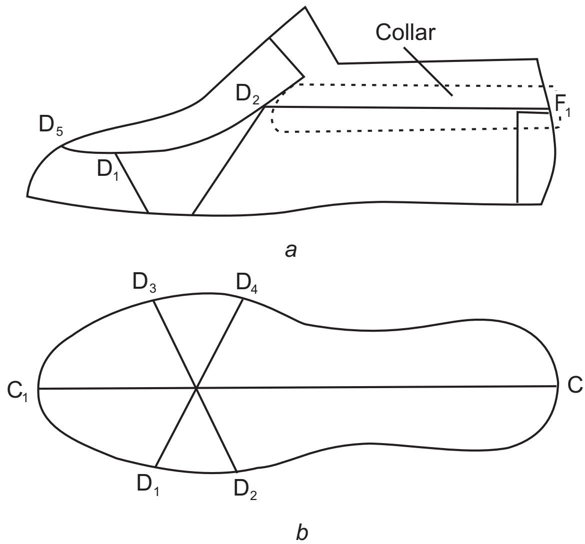

Figure 256. *a* Last with construction lines marked on it. *b* Sole of last with joint directional lines marked.

Method of Cutting a Pattern for a Moccasin Slipper—Draw a base line A (Figure 257). From this base line erect a perpendicular B, passing through the centre of this base line point C. Take a sole shape from the last, draw on this a centre line, and place the heel of the sole shape to point C. With the centre line of the sole shape on the perpendicular line. Next transfer the directional lines from the joint position D_1, D_2, D_3, D_4, D_5, from the last to the centre line, using a protractor to obtain the correct angle.

We follow out this geometric method of transferring the measures from last to paper and design a whole-cut pattern to meet these measures. Measure the back of the last from the seat position to the counter point, and mark on behind the base line A giving point F_1. Measure the width of the seat position across line G and draw lines up to the counter point F_1, parallel to the perpendicular line, giving points F_2 and F_3. Draw lines from D_2, to F_3, and from D_4, to F_2, and add the width of the collar to this. Continue the collar beyond the base line A for the distance F_1 to H_2 to give the length of the collar (collars are usually cut separately from lambswool strips and machined on to the closed upper).

The lining pattern can be cut the same as for the upper pattern or can be cut with a back-seam (see Figure 258). Measure the length of the seat curve from C to G_1 and transfer this measure to points J_1 and J_2. Continue the same distance behind line C from points F_2 and F_3, and draw in the back curve to J_3 and J_4. This method can also be used as an alternative to the method shown in Figure 257 for a moccasin upper pattern.

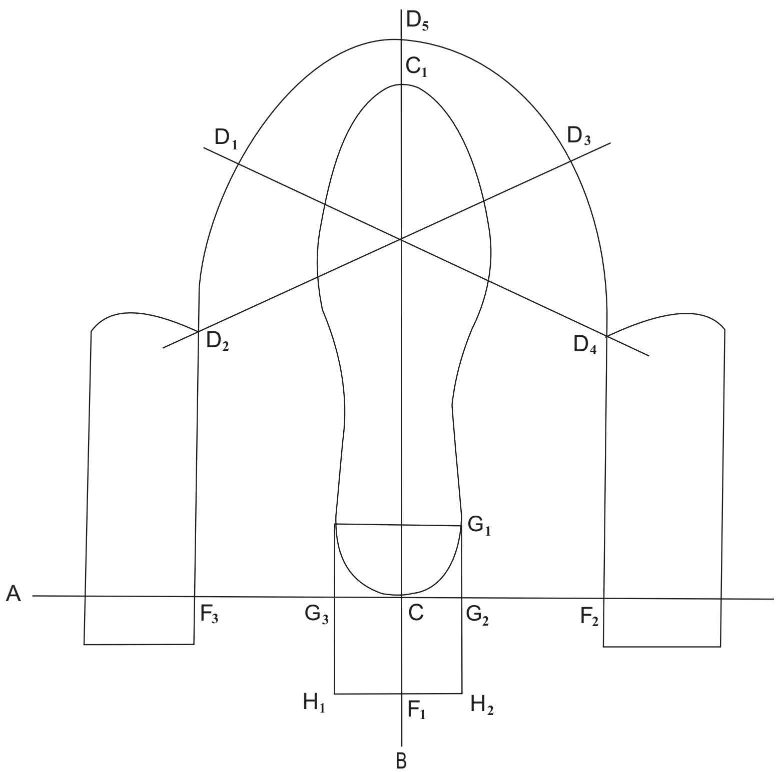

Figure 257. Moccasin upper pattern.

The sole periphery line is an abstract one since it is only used for design purposes and does not appear either in the finished pattern or the slipper. Whilst the measure of the vamp plug is important, the crimping operation is designed to give this finished measure although the pattern bears no resemblance to the measure in its first form. Starting from the centre point on the outside of the pattern the outer line of the pattern becomes the seam of the vamp plug in the finished slipper. In designing the shape of the outer line of the pattern it is well to leave a tiny notch as location point for the fitting of the vamp plug. Five of these points are necessary—one each at the top edge of the vamp plug or apron, one in the centre and one half way between each as a transfer point from the last to the pattern. By fixing these location points a check can be kept on the amount of crimping or pleating that has to be inserted in the upper material prior to sewing.

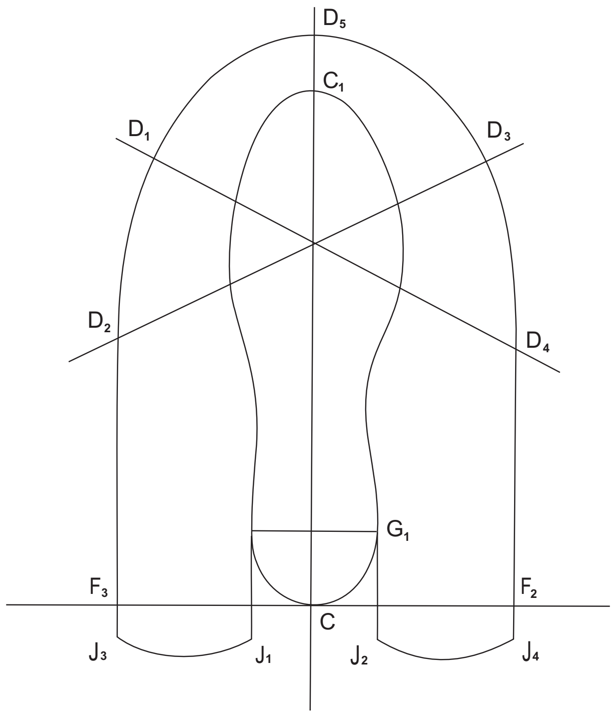

Figure 258. Moccasin lining pattern.

After design of the whole-cut pattern for the outside, a copy of this pattern is made as a lining pattern, but the outside periphery is reduced to allow for tighter fitting of the top line due to the substance of the lining material. If a padding is to be used between the upper and the lining a separate pattern for the interlining is also required. A pattern for the plug or apron of the vamp is also needed. This is generally embellished with an embossed design or with embroidery trimming or bead ornamentation (see Figure 259*b*). Resort is also made to interlacing or the use of plaited materials in which case the necessary design lines will need to be marked on the pattern.

Patterns are also required for lining the vamp plug and for the padding which is inserted between the outer material and the lining. In addition a pattern is needed for the interlining for the sole shape, and one for an interlining counter of rubberised or pliable material between the back-seam of lining and upper.

Each of these patterns will require normal seam allowances depending upon the materials used. `

Materials

Materials for uppers are generally of sheep, goat, cabretta leathers, or of suede splits. These are mostly required in pastel shades when the slipper is to be worn either as a travelling slipper or for use in heavily carpeted rooms.

Where the slippers have to stand stronger wear such as receptionist purposes in hospitals and surgeries where tiled floors are in use, it is customary to make them in natural hide or calf with a leather lining. In this case there will be a leather collar with eyelets or thread holes for a cord trimming, for which a pattern will be required.

For lining materials with uppers in pastel shades of leather quilted satins combined to cotton wool backers or rayon and cotton ginghams are used. These are generally produced in pastel shades to tone with the upper leather being used. For the heavier type of moccasin we shall use a basil lining of natural shade. For interlining, soft pressed felts of wool, jute, or of vegetable fibres are satisfactory although these have also been made from soft, cold flock, and also from latex foam.

Counters or stiffeners are generally cut from rubberised fabrics to give springiness without rigidity, although some prefer to use jaconet* and others strong hessian or buckram interlining to strengthen the back support.

Ornaments and trimmings are favoured from narrow fabrics woven from silk and rayon whilst mercerised cotton is acceptable for the cheaper grades. Much use is also made of metallic cloth brocade for insertions on the vamp plug, and many firms specialise in the production of embroidered vamps to the slipper manufacturer's own design.

Bindings for top edges are chosen from animal skin with hair attached, and furs and also from cut strips of shearling, and from silk braid, each being chosen according to the use of the slipper, and each being prepared by finishing and dyeing to tone with the general appearance of the slipper. Leather collars are used on the heavier types of moccasins, and if the edges are left raw cut they add to the primitive native effect.

*Jaconet is strictly speaking a plain cloth of open weave. In the slipper trade, however, the name is popularly used to denote this type of cloth combined with thin rubber sheet as a backing.

Sometimes moccasins are made from sheepskins with the wool attached and these are simpler to make, but follow the general outline as given for the more complicated one, the finished result being in the form of a foot muff.

Preparation of Materials

Slipper fabrics are generally treated with size or starch to give stiffness to the material, thereby preventing fraying of the edges during manipulation in the factory and also preventing pleats forming where they are not required. Care must be exercised in the degree of stiffness of the material employed for moccasin slippers because the pleats in the forepart of the slipper should have a soft feel and are required to bend around the sharp curves without cracking.

This is important too in the choice of upper preparation and attention must be given to the pliability of the surface of the material to be used. Any starching of the reverse side of the sheep or goat-skins must be carefully watched so that no breaking away of filling material takes place in wear. Latex spraying equipment has been of considerable benefit in the preparation of materials for this type of slipper, but the spraying operation is generally carried out by the suppliers of the material and not by the slipper manufacturer.

Clicking

Firms who specialise in moccasin manufacture prefer hand cutting to machine cutting because of the large areas involved and the small relation of the cutting cost to the price of the finished article. For fittings and vamp plugs, the ordinary type of clicking press is used with steel dies. Lining materials are often cut on the band-knife cutting machine, and effective work is achieved by this means on soft and fluffy materials using card patterns.

For moccasins the appearance of the finished article is much more important than the stretch in the material; therefore, the cutter is mostly concerned with the lay of his pattern on the material rather than the quality of the material he is using, other than the surface appearance.

Preparation for Closing

Materials leaving the cutting room have to be prepared for closing by the size marking, attaching of brand, and reference labels, jointing and overlooking of bindings where required, gimping of fittings and pleating of the vamp line at its meeting with the vamp plug and embroidery of plugs. These operations are generally carried out in a special department where the hand-work involved is done in more pleasant surroundings than with the noise of machinery in the closing department.

Closing

This generally commences with the lining preparation. If a sock padding is used this is stitched to the lining on its reverse side after which we have the closing of the lining back-seam and the sewing in of the counter lining. The lining so prepared is now placed over a replica of the last and the interlining is paste fitted on to the lining.

The upper is then prepared by the closing of the back-seam and staying the crimping. Crimping is of two kinds. In the first method the upper is passed through carefully prepared serrated wheels which crimp the required amount which has been arranged by the size of wheel in relation to the length of the crimp line which has to be reduced. At this stage an adhesive tape is pressed on the back to hold the crimp in position.

On the second type of crimping the procedure is through heated serrated wheels after which a cord is sewn on the back of the crimping which holds the pleats in position for stitching in its later stages. The second method is most applicable to heavier types of uppers and to the method of closing where the plug is sewn on to the upper before the upper is attached to the lining.

We now revert back to our description which precedes the first method of crimping.

The upper having been closed at the back-seam, and any collar or outer trimming having been put into position, the closed upper is then laid over the fitting block or last replica, and paste fitted together with the lining on the last.

The previously prepared vamp plug is now galloon or braid bound, ready for fitting on to the paste fitted upper. Having been paste fitted it is then sewn into position through the lining and the upper, after which the top edge is treated as specifications, then follows the fur binding, trimming, combing, or electrification, according to the type of material used.

Variations in Closing

One variation resorted to is to make this type of slipper by a ‘held together’ method instead of paste fitting, but the result is not nearly so good, and great care must be exercised in the training of operatives for this type of work. On mass production, however, this is often done as it increases the output and cheapens the product.

A further variation from the standard method is the preparation of the lining with interlining, the lining having the vamp plug lining attached either all in one piece with itself or attached as a separate piece before the upper is attached to the vamp plug.

Another variation in method is brought about by the lining being made as a slip-lasted lining with a padded sock seamed to the toe lining before coming into contact with the upper. The pattern making for this type of slipper will vary for the lining from the previously outlined method. In this case an insole shape is taken and the seam allowances added for the upper and lining attachment. The lining forme is also taken from the last and seaming allowances added. When the linings have been cut true to pattern, the upper and sock lining are machined together ready to close in, with the outside edge of the sewn upper. No trimming allowance is required because on this type of slipper fur or braid binding are used and the net top line is satisfactory. The crimped upper is closed completely by the attachment of the vamp plug, and the closing of the back seam. When this method is carried out, the string insertion on the reverse side of the crimping which was put on by the aid of a zigzag closing machine, is more suitable than the tape method chosen for the simpler method of making. The lining is then inserted as a complete unit into the closed upper and the top edge finished according to requirements by binding or trimming, the slipper being completed by steaming or hot-air blast to give the final shape after insertion of the last. Lasts for steaming are not required to be the exact shape of the model from which the patterns were cut but the top edge must be close up to these measures in order to give the cling necessary for a satisfactory finished appearance. After the lasts are removed the slippers are ready for boxing and despatch.

Still a further variation of this method is when the slipper is made from whole shearling or wool sheepskins, or from imitation which has a pile fabric previously combined to the outside material. In these cases the procedure is much simplified for closing and making since only one substance of material is involved but the method of cutting patterns for uppers is followed as previously outlined, and the making-up follows the general procedure of the more difficult type of lined slipper.

MOCCASIN TYPE SLIPPERS WITH SEPARATE ATTACHED SOLES

There are three main types of separately attached soles to moccasin slippers.

First Method

The first type of slipper is where the moccasin upper is made on the processes previously described with the upper going right underneath the foot, and after manufacture a welded or sewn sole is attached to the part which comes in contact with the ground (Figure 259*a*). By this method it is possible to have a longer wearing slipper but some of the flexibility and soft comfort is lost in the sole attaching process.

Second Method

The second variation of this method is to attach on the outside an extra sole of the soft padded type (Figure 259*c*). This is generally stitched to the upper before closing. In the pattern cutting for this particular type of slipper it is as though a slit were made down the centre of the whole-cut pattern and the two ends joined together on the inside of the slipper later (Figure 260). Actually in practice a separate method of forme construction is taken whereby the upper and the portion that goes under the sole are cut on a sprung pattern in two halves, resulting in a considerable saving of materials in the prime portion of the skin.

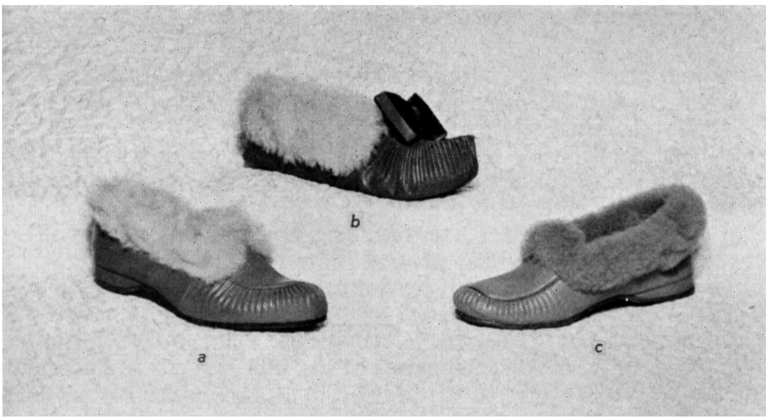

Figure 259. Various types of ladies' moccasin slippers. *a* Machine-lasted moccasin with welted sole. *b* Slipper with sole and upper in one piece with ornamented plug attachment on vamp. *c* Slipper with single sole sewn through the upper with padded stock.

Figure 260*a* shows a standard with the sole shape positioned along the feather edge of the upper. The seam follows line V along the sole, so that one half of the sole shape has to be sprung to fit along the feather edge of the upper.

Figure 260*b* shows the shape of a pattern with the sole shape sprung on to the upper pattern. As in other types of moccasins the vamp plug is cut separately. The two sides are first joined together down the centre seam by a zigzag machine from points W to X. Then points X to Y and W to Z are closed and silked.

The vamp plug is then attached to the main part after crimping and the previously prepared soft padded sole is attached on a vertical type horn machine (Figure 261). The lining, cut by the same method, is made whole and machined in around the top edge and bound, or a collar is attached. Sometimes heels are attached to this type of slipper in which case they are generally made of wood, cellulosed or covered with upper material, with a leather top-piece, and for attaching purposes a seat sock of fibre-board is fixed inside in order to hold the heel pins.

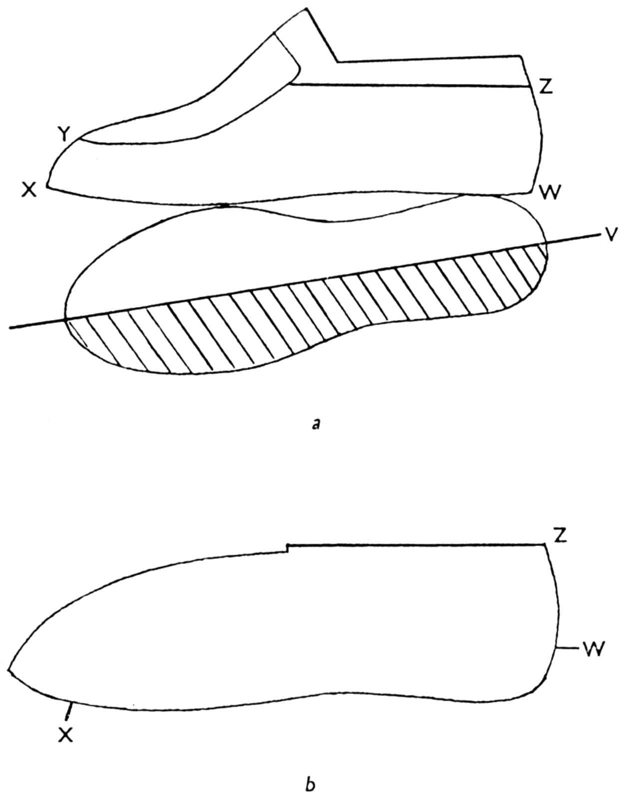

Figure 260. Construction of moccasin slipper with padded sole. *a* Sole shape positioned along feather line of sole. *b* Pattern obtained by springing half of sole shape on to upper pattern. The front seam extends from **Y** to the toe position **X** and the back-seam from **Z** to the seat position **W.**

Third Method

The third variation is a moccasin slipper of the North American type with a hard sole and made by a different method of construction. The outsole material requires to be specially chosen for this purpose, a suitable type of material being a vegetable tanned or curried leather cut from squared shoulders. The substance is generally of 4 to 5 irons and the requirements of the face are such that it will take a thin channel cut into the fibres without damage. After selection the soles are buffed on the surface to give a fine suede nap and then the channel is cut in.

The uppers for this type of slipper are out only to the feather edge line on the last with the addition of the allowance for lasting. Since

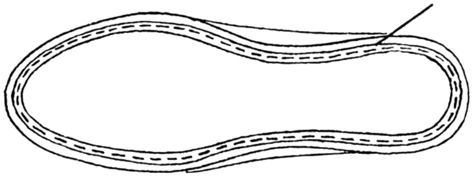

Figure 261. This shows how the padded sole is attached to the upper.

these uppers are sewn to the sole without the last being inserted the amount required for lasting purposes is generally about $\frac{3}{8}$ in. on fine goat uppers with slightly less for softer Persian leathers.

Upper making for this class of slipper takes the usual form of machine-sewn slippers. Pattern cutting also follows the usual routine, but an extra point to watch is the design of the pocket for the hidden heel which is usual in this construction.

It has to be borne in mind that the feather edge line of the upper is net plus a seam allowance for the total measures of the heel line, whereas after making a pattern for the heel cover to join this line the $\frac{3}{8}$ in. lasting allowance has to be added to the heel pattern for the portion of the seat and not to the upper pattern. After these allowances are made it is usual to range the completed pattern, with heel attached, in a gentle curve to join the lasting allowance line that was added to the feather edge of the forepart of the pattern. It will be seen that the only need of a seam allowance is exactly where the heel pattern fits and this seam allowance of $\frac{1}{16}$ in. added to the height of heel at the centre of the back of the pattern, running out to the net line on the forepart, gives a finished pattern of different appearance from that usually encountered for other classes of footwear.

After the parts have been assembled in the closing department the completed upper is passed to the making section, generally located in the closing department. At this stage the upper is turned inside out and the lining is pulled through the top line of the slipper in order to allow free access to the inside of the slipper. The upper is then centralised on the sole and is sewn on a post machine through the channel to the lasting allowance. This is a highly skilled operation but experienced workers can sew accurately through the channel keeping to the $\frac{3}{8}$ in. lasting allowance around the edge, after which trimming over the seams is sometimes necessary but should not reach undue proportions. At this stage the seams so formed are rubbed down and then the slipper is turned, and with the lining still pulled outwards, the heel is fitted inside the slipper.

It is usual to use a solutioned heel made of skived or bevelled-edge cork, or light-weight wood such as obeche. After fitting the heel the lining is pressed inside the slipper and solutioned into position. After this has been carefully done the last is inserted for the first time. This type of last has to stand up to steaming or to hot-air blasts and it is customary to use lasts which either have a very wide forward break for easy entry or which are made with the rear portion detachable completely in order to force the last forepart right up into the toe of the slipper.

After lasting, the uppers are steamed or passed through a current of warm air to settle the fibres on to the last form. Afterwards the last is withdrawn and a previously prepared sock is pasted inside the slipper. They are now ready for boxing and despatch to the customer.

This type of manufacture produces a slipper which has long life with maximum comfort and flexibility.

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SHEARLING AND WOOL SHEEPSKIN SLIPPERS

SHEARLING SKINS WITH FINE curled wool and sheepskins with wool left on which has been treated by a process of electrification to make the wool look like hair are regarded as choice materials from which to manufacture slippers. In some cases the skins are used with the wool outside so that textile linings of fine quality are used next to the foot and for this type of slipper pastel shades are used in the dyehouse in order to give a pleasing finish to the article.

In other types of slippers the wool outside is used for trimming purposes for cuffs and collars whilst in the majority of cases the wool is made up into the slipper next to the foot either as a lining or as a complete slipper.

Wherever the slipper is completely made of shearling the skin is suede finished on the flesh side in order to give a pleasing appearance to the finished product. In addition to the sueding of the skin, dyeing is done to the required shade which in popular fancy varies from ecru through the pastel shades to deep brown and burgundy.

There is a wide scope for this material for ladies' mules to be worn with dressing gowns and negligées and whilst having a frivolous look they are admirably suited for the well dressed person of leisure on special occasions. Such footwear is also ideally suited for the nursing home or the fashionable hotel.

The warmth of shearling skins has been known ever since man started to hunt for his food; the use of modern tanning methods, however, has brought this comfort, without the obnoxious smell, right into the seclusion of 'My Lady's Boudoir'. Those who served in the air in the 1939-45 War were grateful for shearling, and since the war its use for civilian purposes has increased, the warmth and cheerful attractiveness of these slippers being well known.

Method

The method of making slippers of shearling varies according to the purpose to which the slipper is put. Drawn cords are used for manufacturing a whole-cut moccasin type of slipper with heel attached.

The method of making this slipper is in accord with the method employed for an ordinary sheepskin or goatskin slipper with a separate lining and heel pocket. A whole-cut pattern is made but the part that has to come over the surface of the foot at the toes has loops or holes fixed around the edge of the shearling at approximately

$\frac{3}{16}$ in. from the edge and through these holes a strong cord is fitted which, when pulled tight, pleats the upper in comfortable curves around the vamp.

The back portion of the slipper generally has a thonged back-seam made by hand, and the top edge is finished with a roll collar.

On some models the cord is plaited through the collar by a series of loops which, when drawn tight, fit very close to the foot. An improvement is made in this type of drawn cord shearling slipper when a separate heel unit is attached with heel pins to a heel stiffener unit, previously prepared, which is fitted in the inside heel pocket of the slipper.

The manufacture of this slipper is very simple, the equipment required being mostly hand tools, and the finished slipper is all that could be desired for long life and comfort purposes.

A further development of shearling type slippers are those made on the slip-lasted process. By this method an upper is designed on the last with $\frac{1}{8}$ jn. sewing allowance for the upper on to the sock. The sock is sewn to the upper after closing the upper to the design required, and then the platform cover is sewn on to the finished upper. After bringing the upper over the last an insole is fitted underneath the platform and then the outsole attached to the platform either by adhesive methods or by overlock sewing.

A combination of this method is used along with that of ordinary lasting when it is desired to put on an heel above $\frac{1}{2}$ in. in height. For these requirements machine-sewn lasted methods are chosen for the back portion of the slipper whilst the slip-lasted method is used for the forepart.

The heel-seat having been lasted in the usual manner, the last is withdrawn and the heel attached and the sole finished, as for a Louis heel shoe made by an adhesive process.

Mules

Attractive mules, with or without a sling-back strap are often made in shearling. These are particularly pleasing when the shearling has been used as a lining, and the outside covering is of raised velvet or rayon (see Figure 249*b*, p. 502).

The method of making here is generally that of machine-sewn construction with a soft flexible leather sole as the outer sole. Other methods of making are the hand thonging of the shearling for all seams and attaching the uppers by thong to a prepared sole with a walled construction. This method of sole building requires care, particularly in the choice of the construction of the walling material so that it is not too strong to tread over the outsole in wear, yet strong enough to support the weight of the foot against the pull of the front.

A further method of manufacturing shearling slippers is on the veldtschoen principle but with a platform cover attached to the made-up upper before sewing the upper to an insole on veldtschoen machinery. The platform cover can be of sheepskin or of fabric, its purpose being to cover the raw edges of the thick pile of the shearling upper prior to the attachment of the sole.

Tests on Shearlings

It is important when manufacturing shearling or wool sheepskin slippers to have the skins tested for salt content. A substantial amount of work has been carried out on this subject by the British Boot, Shoe and Allied Trades Research Association, and they have recommended that the maximum figure for soluble salts (measured as sulphated ashed water solubles) should be 1 per cent, as for fabric shoe linings. A shearling showing a higher figure than this is likely to produce white deposits on the upper, particularly at the vamp and above the heel where the salt has been carried in solution by the foot perspiration.

Another important point is that grease stains are also likely to appear on uppers if the fat content of the shearling lining is more than 8 per cent (see SATRA *Monthly Bulletin* for November, 1949, for further details of both these effects).

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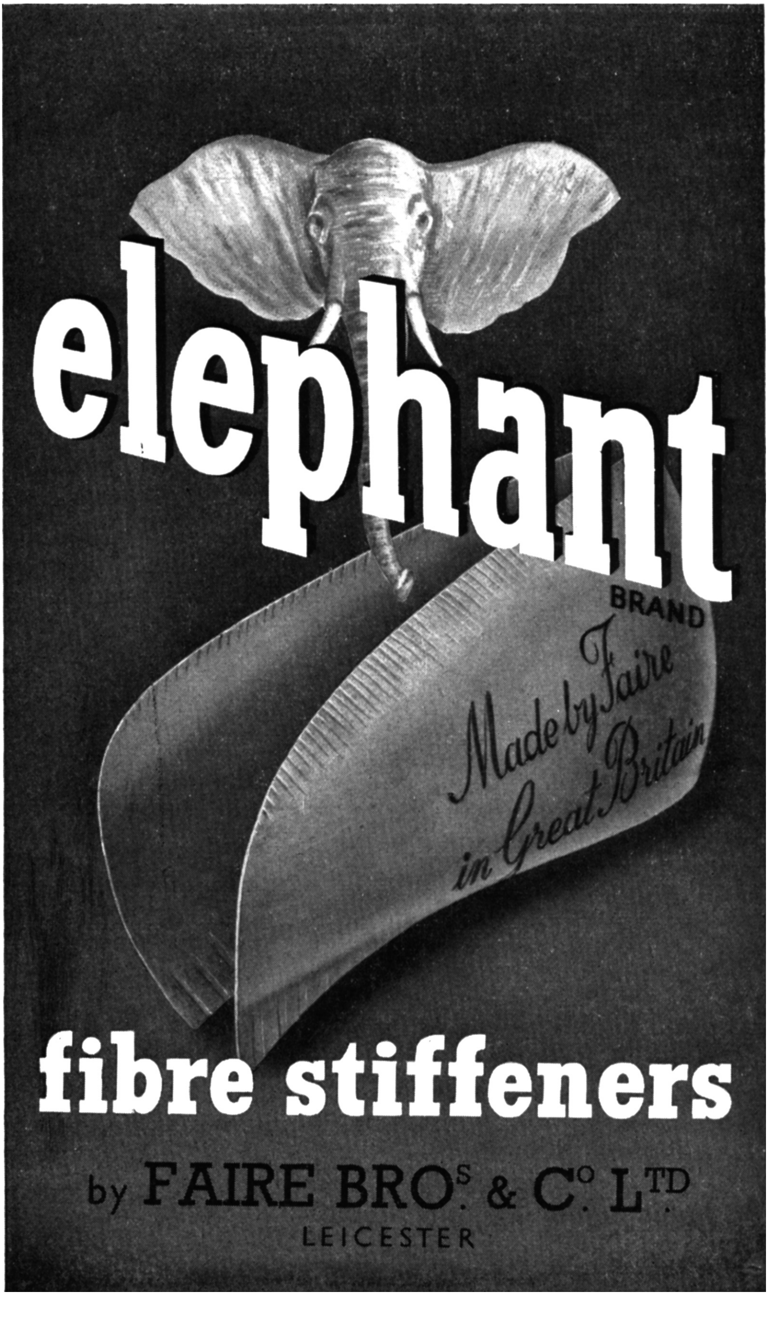
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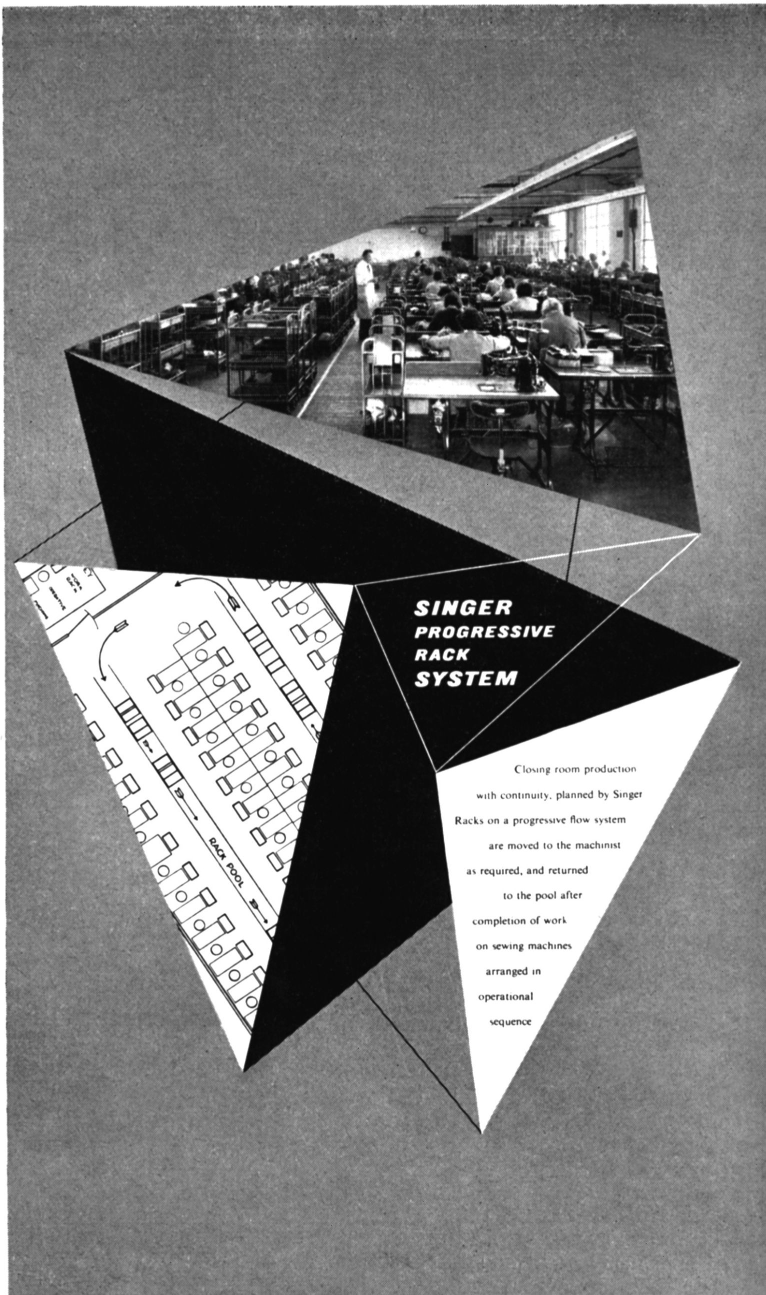

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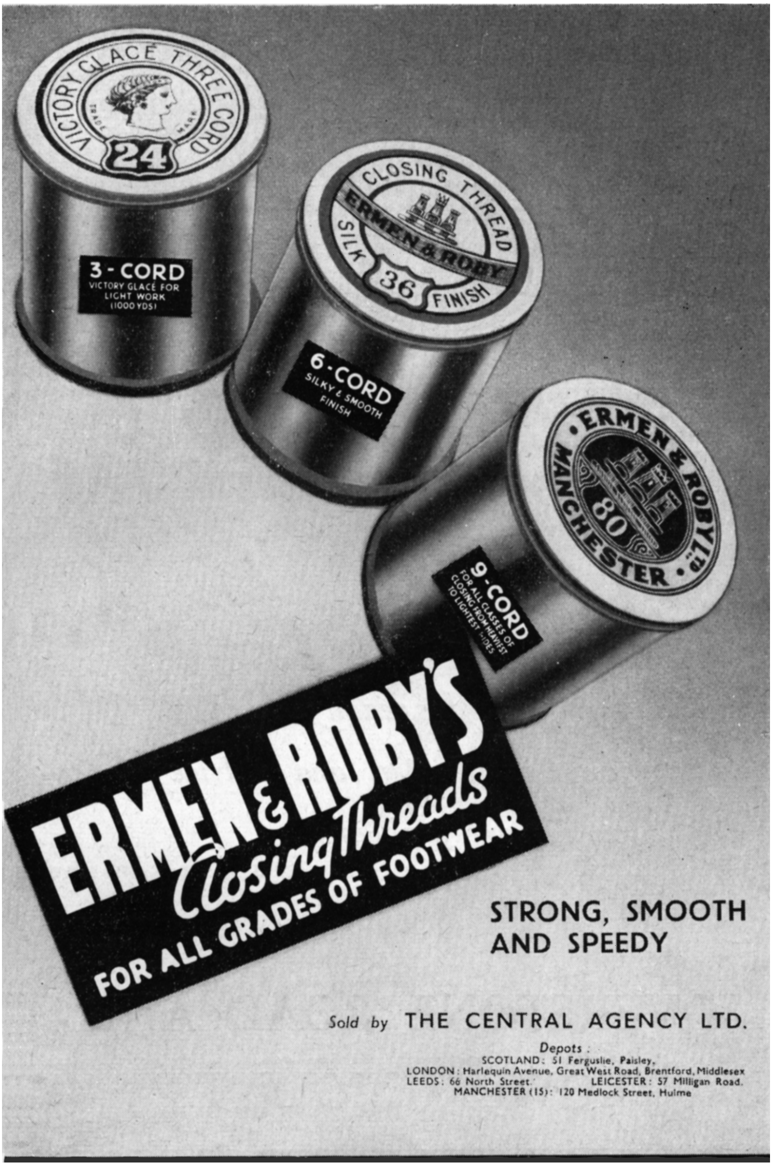
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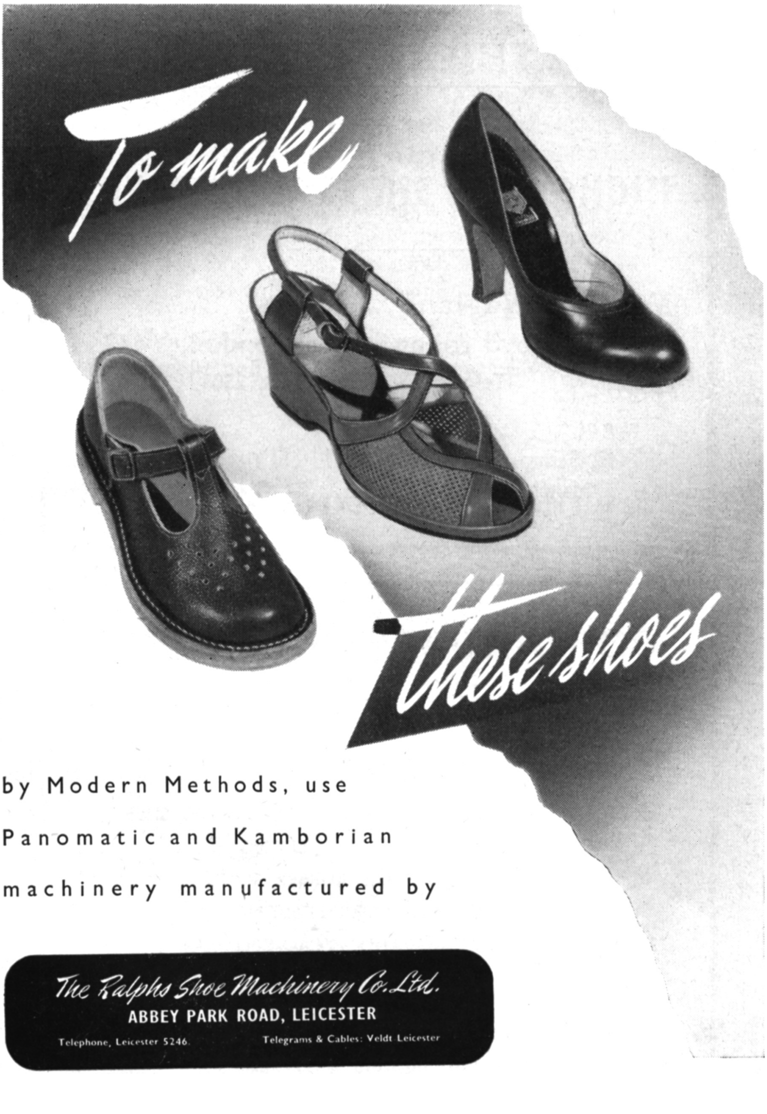
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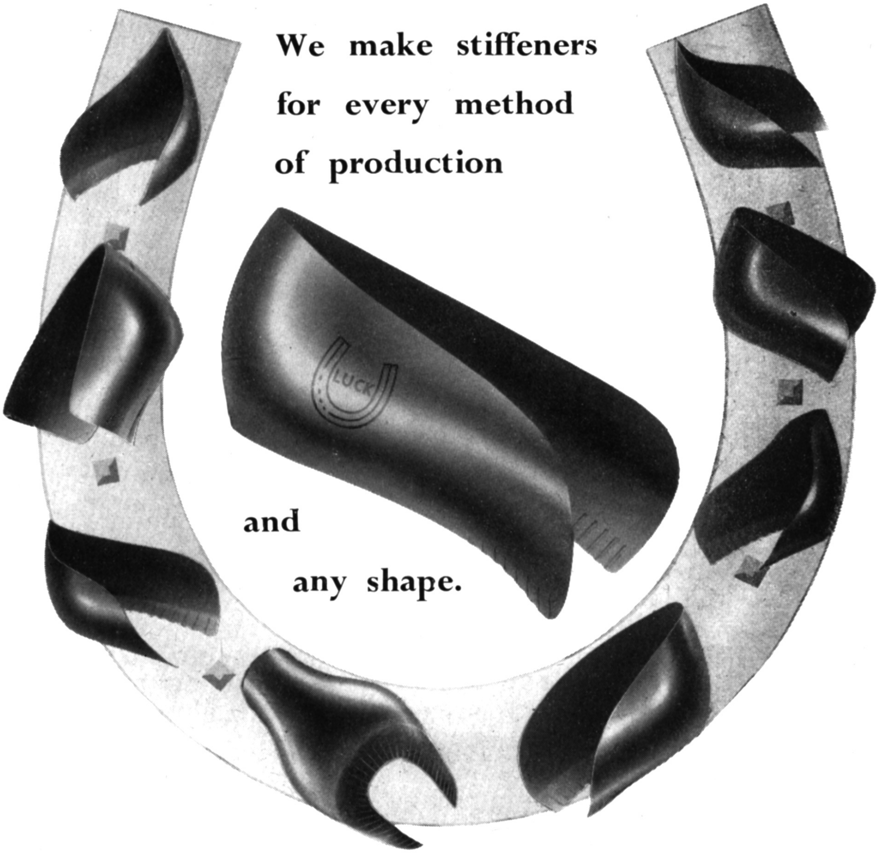

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