BOOTS and SHOES

THEIR MAKING MANUFACTURE and SELLING

VOLUME IV

WARDLEY
SABBAGE

COMPILERS NOTES

The following is a faithful digitalization of volume IV of F.Y. Golding's *BOOTS AND SHOES*.

I have taken the liberty of using this original 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.

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 – 28 June 2004

BOOTS AND SHOES

THEIR MAKING MANUFACTURING AND SELLING

VOLUME IV

LASTING AND MAKING

W. WARDLEY

THE FITTING UP OF LASTS

GEORGE SABBAGE, A.B.S.I.

BOOTS AND SHOES

THEIR MAKING MANUFACTURE AND SELLING

A WORK IN EIGHT VOLUMES

DEALING WITH PATTERN CUTTING AND MAKING. UPPER LEATHERS AND CLICKING, CLOSING THE UPPER, MATERIALS FOR BOTTOMING, CUTTING AND PREPARATION, LASTING AND MAKING, ATTACHING, FINISHING, SHOE ROOM WORK, FACTORY ORGANIZATION, ANATOMY, MEASURING AND OBTAINING DATA FROM THE FOOT, THE MAKING OF LASTS, THE FITTING UP OF LASTS, BESPOKE BOOKMAKING, HANDSEWN BOOTMAKING, RETAILING AND SALESMANSHIP

EDITED BY F. Y. GOLDING. F.B.S.I.

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SECTION VII
LASTING AND MAKING

BY
W. WARDLEY

Twenty-eight years Instructor at the Cordwainers' Technical College

PREFACE

DURING recent years there have been many remarkable and drastic changes in the boot and shoe industry, and the Lasting and Making branch has been no exception. In this section, the aim has been to give a general outline of the methods as used in the bench process, and their application to the machine systems.

The development of machinery, with its gradual elimination of hand processes, has tended to turn lasting into a number of minor but highly specialized operations. The actual process as now carried out by machine is subdivided into four or even five operations, each one separate and yet all closely connected.

By continual repetition of a single operation only, one is apt to lose sight of the important bearing that it has upon the ultimate results of the whole process, but with a knowledge of the fundamental principles pertaining to the whole, there is no such danger. For this reason also, both old and new methods have their place in the following pages.

My acknowledgments and thanks for the use of illustrations, etc., are gratefully tendered to the British United Shoe Machinery Co. Ltd. and to Messrs. George Barnsley & Sons, Ltd. I must also record my sincere thanks to Mr. F. Y. Golding, whose help and tuition in the past now enable me to place this treatise before you.

W. WARDLEY.

SECTION VII

LASTING AND MAKING

CHAPTER I
TOOLS

In the manufacture of boots and shoes, the lasting and making department holds a very important place. It is here that the outcome of previous processes, i.e. the uppers and the bottom-stock, meet; it is here that the component parts of the completed shoe are assembled and attached together; it is here that the shoe is built by methods suitable to the style and purpose of the footwear being made, or according to the factory system in vogue.

But before proceeding further with this part of the subject, it would be wise for the beginner to acquire a competent knowledge of the various tools required, their uses, and their adaptability to the various processes involved.

TOOLS FOR BENCH WORK

It is often said that a bad workman always blames his tools. However this may be, the question remains, "Which is to blame—the tools, the manner in which they have been kept, the way they are used, or the one who uses them?" Tools can be used or ill-used.

There is one thing certain, a good craftsman strongly objects to anyone else using his tools.

Bad tools and bad-conditioned tools spell bad work.

Buy the best tools, keep them in good condition, and learn how to use them.

One of the most important tools in a laster's kit is

The Knife

This tool can be used for various purposes, but it is best to keep one specially for shaping and skiving only. The one selected for this purpose should be broad-bladed, of full

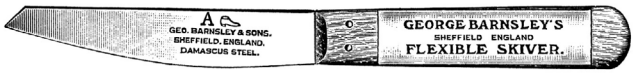

Fig. 1

length, and fairly rigid (as Fig. 1). A blade that is too pliant is worse than useless for good skiving. A good skiving blade may also be obtained of the Swedish type (as Fig. 2).

Fig. 2

Another important part of the kit is the knife's "mate,"

The Buff-strop

This is not actually a tool, but without it the knife soon becomes useless.

Buff-strops can be bought, or made, either flat (two-sided) or square (four-sided)) with a shaped handle, and the flat portions about 12 or 14 in. long. To one of the flat sides should be fastened a piece of emery the full width of the strop; to the other side should be attached a piece of leather. The emery should be fine in grade, as coarse emery tends to "fire" the blade in sharpening, and produces a wire edge to the knife.

The square buff-strop may be used for two or three grades of emery, according to needs, and one side for leather.

To Sharpen the Knife

For skiving, hold the knife *flat* on the emery, with the full width of the blade from the back to the cutting edge; then pass it straight down the emery the full length of the strop, sharpening from the point of the knife to the shoulder of the blade. After a few passes in a downward direction, turn the knife over (still keeping it flat on the emery), and make a few passes in an upward direction, to obtain a long cut on the blade. Continue these motions until satisfied that the knife is sharp) then turn the strop over, making a few passes up and down on the leather side to remove any wire or burr caused by the friction on the emery. By now the knife should possess a keen edge and be ready for business.

These knives, as they wear down, become handy for smaller jobs in later processes.

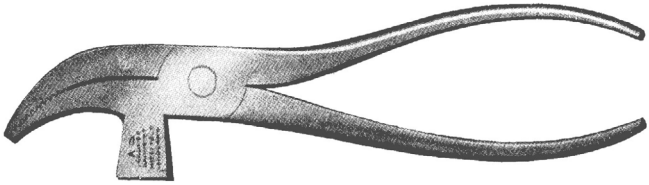

Fig. 3. Pincers

The Pincers

These are made in many different shapes and sizes, and should be selected according to the different kinds of work to be done—as large size for heavy work, smaller size for lighter work, narrow jaws for narrow-shaped toes, etc. (See Figs. 3 and 4.) An all-round

bench-laster should provide himself with three or four pairs of pincers of different sizes and shapes for different kinds of work.

This is a tool with which to apply strain to the upper, to pull the upper into position on and over the last,and one great point

FIG. 4. SWEDISH PATTERN PINCERS

to consider when selecting this tool is the amount of leverage it possesses, and how to apply this leverage to the best advantage.

Another handy tool similar in its use, hut unlike in shape to the ordinary pincer, is the

Bulldog Pincers. (See Fig. 5.) These can be used for lasting

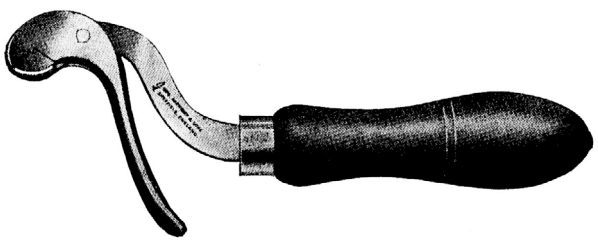

FIG. 5. BULL-DOG PINCERS

in the waist or shank of the upper, enabling the laster to overcome the difficulties of a tight upper at that point or excessive curvature in the waist of the last between the joints and. the heel-seat. It is a dangerous tool to use unless care is taken not to use it transversely across the waist.

The Hammer

Hammers are also made in various sizes and shapes and are intended for different purposes.

Double-faced Hammer. (See Fig. 6.) This type of hammer

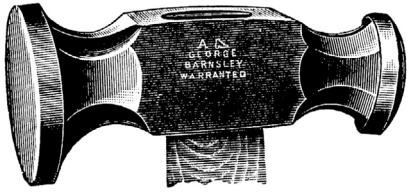

Fig. 6. Double-faced Hammer

should be selected in size for heavy or lighter grades of work. Probably, a medium-sized hammer, size 3 or 4, is the most suitable for all-round purposes. It can he used where hammering is required, as in bottoming and channel-laying.

In selecting, notice the face of the hammer, and select one not too convex and not flat. The reason for this is to prevent marking or indentations on the material, and to spread the material outwards in the proper direction. A flat-faced hammer will always produce circular or semi-circular indentations in the sole, sometimes ruining the whole of the bottom-stock or at least causing a lot of trouble in the finishing process.

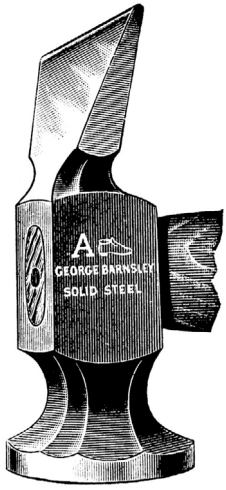

Fig. 7. London Pattern Hammer

The large face of the hammer is intended to be used for levelling and bedding the sole in the forepart

and seat, the small face for bedding and shaping the waist.

The Single-faced Hammer. (See Fig. 7.) Also known as the London pattern hammer, this is intended for assisting in the lasting of the shoe, tapping-up, levelling the lasting allowance of the upper material, and defining the feather line of the shoe, etc.

The Driver. (See Fig. 8)

This can be bought already shaped or can be fashioned. An old half-round finisher's file with the ends broken off to about

Fig. 8. The Driver

10 or 11 in. long will make a very handy driver. It is used for the driving of brads, sprigs, etc., and for securing the sole-seat, and is far superior to any other tool for nail-driving.

Drivers should be made slightly smooth on the half-round side—not too smooth, but the roughness of the file taken off. This can be done on the grindstone or emery-wheel, and they then make a handy tool for channel-laying, providing they are not too smooth to lose the grip on the channel, or so rough as to rasp the channel off.

Fig. 9. Cutting Nippers

The Cutting Nippers. (See Fig. 9)

These handy tools are intended for cutting off brads, nails, or rivets, according to requirements, as in machine-

sewn work, "blinding the sole on," a process of temporary attachment preparatory to sole sewing.

The Sleek-stick

This tool can be made from a piece of wood, preferably box-wood or some other hard wood that will resist wear, and is about 15 in. long, $1\frac{1}{4}$ in. wide, and about $\frac{3}{4}$ in. or 1 in. thick. It is oval-shaped, and the centre 6 in. of the flat oval side are hollowed out with a convex curve to form two notches about $\frac{1}{4}$ in. deep.

This tool is used in the channel-laying process after the shoe is sewn.

The Toe-beater

This is a curved shaped tool used for levelling and defining the feather line of the shoe around the forepart and seat, especially on machine-sewn work after sole sewing.

One end should be shaped to fit the curvature of the last around the forepart, and the other end practically flat to take the shape of the last around the base line of the seat.

The ends of this tool should be kept perfectly smooth to prevent damage to the upper in use.

The Channel-opener

This can be bought or made, and is used for opening the sole channel ready for the sewing or stitching. It should be shaped so as to throw the channel well open with the lip of the channel turned inwards towards the centre of the sole so as to avoid the needle of the machine during the sole sewing operation.

The Tack-knife

This is a small tool used for the removal of superfluous or unwanted tacks.

The Shoe Lift

This is used for easing the shoe back on to the last after sewing. Great care must be exercised, as much damage to the upper can be done by the improper use of this tool.

The correct method of using is to place the shoe lift well into the back of the shoe when stretching the heel portion of the shoe over the seat end of the last, then gradually to ease the shoe lift out as the shoe assumes its position on the last. By this means stretching the quarters of the shoe in length by the extra substance of the shoe lift is avoided, and the gradual easing out of the shoe lift prevents over-straining of the quarters and the bursting of the back seam.

Skiving Slab

As an adjunct to a laster's kit, especially a bench-man, this may be just a flat board, planed smooth, but if so it is apt to get cut and splinter up in wear. A flat board covered with zinc is better, or a marble slab is better still, and in some instances an old large flat-bottomed iron last is used. Whatever is used, the surface must be smooth to ensure good work.

The skiving slab is used for all skiving of stiffeners, toe-boxings, fleshing of soles, etc., and the preparation of work of all kinds.

Other odds and ends are required, such as brushes for water or paste, a paste-pot, and sprinkle tin for French chalk, etc., and may be easily obtained.

These are the main tools comprising a laster's kit, and, after careful selection, they should be kept in good condition to be always ready for use.

Good tools, well-conditioned tools, and tools used properly spell "Good Work."

CHAPTER II

BENCH LASTING—-MACHINE-SEWN SYSTEM

BEFORE proceeding with any actual method of lasting, there is a lot of work and skill required in the preparation of the component parts to be used.

A bench-man usually has his work given out in complete sets, which may be in single pairs or in lots of greater bulk. He should see that he has his full complement of components.

In machine-sewn work with machine-attached heels, known in the trade as "channels down," a "set of stuff" should consist of 1 pair of innersoles, 1 pair of heel stiffeners, 1 pair of toe-boxings, 1set of side linings (4), 1 pair of soles, 1 pair of middle-soles (if double-soled work), 1 pair of uppers, 1 pair of shanks and material for bottom-filling, 1 pair of lasts, and, of course, the description ticket.

PREPARATION OF COMPONENTS

The bench-laster now proceeds to prepare the component parts, to which reference has been made.

It must be understood that this is dealing with an all-leather shoe, and in this instance the whole of the bottom-stock has been press-cut, i.e. patterns have been taken of the last's bottom shape, and press knives or dies have been made to these patterns. The innersoles, soles, and middle-soles are then "died" out under the press, and this also applies to the various shapes and sizes of heel-stiffeners and toe-boxings, so that in this case there should be very little *shaping* required.

The bench-man commences by wetting, or rather mellowing, the heel-stiffeners, toe-boxing, and soles.

The process of mellowing is one that should be thoroughly understood. It is not just dipping the material in and out of the water; nor is it leaving the material soaking in the water for an indefinite period.

The Process of Mellowing

A large earthenware or enamelled pan should be obtained deep enough to cover completely the materials being soaked. Any old pan or tin will not do, as, in soaking, the bare iron coming in contact with the leather causes a deep black stain on the material, which, in the case of sole leather is an eyesore to the appearance of the bottom, and a great detriment to the finishing process. This stain is caused by the salts of iron coming in contact with the tanning agents or tannic acid emanating from the material being soaked. The same thing occurs if damp or wet leather is placed on iron tools upon the bench, and is a point to be guarded against.

The material should be placed in clean water and completely covered, not half in and half out, as this causes stains and shadings in the colour of the material.

If a little mulling liquor is added to the water, it greatly adds to the softening, tempering, or mellowing effects on the leather.

The duration of soaking is governed by many factors peculiar to the material being used, such as substance of the material, denseness of fibre, quality of leather, and the various tannages. As a general rule, the material should be thoroughly soaked until quite supple, then taken out and laid on one side (preferably in a dark corner) to allow all superfluous water to drain off, and the fibres to become thoroughly impregnated.

If it is not to be used at once, a good plan is to wrap the material in a cloth or brown paper and keep it in

the dark. This will keep the material in a mellow condition for a very considerable time.

In this condition it will be found that the material can be skived much more easily, and better results can be obtained than when the material is in any other condition.

Heel-stiffeners

These are cut in various shapes and sizes to suit the different sizes of footwear, the different designs of uppers, and the different styles and purposes of the boot or shoe.

They are sometimes termed "counters" especially in American shoe circles.

Length of Stiffener

In the ordinary methods of manufacture, the stiffeners are usually graded and cut in sizes, three sizes for ladies' work, and three sizes for men's work.

Ladies' sizes in lasts usually range from size 2 to size 7, and press knives are made to cut, small size for 2 and 3, medium size for 4 and 5, and large size for 6 and 7.

Men's lasts usually range from size 6 to size 11, and stiffeners are cut, small size for 6 and 7, medium size for 8 and 9, and large size for 10 and 11.

These sizes are calculated as being suitable for average requirements.

There has always been a controversy as to how long the stiffener should be, or how far it should extend into the waist of the shoe. When we see so many different shapes of last, each one with its own individual lines and curves, and notice the great care that is bestowed on the making and selection of these, it makes one feel sure that the ideal stiffener should extend far enough into the waist to reproduce in the completed shoe the

various lines, curves, and characteristics of the back part of the last being worked upon; otherwise we defeat one of the objects of the heel-stiffener, namely, "contour."

The same thing applies if the wrong size or shape is used for the work in hand.

Sometimes the design and stitching of the upper prevent the ideal stiffener being used, and in that case details must be sacrificed for fashion.

Height of the Stiffener

This is an important point in lasting, and one that the laster should study.

The stiffener at the back should be high enough to give all necessary support to the seat portion of the shoe, but not high enough to prevent the top edge of the quarters gripping inwards towards the last, or to interfere with the extending or flexing of the foot in wear. In practice it is found that an average suitable height at the back is about one-fifth the entire standard length of the last.

In machine-sewn work, $\frac{1}{2}$ in. is allowed for lasting-over the feather of the seat. The laster should therefore see that he takes just the $\frac{1}{2}$ in., no more and no less, and this should give the correct height required and full solidity to the seat of the shoe. If more than $\frac{1}{2}$ in. is taken over, it reduces the support in the heel of the shoe and produces a large and bulky seat, out of proportion to other parts of the shoe. If less than $\frac{1}{2}$ in. is taken over, it results in loss of solidity in the seat and is one of the great causes of the shoe treading or spewing over the seat end of the sole in wear.

Shapes of Stiffeners

There are many and various shapes of stiffeners used for different purposes and different kinds of work,

affecting mostly bespoke making, but as this Section is dealing with the ordinary methods of making we will confine it to the two more common shapes of stiffener in use—

1. *The Shoe Stiffener.* (See Fig. 10.) This is shaped with a round curved top edge, and the bottom edge or lasting

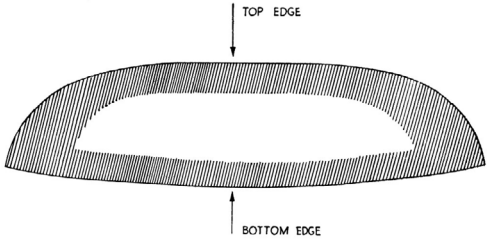

FIG. 10

allowance with a slight oval curve. This bottom shape allows it to conform to the curvature around the seat of the last.

2. *The Square or Golosh Stiffener.* (See Fig. 11.) This is a boot stiffener, used mostly in boot uppers of golosh pattern or

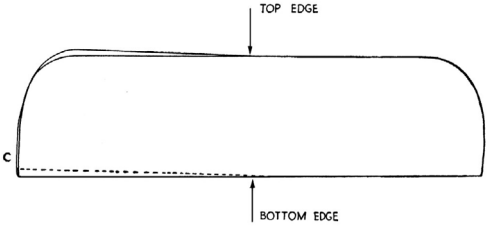

FIG. 11

whole cut vamps, i.e. vamps cut and extending right through to the back seam.Such a stiffener is shaped practically square, except that the bottom edge is a little longer than the top edge, and is used to support the line or range of golosh along

the sides, thus preventing the golosh from sagging down, or the strains used in lasting from pulling the line of golosh out of the straight. *C* in Fig.11 shows a portion removed to ensure good gripping properties of the top edge.

Skiving the Stiffener

This is a very skilful and important operation, as a great deal of the comfort and appearance of the completed shoe depends on the manner in which it is done. This is proved by the care and attention that have been given to the process in later years, but even now in some grades of footwear it leaves much to be desired.

The principle involved in the process is to reduce the stiffener in such a manner as to be invisible in the completed shoe, to be perfectly smooth on the inside to prevent friction with the foot, and yet give all necessary support to the heel portion of the shoe, to maintain its shape, and be strong enough to keep the foot forward in the shoe in walking.

Assuming that the material has been mellowed, we can now proceed with skiving. The width of the skive is partly governed by the substance of the stiffener—for a stout stiffener a wider skive and more reducing, for a light stiffener less—but as stiffeners are now generally graded for substance we can strike an average.

The bottom edge should be skived $\frac{1}{2}$. in. in width, which will bring when lasted the base line of the skive to the feather edge of the seat, leaving the half-inch skive for bending and lasting-over.

The top edge should be skived $\frac{5}{8}$ in., reducing the stiffener from thick to thin without any visible signs of the knife having been employed.

It will be noticed in most lasts that the heel (just where the breast of the heel comes) is where the curvature of the last begins to drop into the waist. As it is

our object to reproduce the contour of the last, and this is just the point where the corners of the skived stiffener come, we must reduce the stiffener here and widen the skive to follow the curvature of the last. (See Fig. 10.)

A wrongly-prepared stiffener will produce many bad effects at this point. A thick stiffener, or one with a stunt skive, will produce a bulge in the waist just beyond the corners of the heel, a thin or over-skived stiffener will leave a weakness, or cause a "dropping-in" when the shoe is slipped off the last. These effects tend to spoil the whole symmetrical outline of the shoe, and this shows the need for careful skiving.

There are many mistakes made in skiving. A skive too stunt, or a bevelled skive, is worse than useless, and a knife too pliant just buckles and produces a hollow skive. These show up in the shoe and tend to spoil the appearance.

It is no use just tickling the material with the point of the knife, or sawing at it as if carving meat. There is only one correct skive, that is, a flat skive without ridges, reducing the material from the thick right out to a feather edge. This is obtained by holding the knife firmly and at the correct angle, and taking a long sweeping cut practically the whole length of the blade, from the shoulder of the blade to the point, maintaining the same angle all the way through the skiving.

There are two sides to a piece of leather, the grain side and the flesh side. The grain side is the harder, and the flesh side can therefore be skived away, reducing the substance of the stiffener without interfering with the firmness and wear-resisting qualities of the material to any great extent. For this reason it is usual to skive on the flesh side, unless it is a very hard-grained stiffener that is liable to cut through the quarters of the shoe

in wear ; then both sides may be reduced to advantage.

The stiffener is placed in the shoe in a mellow condition, but in drying there is a tendency for the grain to curl at the top edge. The curl is always in an outward direction, showing up the outline of the stiffener in a light upper. In order to prevent this, when the skiving is finished on the flesh side, turn the stiffener over, and skive off just a narrow margin of the grain along the top edge. This leaves about $\frac{1}{16}$ in. of the softer flesh part of the stiffener, which is a preventive to curling, and also helps the stiffener to bind tighter around the curvature of the last.

By now the stiffener should be correctly skived, leaving the full required substance in the elongated centre. This gives when lasted a firmness around the base of the seat and a suppleness to the top edge.

The beginner is often puzzled as to the way in which he is going to get the $\frac{1}{2}$ in. lasting allowance all round the curved bottom edge of the stiffener. This curve has been especially designed in this shape of stiffener, and may be termed the "draft" of the stiffener or rather the means by which the stiffener is made to conform to the shape of the last.

Drafting the Shoe Stiffener. (See Fig. 12)

In the lasting of the shoe, when the seat of the upper is pulled down to its correct position, the laster should have acquired just the bare $\frac{1}{2}$ in. of stiffener over the feather of the innersole at the back seam.

It will now be noticed that the ends of the stiffener probably fail to reach the feather of the innersole around the sides of the seat, and in order to obtain the $\frac{1}{2}$ in. lasting allowance the laster is compelled to pull the corners of the stiffener upwards towards the waist of the shoe. These pulls have the effect of drawing the top edge of the stiffener inwards and giving a grip around

the sides of the seat, and their ultimate result depends on the manner in which they are taken.

The correct method of drafting the stiffener is first to take a pull on the corners of the stiffener lengthways towards the joint—this should remove any possible stretch that there may be in a mellow stiffener—then with a twist pincer movement to bring the corners of the stiffener upwards and over the sides

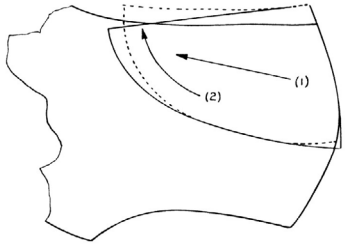

FIG. 12

of the seat, binding the top edge tightly around the thin part of the last.

In lasting a golosh stiffener (which is intended to support the range of the golosh in a boot) this must not be pulled away from the line of the golosh. Such a stiffener is cut more square along the bottom edge and the $\frac{1}{2}$ in. lasting allowance is obtained more easily. Again, the golosh stiffener is intended for a boot, and if we examine a boot last we find it is much thicker round the top portion of the seat and along the sides than a shoe last; consequently, the stiffener does not need so much drafting to bring it in tightly to the sides of the last.

The shoe last is hollowed out at this part, to allow the top edge of the quarters to bind in tightly and give a grip to the shoe around and under the ankle on the foot; hence the need for more careful pulling and drafting at this point.

Fitting the Toe-boxing or Puff

This is another very important item in the lasting and making of footwear, to which much thought and attention have been given of later years, and the laster would do well to consider the special needs and requirements of the ideal toe-box.

When we come to consider the many different designs of footwear (all of which have to be boxed), the many different shapes of last (the lines and contour of which have to be reproduced and retained in the completed footwear), and the many purposes and conditions to which the boot or shoe is subjected, then the question becomes a vexed one as to the most suitable material to use for toe-boxing under all conditions. There have been many substances and materials used and experimented on in the past, and they are still being tried out.

We have only to glance down the trade papers and see the number of different toe-boxings advertised, each with its own qualifications for various conditions, to know that one kind of toe-box is not suitable for all makes of footwear, all climates, and all conditions. Although great improvements have been made in this direction of late years, the ideal toe-box for all-round purposes, and answering every requirement, has yet to be found.

The requisite properties appertaining to the toe-box of an ordinary walking shoe are firstly slimness, to reproduce the shape of the last; secondly, firmness, to maintain the shape, to keep the toe from spreading out, and to retain the correct length measure inside the shoe; thirdly, resiliency, that is, firm around the feather line, the sides and top of the toe, but supple towards the toe joint.

For other kinds of footwear this firmness and suppleness must be modified according to the style and

purpose of the boot. For instance, a very heavy hard-wearing boot would require a much harder boxing to stand the strain and stress placed upon it, and a football boot would require a still harder boxing to give full protection to the toes of the wearer.

Amongst the many materials used for this purpose that answer to average requirements may be mentioned some of the prepared puffs, celluloid and leather.

Many kinds of the prepared puffs or boxings are made of layers of canvas or similar material solutioned together, each layer being a little smaller than the other, so as to give full substance in the centre and thin towards the edges in the same manner as skiving. These are softened and placed in the upper without any further preparation, setting very hard after the lasting is completed.

Celluloid

Celluloid is a hard elastic compound, obtained by hydraulic pressure from pyroxylin mixed with camphor. It is made in various substances, and can be cut under the press to any shape required. It makes a very sleek, firm, but resilient toe-box, and probably the greatest drawback is its preparation.

For the softening of this material an airtight tin should be procured, fitted with open-mesh wire shelves, after the manner of an oven. At the bottom should be placed a layer of felt or cotton-wool, saturated with methylated spirit, and the shaped toe-boxings placed upon the shelves. The fumes of the spirit percolate through and so soften the celluloid. It is far better when softened by the fumes only, as if allowed to come in contact with the raw spirit for any length of time, the celluloid becomes creased, wrinkled, and curled, and is apt to run thin and weak in places.

The process of softening takes from 12 to 24 hours, according to heat conditions.

When softened, celluloid can be skived quite easily, is very smooth and supple in the lasting process, and sets very firm and resilient after evaporation has taken place.

Leather

This probably makes one of the best all-round toe-boxings for everyday use. After mellowing, it can be shaped to any

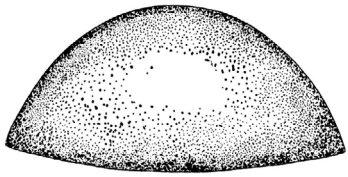

Fig. 13

design of toe-cap, it can be used in plain front work, and it can be skived and fitted to any shape of toe; it can be skived thin or left thick to suit the firmness required, it lasts in easily if fitted properly, moulds well to the last, and sets firm in the lasted shoe.

The shape of the toe-box is an important matter. For a capped shoe (see Fig. 13) the box should be practically the same size as the cap, so as to reinforce completely the whole of the cap and to prevent any break occurring between the edge of the box and the machining line of the cap.

The toe-box for plain front work should be fitted to the shape of the last, carried far enough back over the toe to hide itself into the curvature of the last, making it invisible from the outside, but not so far as to interfere with the bending of the foot, and should be strong enough to support, reproduce, and retain the full height of the toe of the last.

The skiving of the toe-box should be carried out in the same manner as the skiving of the stiffener, reducing it all over to the correct substance required, the straighter edge to be skived down, leaving no ridge to show or assert itself across the cap, the rounded edge to be skived away to give a bare $\frac{1}{2}$ in. of lasting allowance over the toe, bringing an even graduated substance of the toe-box around the feather line of the toe. This should give the firmness around the base which is so necessary to a well-lasted toe.

Side Linings

These may be made of various materials, such as linen, canvas, or leather, and used according to the quality and grade of the footwear being made. No doubt the leather side lining is the best, but it is too expensive for the cheaper grades of work.

The object of using the side lining is to continue the support around the feather line of the shoe between the ends of the heel-stiffener and the toe-box.

The waist, under the joints, and the forepart have to stand the whole strain of the bending and flexing of the foot. These parts of the shoe cannot be made rigid as in the heel portion and the toe, because it would interfere with the flexibility of the shoe in walking, but some additional support around the feather line of the shoe is required to stand the strain and stress placed upon it at these points. Hence the necessity of a light but good side lining.

The length of the side lining varies according to the design of the upper. For a capped boot or shoe it should extend from the skived end of the stiffener to lap just over the skived edge of the toe-box. In plain front work the side lining should extend further, practically up to the end of the sides of the toe.

The shape of the side lining should conform to the

curvature of the last along the sides, that is, fit close and snug without puckers or wrinkles. The side lining should be neatly skived to a feather edge along the side that is inserted in the upper and at the ends where it meets the stiffener and toe-box.

This skiving and fitting of side linings seem trifling and unimportant, but nevertheless play a great part in the ultimate appearance of the finished shoe.

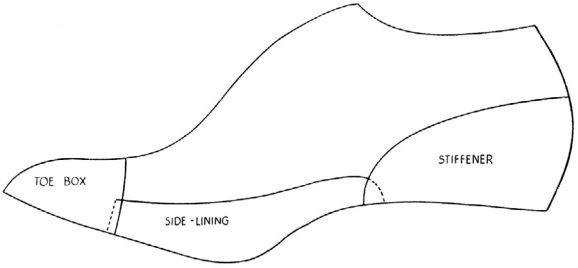

FIG. 14

ASSEMBLING THE UPPER

The sections to which reference has been made, having been correctly prepared, can now be placed in the upper in their respective positions. This is known as assembling the upper, and consists of the correct insertion of the components to reinforce the upper at the desired positions. (See Fig. 14.)

This, too, may seem a small matter—the stiffener goes in the back, the toe-box in the toe-end of the upper, and the side linings along the sides. That is right, but here again is where the details count for such a lot in the ultimate results. Take, for instance, the

PLACEMENT OF THE HEEL-STIFFENER

There has always been some controversy as to whether the stiffener should be inserted with the flesh side or the grain side to the lining of the upper. Some advocate

placing the grain side to the lining, as it is the smoother side, and hence gives a smoothness to the inside of the shoe and prevents any likely friction to the foot at this part. On the face of it, this idea seems good, but if the skiving has been done properly there should be no cause for friction.

The quarter linings of the shoe are mostly placed with the grain or smoother side to the foot, thus bringing the flesh or rougher side to the stiffener. The stiffener has to be pasted to keep it in position, and it is a well-known fact that paste adheres better to a rough surface than a smooth one. If, therefore, the stiffener is pasted on the flesh side and inserted with the flesh side to the lining, the two flesh surfaces are brought together, the paste binding the two parts fast, and when the lining has been strained up and smoothed out as in lasting, this should prevent any looseness of lining, wrinkles or puckers occurring inside the shoe, and leave the smooth or grain side of the stiffener to give a smooth impression on the outside.

Again, the pasting of the stiffener calls for consideration. It was the usual thing at one time to paste both sides of the stiffener, binding the quarters, the stiffener, and the lining all together, the idea being to prevent movement of these sections in wear. This may have answered the purpose with the older kinds of upper leathers and the older styles of footwear, but with our present-day varieties of leather and designs of uppers it would prove a failure and be detrimental to the shoe.

Paste in drying tends to draw and contract, and on the under side of light or delicate leathers proves pernicious, as if any shrinkage takes place in the drying of the stiffener or toe-box, the paste adhering to the quarters or toe-cap will draw it into innumerable small wrinkles. Paste on the under side of patent leathers is fatal, and should never be allowed.

We should be able to press the stiffener slightly inwards (as we do in testing the "grip" or "draft" of the stiffener) without drawing the quarters in with it. Therefore the stiffeners and toe-box should be pasted on one side only—the flesh side—in all the lighter grades of work. If used on both sides at all, it should only be on the very heavy grades of footwear, to add to their rigidity.

The stiffener should be pasted all over (except the edge to be lasted-over) evenly and smoothly, then inserted in the upper between the quarters and the lining, care being taken that the edge of the stiffener is not curled over, but placed in level with the edge of the upper, and to give equal proportion from both sides of the back seam.

This can be done quite easily by inserting the thumb of the left hand between the lining and quarters of the upper, and with a slight twist of the wrist opening the lining away from the quarters. Then, with the right hand, take the stiffener centrally between the thumb and fingers, inserting the centre of the stiffener level with the back seam of the upper. This gives equal support to the stiffener on both sides of the seat.

The lining should then be brought back into place, and all looseness and wrinkles smoothed away towards the bottom edge.

Sometimes the quarter linings will be found rather full or foul. If too foul, then they are almost sure to produce wrinkles somewhere round the seat in the finished shoe, but if only slight these can be cleared away during the lasting process.

The best method is to make sure to clear the lining at the back seam first, bringing any looseness to the sides of the seat. Then give the upper a stretch lengthways with the hands, or place the seat of the upper over the stand of the jack and pull lengthways with

both hands, or anywhere where the resistance of the pull comes directly on the back seam. This will help to remove some of the looseness, and the remainder will be taken up by the stretching of the upper over the toe in the lasting. The whole principle is to make sure to remove any pleat or wrinkle from the back seam, as this will prove unsightly in the shoe and very uncomfortable to the wearer.

Placement of the Toe-box

For a capped boot or shoe the toe-box should be positioned at the time of assembling. If of the leather variety it should be placed either between the cap and vamp or between the vamp and lining, each of these positions having its advantages and disadvantages.

The principle of the process is to box or stiffen the whole of the cap to prevent any falling-in or wrinkling occurring in wear. This may prove easier with a leather-lined shoe, as the toe-box can be placed between the vamp and lining, brought back to the full length of the cap, and so give it its whole support and the leather lining help the box to retain its position.

But this method is apt to prove a failure with linen linings, as the edge of the box may become loosened and curl up with the heat and perspiration of the foot, making it very uncomfortable to the wearer. In this case there is only one of two things to do, either find a paste or cement that will not be affected by wear, wet, heat, or perspiration, and will remain fast during the life of the shoe, or place the boxing between the cap and the vamp.

This latter should be very carefully done. The toe-box should be carefully fitted to the shape of the row of machining across the cap and placed as close to it as possible. A good paste or cement should be used to hold it firmly in position, and should be smeared all

over the flesh side, not thick but very "tacky" to keep it from slipping.

The great fault with this method of boxing, even after good positioning, is that when the upper is pulled over the toe, there is great danger of the boxing slipping or riding forward from its position, causing a "break" between the edge of the box and the machined line of the cap, which is apt to fall in and wrinkle in early wear. This shows the need of a good and quick-drying adhesive for this kind of work.

The tendency of the box to come forward is worse in greasy or very stretchy uppers. To prevent it, a method is sometimes used called "casing" the toe, that is, the boxing is fitted and machined in with the cap in the closing room, leaving the wetting, etc., to the laster.

In plain front work, the toe-puff or boxing is usually placed into position during the process of lasting. This gives the laster a better chance to place it correctly, as the only guide he has to work to is the shape of the toe.

Placement of Side Linings

Side linings should be placed between the vamp and the lining of the upper, extending from the stiffener to the toe-box, long enough to prevent a gap at either end, but not so long as to cause a bulge at the sides of the cap by the added thickness.

The skived edge of the side lining should lap evenly over the skived end of the stiffener, extending forward to lap evenly over the skived edge of the toe-box, thus giving an even continuity of support around the entire feather edge. For plain fronts it should extend further along the last to the sides of the toe, lapping evenly under the skived edge of the puff.

Side linings should be placed evenly with the edge

of the upper, and be lasted-over just the bare $\frac{1}{2}$ in. allowed. If paste is used to position them, it should be very temporary and placed just along the edge of upper or lining and lasted-over. In no case should the paste be allowed to extend upwards beyond the feather of the shoe, as when dry this would give the sides of the shoe a lumpy appearance, and a brittleness to the touch instead of the soft smooth feel that a light material should possess.

In bench lasting the side lining can usually be placed into position after the first pull over the toe, thus entirely avoiding the use of paste.

Before proceeding with the actual lasting of the shoe, we must give our attention to

The Innersole

It will be noticed that the last used for machine-sewn work is iron-plated along the bottom, for clinching the tingles used in the lasting. Along the centre line of the bottom will be found two or three plug holes through the plate, one towards the toe, one at the joints, and sometimes one at the seat. These are for the temporary positioning of the innersole.

The innersole should be slightly bent and shaped with the hands to conform to the roundness of the bottom of the last, both lengthways and transversely. It will then be found much easier to position on the last and make it easier for the lasting process. (This will not be required if the insoles are previously moulded.)

The innersole can now be positioned on the last by placing it *level* with the plate all round, and temporarily secured with brads driven through the innersole into the plug-holes of the last. The brads should not be driven right home, but left standing up a little to be pulled out when the lasting is completed.

The innersole, being press cut to shape, should not require any further shaping, or very little. We do find sometimes that the innersole is a little too long and projects over the seat end of the last. This may be due to a floating edge imparted by the press knife or some other cause, but the correct fit of the innersole should be ascertained by pressing it down into the dip or hollow of the waist to bring it in contact with the last. If it is then full at the seat, that amount of fullness should be rounded off. The seat trimming should follow the same curvature or fall into line with the curvature down the back of the last.

Nothing looks worse in the completed shoe than a projecting innersole at the seat. Not only does it appear full, making it impossible to get a close seat, but it looks badly lasted, spoiling the appearance and causing a deal of trouble in the later processes.

Shapes of Innersole

There are various shapes of innersoles used in machine-sewn work for different kinds of footwear.

For ladies' and light walking shoes, the narrow or bevel waist shape is used. For heavier grades and men's sewn and stitched-to-heel work, the square waist is used.

The inference is, therefore, bevel waist for light work, square waist for heavy work.

Feathering the Innersole. (See Fig. 15)

Assuming the innersole to be correctly positioned, mark off the heel-line, i.e. about one-fourth the length of the innersole from the seat end to where the breast of the heel would come, then chamfer or bevel the innersole right round with the exception of the heel portion marked off.

This is called "feathering," as the edge of the innersole is then known as the "feather" of the shoe. The feather or skive should be one-eighth of an inch wide, and taken down to about half the substance of the innersole. This is an important point, and in every instance the $\frac{1}{8}$ in. should be maintained and never exceeded.

The reasons for this feather are many, and to the beginner, rather obscure. Firstly, it is to give an even, clear, and definite

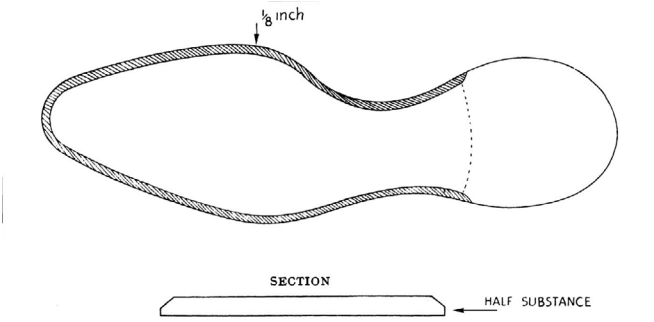

FIG. 15

outline around the shoe; secondly, it acts as a "hinge" between the upper and the bottom parts of the shoe—the hinge between the flexibility of the upper and the rigidity of the bottom—the medium that blends the two, and gives to the strain placed on this part of the shoe by the bending and flexing of the foot in walking; thirdly, if the innersole was left square at the edge, the strain on the upper caused by contact with the sharp or abrupt edge of the innersole when walking would soon cut the upper through.

The seat end should be left practically square, except that the sharp edge should be taken off with the rough of the driver. This allows for obtaining a close seat and gives a better foundation for the heel.

Always remember that the machine-sewn innersole should be worked quite dry, because if it is wet the iron plate on the bottom of the last will turn the innersole black. Again, the innersole would spread out in the process of lasting. When one side of the upper is tacked, a pull on the other side causes the innersole to give to the strain, stretching it out of proportion and making it impossible to retain its original shape. The toe spreads out to a much wider shape than the last it is made on, and this not only looks bad at the time, but becomes aggravated in the later processes; the sole, being press-cut to the shape of the last, appears to be too narrow for the shoe, and then the sole-sewing and channel-laying increase the spreading and spoil the whole appearance of the shoe.

Adhesives Used in Assembling

There are many good manufactured adhesives now on the market used for assembling, but many workers prefer to make their own, and for these, the following are easily made, and, if a little care is taken, answer well for most purposes—

Paste is made with rye flour and boiling water, and if properly made provides a fairly strong and suitable adhesive. Rye flour contains both starch and gluten, which form its adhesive properties. The water must be brought to boiling-point at the time of mixing, and it will then readily combine. The mixture should be well stirred to prevent any lumpiness, bringing it to a soft smooth consistency. When used, it should be spread evenly and sparingly, and only just where needed.

Dextrine can be procured in powder form. This is readily soluble in either hot or cold water, but the great objection is that it dries very hard and brittle. Sometimes a little of this powder is added to paste in mixing to increase its adhesive properties.

Great care and cleanliness are required, in the use of these adhesives, as linings should be kept perfectly clean, and the many delicate-coloured materials used in uppers at the present time are apt to be spoilt by stains.

Upper Lacing

This is often called "tying-up." The lacing of the fitted upper for lasting is one of those minor but important operations that received scant attention until a few years ago, but it is now recognized as a very important factor in correct shoe-making.

It was the practice in the past (and may still be in some places) for each bench-man to lace his own work up. This proved a very unsatisfactory procedure, as each had his own idea or method of lacing. Moreover, as there was never any thread provided for the purpose, each man had to find his own, and consequently all sorts of odds and ends were used—one used thin string, another thick, one would use wax ends, or the waste from the sole-sewing machine, others would use a leather lace, because this could be used over and over again. All these methods produced varying results; for instance, thin string cut into the facings leaving impressions between the eyelets, string that was too thick often loosened the eyelets from their setting, and many other faults resulted.

Again, one laster would lace only two holes, another would lace three, and others would lace the whole instep up. Some would lace up too tightly, lapping the facings over each other, others too loosely, leaving the facings open, and so on. All these variations had great effects on the fitting of the finished footwear, so that shoes even though made on the same last would have different fitting properties on the foot.

In up-to-date factories, and more especially in connection with machine lasting, the process of upper

lacing has undergone a complete change. It is recognized that by confining this operation to a few work-people, advantages are secured by the work being more uniform and maintaining the fit and measurements of the completed shoe.

In factories equipped with complete machine systems this process is carried out by machine, such as the Ensign Lacing

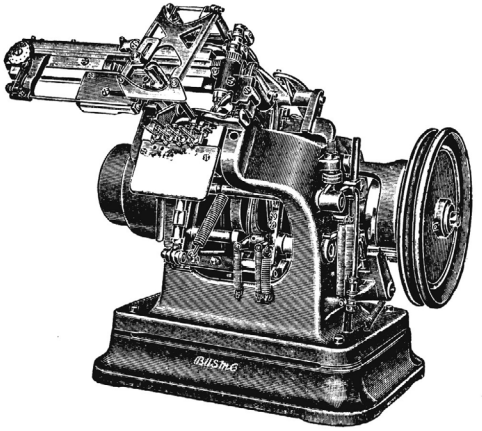

FIG. 15A ENSIGN LACING MACHINE

Machine, which, fitted, with needles that penetrate the eyelet-holes carrying the thread through, laces the upper and ties the knot, producing more uniformity than when each laster laced his own work. (See Fig. 15A.)

Where the bench-man is compelled to lace the uppers, there are many points that should claim his consideration. In the first place, the lacing thread should be of suitable strength and substance, strong enough to stand the strain of lasting without breaking (broken lacing means either extra work or distortion of the upper), but the substance must not be too thick, as

this would increase the heel and instep measurement. Waxed thread should on no account be used.

Methods. In order to preserve the design of the upper and to ensure correct lasting, the upper should be laced from the bottom eyelet to the top of the instep, bringing the facings just close together, and the knot securely tied to prevent slipping in lasting. The facings must not be allowed to open in the lasting process, as this would lessen the actual heel and instep measurement; neither must they be tied too close, or lap over

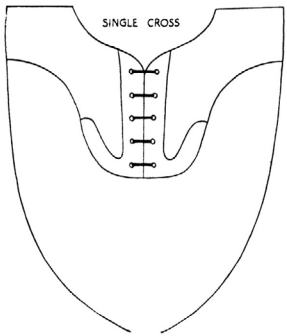

FIG. 16

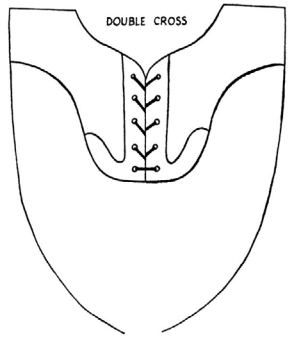

FIG. 17

each other as this would increase the measure, and make it difficult to position the upper on the last, as the extra strain required in lasting owing to the distortion of the design would probably cause broken eyelet holes as well as crooked seams.

In such designs of uppers as Derby, Moliers, or any of the open-tab variety, the bottom eyelet holes should be firmly secured, because of the shape of the last. Most lasts are fuller or more pronounced on the inside of the instep than on the outside, and when the strains of lasting are applied, as in sinking the seat, this prominence offers more resistance to the pull than the

other side, often causing one facing to "ride" up the instep and so pull the tabs out of the level. A good plan is to tie these bottom eyelet holes separately instead of with a running thread all through.

Other methods that may be used are the "single-cross" and the "double-cross." (See Figs. 16 and 17.)

The double-cross method is certainly very secure, but rather more ornamental than useful, as the crossing, coming between the facings, causes a certain amount of distortion at those parts as well as helping to increase the heel measurement.

The single-cross method is more useful, as the facings can be drawn close together, or left open as required (this is sometimes done where shoes are made on unsuitable lasts), care being taken that the spacing is equal and uniform, and the knot securely tied, to stand the strain of lasting.

CHAPTER III

LASTING–METHOD ONE

AFTER the upper has been correctly assembled, make sure that the lining seams are perfectly flat. In some designs of uppers the linings are cut whole, i.e. heel-to-toe . This brings a seam down the front, from the bottom of the instep to the toe end. Such a seam must be flat, and if not, it should be gently rubbed down with the handle of the pincers, but on no account should it be hammered, as this would cause the stitching thread to cut through the material, and the strains of lasting would burst the seam open.

French chalk should be freely sprinkled over the lining. This is a powdery substance with a smooth slippery nature but not greasy, which allows the lining to be eased or strained over the last smoothly, without dragging or forming into wrinkles. It also allows the shoe when completed to be slipped off the last cleanly and smoothly.

The upper should then be placed inverted on the stand of the jack, the last on the pin, and the upper brought up to it.

POSITIONING THE UPPER

Placing the upper in its correct position on the last with the seams and sections of the upper, the quarters, vamp, and cap fitting to their corresponding parts of the last, can only be done by the laster imagining a central line on the last—running centrally from the base of the seat to the top of the back, and extending from the centre of the instep to the centre of the toe. This imaginary line must be worked to and kept in the

"mind's eye" of the laster to obtain a central upper position.

The back seam of the upper must be placed on the central line at the back of the last, and the front seam or central part of the upper on the front line. This should give the upper a correct balance on the last. The position of the upper should be held on the last with the left hand, while with the pincers in the right hand a central first pull is taken over the toe. If the upper fits the last correctly, this first pull can be taken with the seat of the upper positioned flush with the seat of the last.

The First Pull

This is one of the most important strains used in lasting, and in order to get good results the method must be correct and closely followed. (See Fig. 18.)

After seeing that the lining is cleared forward and taut with the upper, the pincer should be positioned central with the toe of the last, a grip taken on the lining, the vamp, and the cap (if a capped shoe) in the centre, and the upper levered forward with the pincer, the left hand helping the upper forward to the strain.

The pull must not be taken with a sharp jerk, nor dragging backwards over the toe of the last, but with a forward pull giving a rather lengthy drawn-out strain before bringing the upper over the toe.

We must understand that the outer side or faced side of the upper when lasted is forced to occupy a larger area in circumference than the under side, and faced materials (especially patent or enamelled leathers) forced over or round a prominent curve in an abrupt manner will soon crack.

The full-length strain should be applied before bringing the upper over the toe of the last.

The amount of strain must be suitable both to the

material and the design of the upper. There is no hard and fast rule as to the amount of strain required. It depends so much on the conditions, and can only be acquired by practice, observation, and a sense of touch.

As a general rule a stout, unyielding material will require more strain, and a light material less, and the extremes are modified according to conditions.

There are several points by which the laster may judge if the correct strain has been applied. Too much strain will drag the

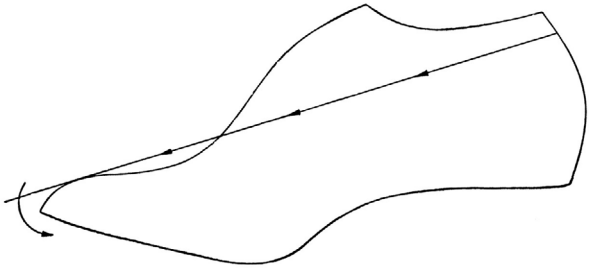

FIG. 18

vamp and cap sections out of proportion lengthways, and in most cases the cap will be pulled out of the straight. Too little strain will leave the upper laying loose and flabby on the last. The correct strain should bring the upper tightly to the back of the last, setting up a tightness along both sides, and cause the vamp to become taut lengthways between the instep and the toe end bridging the hollow forepart of the last. A tack should then be driven to secure the upper to the innersole, still maintaining the strain applied.

If the pull has been taken centrally, the upper should now be tightened to its central position on the last, but if not, it will be found on examination that the upper has become twisted and the seams are not in

their correct position. Should this be the case, then the tack must be removed, the whole upper re-positioned, and the first pull taken over again until the central position has been attained.

When satisfied with results, a tack should be driven on each side of the first tack, to maintain the position by preventing the upper from pivoting round with the succeeding pulls.

At this point, the side linings should be positioned (if not done in the assembling) for a capped shoe. It is better to do this after the upper has been partly stretched, so that the joins at toe-box and stiffener can be properly made.

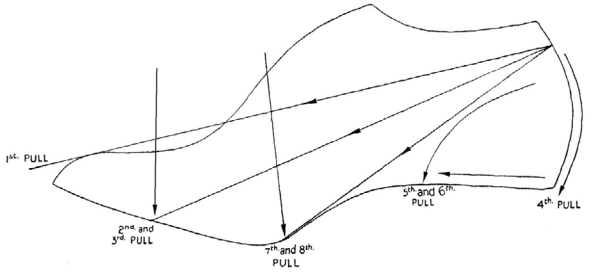

FIG. 19

THE SECOND AND THIRD PULLS. (See Fig. 19)

These are taken at both sides of the toe *near* where the edge of the cap would come. Here, again, suitable strain must be applied, but this time with a view to conforming the vamp portion to the shape of the last. For this reason these pulls must be taken in two directions, viz. *lengthways* and *across* the last.

The length strain should be applied in the first instance, then with a side pull or a twist pincer movement (without altering the position of pincer) the upper should be brought over the side of the last and secured.

Great care must be taken with these pulls to give an equal strain to both sides of the upper and maintain the central position of the upper on the last. If pulled harder on one side than the other, the upper becomes twisted on the last, distorted in appearance, and the whole balance of the upper is destroyed.

The lining should receive attention at these points, that is, to prevent wrinkles occurring, they should be cleared forward to the same tautness as the upper, then the whole lot, lining, vamp, and cap, taken over together.

Under easy conditions, the toe end of the upper would now be brought in contact with the last, and we can proceed with the

Fourth Pull

This pull is taken at the back of the upper directly at the back seam. With a correctly cut upper we should have half-an-inch lasting-over allowance, no more and no less, but this point has to be watched, and sometimes the amount of lasting allowance has to be modified to get the correct height of the quarters in a shoe, and the correct leg position in a boot.

If too much is lasted-over, the quarters of the shoe will be too low and lose their grip around the heel of the wearer. On the other hand, if too little is taken over, leaving the quarters too high, the shoe will cut into the back of the heel in wear when the foot is flexed or extended; also there will not be sufficient material over the feather to ensure solidity in the seat. The linings should be pincered and pulled tight to make them clear and smooth around the seat.

Fifth and Sixth Pulls

These should be taken at the sides of the seat, and their exact position should be noted, as a great deal

of the fit and. ultimate appearance of the shoe depends on the exact position, and the direction and manner in which the pulls are taken.

The pulls should *not* be taken across the full width of the seat or in the waist part of the shoe, but between these two points.

If we notice the shape of the last we find the top portion of the seat very narrow (this is to give a grip to the shoe when on the foot) and a prominent bulge, especially on the outside, towards the base of the seat. The laster's object should be to bind the lining, stiffener, and quarters around this bulge. For this reason the exact point of the pull should be just where this prominence drops into the curvature of the waist.

On no account should these pulls be taken straight, as that would cause the top edge of the quarters to gape open and the shoe to lose grip. The pulls are rather complex and the method should be closely followed.

First clear the lining of any looseness, bearing fairly hard to bring the top edge of the quarters tight along the sides of the last. Next, take the stiffener with the pincers, giving it a pull first towards the joint; then upwards and around the curvature of the seat, to obtain the correct lasting allowance. Then take the whole, the lining, stiffener, and quarter together, and with a twist pincer movement pull around the curvature of the seat, over the feather and secure, as indicated in Fig. 19.

Seventh and Eighth Pulls

The position of these pulls is also very important. They should *not* be taken across the full width of the last, but at the back joints (as indicated in the diagram). The laster's object is to set up a tautness along the

sides of the shoe and clear the waist of any loose or foul material and so prevent wrinkles occurring at this point, by bringing all loose material forward to the forepart to be cleared later by the "clearance pulls."

This series of pulls is known as the "main" or "draft" pulls, and the process as "drafting" or "pulling over," and is responsible for the whole "sit" or balance of the upper upon the last. The pulls have been numbered, and for the convenience of this Section will herein afterwards be known by their numbers from No. 1 to No. 8.

The positions on the last where they are taken are known as the "draft" points, numbered 1 to 8. (See Fig. 20.) These

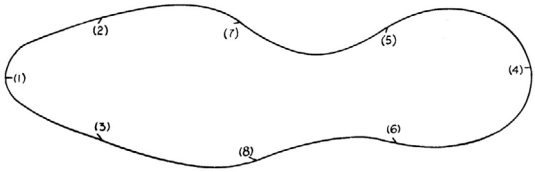

FIG. 20

positions have been found by years of experience to be the points of pull calculated, to obtain the best results.

Now let us consider the further lasting of the shoe by the

CLEARANCE PULLS

These consist of clearing the feather, lasting, and securing the upper between the draft points.

We can proceed by lasting the *outside waist* first, as it is the shorter and straighter side requiring the least amount of strain, and by securing this side first the upper is held in position against any extra strain that may be required when lasting the inside waist. At this point we probably have a little more difficulty, on

account of the curvature and. hollowness in the waist of the last, and. here, *perhaps,* is where the dog pincers come in handy.

The pulls in the waist must not be too straight, but partly towards the joint and partly towards the feather of the insole. To clear the waist of any looseness the innersole should be kept well down to the plate of the last.

We can next proceed to last the upper in the forepart between draft points 2 and 7, and 3 and 8. It may be found in some uppers that there is a little fullness at these points, but the upper should not be pleated or lapped over, nor should the pulls be too straight. A curved pincer pull should be used, bringing the material first forward then around and over the side, and by this means clearing the feather and binding the upper around the sides of the last.

Clearing the Seat

We can commence on either side of the centre tack at the back, bill it should be remembered that the height of the back has previously been determined and any severe pulling now will drag the upper out of position and cause a lot of trouble in the lasting. Only sufficient strain should be used to clear the lining, stiffener, and quarters.

If the quarters are loose or full at these parts, the laster should commence by pulling the material gradually towards the No. 4 tack and over the seat, securing it at intervals. If this method is followed it will be found that the seat can be tightly lasted and the loose material cleared away.

The seat should then be lightly hammered flat, not smashed down, and the feather gently tapped round, clearly defining the seat-line of the last while the stiffener is in a mellow condition.

Clearing the Toe

This is undoubtedly the most difficult part of the lasting process, the reason being the narrow part of the last and the added substances of the upper.

If working on a plain front shoe, this is the time to insert the toe-puff.

The tacks at draft point No. 1 should be removed, and the end of the vamp turned back over the toe of the last. This will be found quite easy on most materials, and if the tacks at draft points 2 and 3 have been placed in correct position.

Assuming the toe-puff is fitted, it can be positioned, the exact position being decided by the shape of the last. The puff should be placed far enough back to hide itself into the curvature of the forepart and to support the full height of the toe, but not so far back as to interfere with the bending of the foot.

It should be drawn tight across the sides of the toe, the vamp then turned back, and the No. 1 pull retaken, making sure to clear any creases from the vamp that may have been caused by the turning back. Then proceed to last the toe on either side of the centre tack, preferably lasting the tighter side first.

To begin, take hold of the material with the pincers about $\frac{1}{2}$ in. from the centre tack, pulling tightly to clear any looseness, and bring the material over the feather. Then with a lateral or side twist of the pincers lay the material in a small and neat pleat close to the tack of No. 1 pull, hold the pleat down with the thumb of the left hand, without losing the strain, and secure with a tack placed in the side or depth of the pleat, but not on the top.

This process of pleating should be repeated and continued around the toe until all the excess material is lasted over.

All pleats should be taken small, and the head of

each tack buried under the fold of each succeeding pleat. This allows of all upstanding surplus material being trimmed off level with the heads of the tacks, and helps to keep the bottom flat, and there should be no pleats or wrinkles visible beyond the feather of the shoe.

In a Capped Shoe. This toe-lasting may prove a little more difficult on account of the extra substance, but wherever

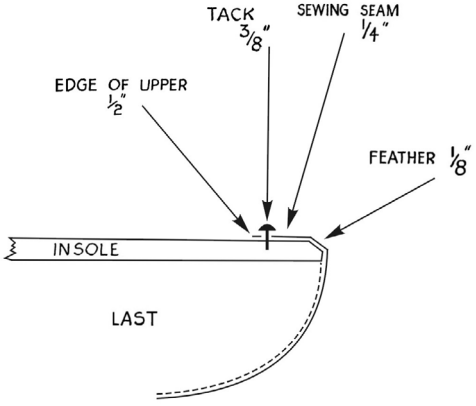

FIG. 21

possible the pleating method should be adhered to, and only on very stout unyielding uppers should recourse be had to the method of "cutting-in."

When this is necessary, we should begin by making a slanting lateral cut at the side of No. 1 tack, and follow the same direction as the pleating, and so continue around the toe until all the loose material has been cleared away.

Great care must be taken that cuts do not extend out to the feather, or penetrate the innersole, as both these faults have serious results.

Having completed, the actual lasting of the shoe, we should do well to consider the position of the tacks.

Tack Position

This is a very important point in the making of machine-sewn work, and the driving-in of tacks anywhere or anyhow causes a lot of trouble in the later processes.

In the construction of a machine-sewn shoe (see Fig. 21) we are allowed $\frac{1}{2}$ in. of upper material for lasting-over. To secure this, the tacks should be placed in $\frac{3}{8}$ in. from the feather edge. Since the feather of the innersole is $\frac{1}{8}$ in. wide, this leaves $\frac{1}{4}$ in. full substance of innersole for the sole-sewing seam, and so if the tacks are placed in this space there is bound to be trouble in the sole-sewing process.

The tacks should be evenly spaced in lasting, about $\frac{3}{8}$ in. apart along the sides, and a little closer round the seat and toe, according to the number of pleats made and the necessity for solidity.

After the lasting has been completed, all surplus material should be trimmed off level, and the bottom lightly hammered as flat as possible.

The foregoing method will be found sufficient for ordinary conditions of lasting, but there are many circumstances and conditions which will make it necessary for the laster to vary his methods. At the present day, fashion demands many different shapes of last, all possessing different features and curves, and as the laster's work is to strain and stretch the upper over in such manner as to reproduce these various curves, so he must vary his methods accordingly.

CHAPTER IV

SHAPES OF LASTS AND HOIST METHODS

In comparing the shapes of lasts it will be noticed that the No. 2 shape possesses more curvature of forepart than No. 1, and.

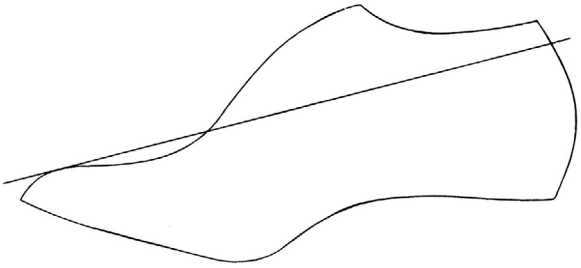

Fig. 22. No. 1 Shape

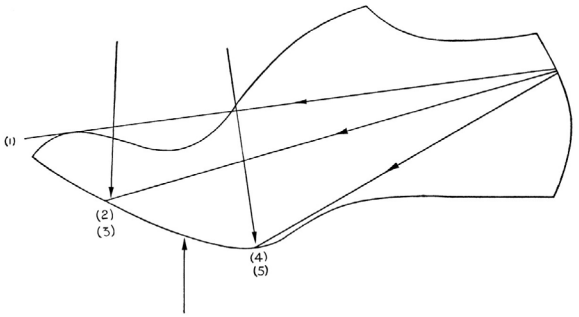

Fig. 23. No. 2 Shape

consequently makes it more difficult to bring the upper in contact with the last across the forepart. (See Figs. 22 and 23.)

The ordinary or No. 1 method may be followed on

the first shape, but a variation of the main pulls must be used on the second shape.

Take No. 1 pull as in the ordinary method. No. 2 and No. 3 pulls are the same, except just a little nearer the toe-end.

For No. 2 method make a variation, by taking the joint pulls 4 and 5 at the points indicated on the diagram. This leaves space enough to take a pull on both sides of the forepart between draft point 2 and 3, and 4 and 5, as indicated by the arrow. But be sure to pull first from the back before pulling across.

Then retake draft pulls 2 and 3.

If the upper is now down in contact with the last across the forepart, we can proceed by taking No. 6 pull at the seat. But if not, this series of side pulls must be repeated until the upper is quite tight to the last.

Then take No. 6 pull at the seat to bring the upper to the correct position.

Take Nos. 7 and 8 pulls at the side of the seat to draft the stiffener, etc.

Then retake pulls 4 and 5 at the joints to remove any looseness of upper, and tighten up the waist portion.

This method allows the upper to be "eased" down gradually to the last, before the strain of sinking the seat is applied. It is also suitable for certain designs of uppers, such as those of the open-tab variety—Derby cut, Moliers, Langtry, etc.—as the securing of the forepart holds the tabs in position against the strain of sinking the seat, whereas if the ordinary method is followed, the tightening-up effect of sinking the seat often causes the tabs to pull out of the level by riding up the instep of the last.

The further lasting of the shoe can then be carried out by the ordinary method.

HOIST METHODS

In later years, the demand for new shapes of lasts and new Tipper designs, and the introduction of machine lasting systems, have caused great attention to be paid to the fit of uppers on the last, yet sometimes the bench laster is confronted with the difficulty of lasting tightcut uppers, and further variation of methods must be employed to overcome this difficulty.

With uppers that are cut tight either in length or girth, the laster is compelled to use some method of "hoist" in order to

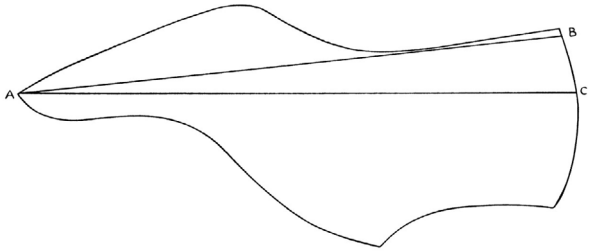

FIG. 24

get a sufficient amount of lasting material.

"Hoisting" means the placing of the upper over the last with the seat or stiffener portion "raised" to some suitable position up the back of the last prior to taking the first pull over the toe. In this position the bottom edge of the upper is held away from the prominent curves of the last; moreover, the upper now occupies a shorter length line of the last, and so gives more material at the toe end (see Fig. 24), the measurement along the line *A* to *C* being less than the measurement along the last from *A* to *B*, thus placing the upper more forward on the last.

For uppers that are only moderately tight, the following method will be found useful.

METHOD NO. 3. (See Fig. 25)

Place the seat of the upper to the position of the hoist at the back, then take No. 1 pull.

Take Nos. 2 and 3 pulls *directly across* the last to allow for subsequent length strain.

Take pulls 4 and 5 at the joints directly across for the same reason. If the upper is now tight down to the last, pull No. 6 can be taken at the seat, making sure that the lining is clear and the stiffener is in its correct position. If not, repeat pulls 2 and

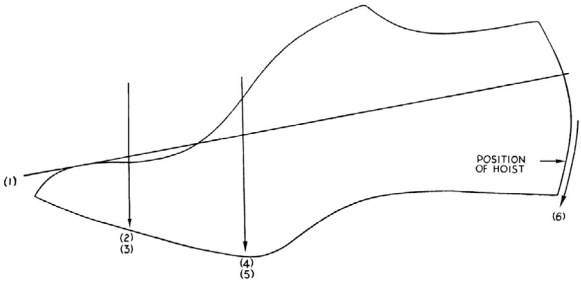

FIG. 25

3, then 4 and 5, before sinking the seat. Then take pulls 7 and 8 at the sides of the seat. Next re-last points 4 and 5, this time *forward* towards the toe to clear and tighten up the waist, and give the necessary length strain. Then re-last points 2 and 3, *forward* for the same reason.

This method is also useful for heavy materials or uppers requiring a great length strain.

For uppers that are cut very tight and requiring more "hoist," we may have to resort to the following method.

METHOD NO. 4. (See Fig. 26)

Raise the upper at the back of the last to the adjudged position—say point *A*. Then take No. 1 pull

over the toe. Take Nos. 2 and 3 pulls at the sides of the toe, bringing the cap portion down to the last.

Then last the toe right in to prevent the upper tearing away from the tacks when the length strain is applied by sinking the seat.

Now raise the seat of the upper a little to, say, point *B*. Take pulls 4 and 5 between the back joints and the draft points 2 and 3.

Next raise the seat a little more to, say, point *C.* Then take pulls 6 and 7 at the joints.

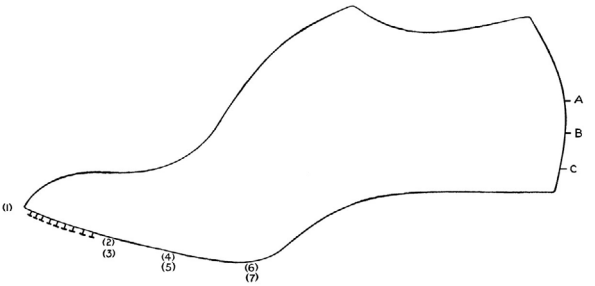

FIG.26

Now raise the seat to the correct position, making sure to clear linings, etc.

Then draft the corners of the stiffener into position, and re-draft points 6 and 7 to clear the waist.

Great care is required in the use of this method on account of the excessive length strain set up, which is liable to burst the seams, and the method should only be used when absolutely necessary.

The further lasting can be proceeded with as in method No. 1.

The foregoing methods of "hoist" may prove very useful under the conditions described, but great discretion must be used in their choice and applications.

Although they a.re considered of great value in handsewn circles, and may sometimes be used to advantage by bench-men, yet to resort to them on all conditions of work would be entirely wrong, and would often prove detrimental to the work in hand.

Under ordinary factory conditions, where bench lasting is still in vogue, and where they are equipped with standardized patterns which are cut to, and made on, standardized lasts, the uppers are cut to be lasted flush with the seat, that is, the seat of the upper is positioned level or flush with the seat of the last when taking the first poll over the toe. This system gives the ordinary method of bench lasting.

Where lasting machines are in vogue, the uppers are cut according to the machine system used, usually the heel-seats-up system. These methods of upper cutting simplify the methods of lasting by making the process more direct and final.

The use of hoist methods entails a greater amount of labour and time, as after the forepart of the upper is brought in contact with the last, when the seat is sunk to its proper position, it will be found that there is an accumulation of upper material in the waist. To clear this, the laster has to remove tacks and retake pulls, sometimes repeatedly, almost amounting to a double lasting process, before the fullness can be cleared away around the feather.

When "hoist" is found necessary, the selection of these methods must be left to the discretion of the laster. Also the *amount* of hoist necessary must be left to his judgment, as one *method* or one *amount* of hoist is not suitable for all circumstances. This is proved by the many faults that occur by the methods being used indiscriminately.

If hoist has been excessive, or if hoist is used when not required, then overstraining of material must follow,

and this means deterioration of the material, affecting the durability and the appearance of the finished footwear. Excessive strain often causes a displacement of the sections and seams of the upper on the last, through one part of the upper stretching more than the other. This is caused by the varying amounts of stretch in the skin, when the uppers are cut out, and in spite of matching up in the clicking room, it will often be found that one quarter stretches more than the other, and when the strains of lasting are applied a bad seam position is caused. The more strain used, the worse becomes the position of the seams, in fact often throwing the whole upper out of range.

There are many bad faults that occur through the use of these methods for which the laster is in no way to blame. Where he is compelled to use hoist for one reason or another, these faults often assert themselves as a natural outcome of the excessive strain he is compelled to use.

Another bad fault which often asserts itself through these methods is in a golosh boot. The upper is hoisted and pulled over the toe, and then the vamp is brought in contact with the last. This brings the upper and leg forward with the cue or neck of the golosh low down over the instep. The seat has now to be sunk to its proper position, and if the upper is in any way tight in the heel measurement, the sinking of the seat brings the facings or lacing of the upper tightly to the instep holding up that part of the golosh immediately underneath and preventing the full effects of the seat pull. Hence, when the seat is sunk to its proper position, a pronounced curvature in the line of the golosh will assert itself above the waist, spoiling the range of the golosh which should otherwise be quite straight.

One could go on for a long time enumerating faults that often occur through the use and mis-use of these

methods, such as distorted designs of uppers, broken linings, etc., but probably the worst fault of all is the manner in which the leg position in a boot is affected.

LEG POSITION

This means the position or standing of the leg portion of the boot in relation to the bottom or foot covering part of the boot.

The leg position in the boot is often incorrectly termed "pitch." We often hear the remark "the pitch of the leg," meaning the position of the leg. The term "pitch" is more correctly applied to lasts, as when the lasts are made, the last-maker makes provision in the seat for the accommodation of the heel. This is termed pitch or heel elevation, being the amount of elevation in the seat of the last from the ground line when the joint of the last is placed in its correct position. The amount of pitch varies in the last, according to the height of the heel to be built, less pitch being provided in the last for low heels, and more for high heels.

This is probably where the meaning of the two terms "pitch" and "leg position" is confused, as it is possible to influence the position of the leg by the height of the heel. The wrong height of heel (either too high or too low) for the last would throw the leg of the boot either too far forward or backward of the normal position it should occupy.

With the last selected for the correct height of heel to be carried, the leg should be positioned when lasted in accordance with the pitch of the last, so that when the heel is built up the leg is brought into the required position.

The leg position in a boot is decided by the pattern cutter according to the type of foot to be fitted, and this position should be maintained throughout the

making of the boot, but this is sometimes difficult where the laster is compelled, to resort to extreme "hoist" methods of lasting, these methods often having the effect of causing a wrong leg position.

In bespoke work, where extreme leg positions are catered for in order to meet individual requirements, some may need a very forward leg position and some may need a more backward position. These positions of the leg must be maintained, and suitable methods of lasting used. to preserve

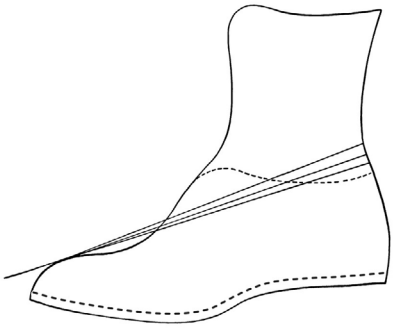

FIG. 27

the design of the upper. But for ordinary factory methods, where the normal leg position is aimed at, calculated as suitable for average requirements, the laster must judge where to position the seat of the upper when taking the first or primary pulls over the toe on account of the influence these pulls have on the ultimate position of the leg.

Uppers that are cut with the correct leg position and intended to be lasted flush with the seat should *not* be hoisted, as this would cause a wrong leg position. But uppers cut with a backward tendency and requiring a more forward leg position may be hoisted with advantage.

THE PULLS AFFECTING LEG POSITION. (See Fig. 27)

When lasting the normal cut upper without hoist, the primary tensions over the toe radiate to the point of the back seam just above the back of the last, binding the upper snugly into the curve at the back without affecting the top portion of the leg. This allows for all the necessary strains to be applied in lasting and the seat of the upper to be sunk to the correct position without undue strain, obtaining sufficient lasting

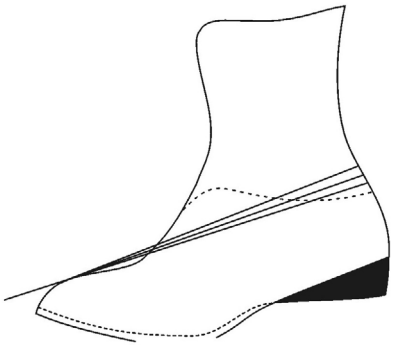

FIG. 28

allowance and. maintaining the normal position of the leg in the completed, boot—always providing that the sinking of the seat is not overdone when pulling-up the seat, as this would cause a backward leg position, making the boot not only uncomfortable to the wearer through cutting into the front of the leg, but very unsightly in wear, with ugly wrinkles extending from the eyelet holes across the leg to the back seam.

Where methods of hoist are used (see Fig. 28), these affect the upper in a different manner. When the upper is hoisted this throws the leg more forward, and the more hoist used the more forward the leg becomes.

Then the primary tensions over the toe, although radiating in the same direction, affect the leg of the upper in a lower part, bringing the leg more forward still and binding the upper tight in over the back of the last. With these methods the whole forepart position of the upper must be firmly secured down to the last, and therefore some force is required to sink the seat to its correct position. The forepart being firmly held and the leg binding tightly over the back of the last does not allow the upper to be "hinged" back easily over the last, so the sinking of the seat is mostly done by stretching the upper from the instep to the heel without fully affecting the front portion of the leg, and thus we get a too forward leg position when the boot is completed. This again proves very unsightly in wear.

In these cases, even though the boot may fit the foot, if it has the wrong leg position the leg of the boot will not fit the wearer, thus spoiling the whole appearance of the boot and making even the best-made boot very uncomfortable in wear. So it will be seen that in consequence of these many faults, great discretion is required in the use of these methods.

With modern conditions and standardized patterns, and in order to facilitate the output, the prevalent idea is to dispense with hoist entirely, so the use of these methods should be restricted to just those occasions which demand it.

CHAPTER V

WHAT IS LASTING?

In the foregoing we have seen a few of the methods that can be used in the process of lasting, but these methods consist of pulls only, and the continuous use or repetition of one class or set of pulls on one grade of work, on one kind of material, or on one shape of last, becomes a mere routine or habit, and although good results may be obtained on that particular grade of work, when confronted with other conditions that same set of pulls would hardly prove efficient, so that all pulls used in lasting must be modified according to circumstances, but at the same time all pulls must be taken with a view to the results. In other words, the laster should know what effects each pull should, or will, have upon the upper.

The ultimate results of the laster's work are shown in the completed footwear, and his aim in stretching and pincering the upper should be towards those results. Like an archer shooting at a target, he should know when he has "scored a hit."

In order to become proficient in lasting, the beginner should make a study of the many circumstances, such as shapes of lasts, different designs of uppers, and the many different natures of upper materials that call for a variation in methods of lasting and a modification of the strains used.

The art of lasting is to reproduce in the completed shoe the shape and characteristics of the last being worked upon, so that when the last is withdrawn, not only should the shape of the last be reproduced, but the upper must be stretched and strained in such

manner as to retain that shape while being worn. The best lasted shoe is that which retains the shape of the last longest when subjected, to the straining and distortion which are inevitable in wear.

Supposing that the last fits the foot, and the strains used in lasting have been suitably applied both in strength and direction, then the shape should be preserved throughout the life of the shoe.

To the question, "How may this be best brought about ? " the only answer is, *firstly,* in the process of lasting to apply a proportionate strain suitable to the material; *secondly,* the application of this strain must be combined with a relativeness of pulls; producing, *thirdly,* the ultimate result, "draft."

UPPER MATERIALS

These usually consist of leather of various kinds or fabrics. Sometimes they are used in combination, and sometimes the uppers consist of one kind of material only.

Leather

In the manufacture of uppers at the present time, there are many different kinds of leather used, each differing from the others either in nature, quality, or substance. Each possesses some peculiarity or characteristic of its own quite apart from the others, and in order to preserve these characteristics in the completed footwear, each should receive in lasting suitable strains according to the stretch and elasticity of the material.

If we inquire into the question as to what actually happens when a shoe loses its shape in wear, we are led to the conclusion that it is because the leather has stretched in some way and, therefore, the shoe has become in some way larger than before, probably because sufficient stretch has not been removed during

the lasting process. This does not mean that every particle of stretch should, be removed, as this would bring the material to breaking-point, and therefore lessen its wearing qualities, which would be quite wrong, as one of the essential qualities of upper leather is its elasticity, coupled with its power to withstand the fatigue due to the continual bending and stretching it receives in wear. But sufficient stretch must be removed to impart the elastic quality to the fibres of the material.

This can only be likened to the tuning-up of a string instrument. If the string is left slack we get no tone, because there is no tension or life in it, but if tightened up just sufficient to what is called "concert pitch" we get the right note, as the string is now taut or live, but a further tightening-up of the string will cause it to snap.

This is exactly what happens to leather materials when the strains of lasting are applied. If the strain is insufficient to influence the fibres of the leather it remains a dead or dormant material, and stretches or gives out to the strain in wear and will very quickly lose shape. If just sufficient strain is applied, the fibres are stretched and become taut. The removal of the surplus stretch imparts a life or elasticity into the material, and this adds to its qualities and makes it more suitable for footwear. If too much strain is applied, then the fibres become overstrained and weakened, sometimes pieces are pulled out, and in all cases of overstraining, deterioration of the material is bound to follow, subsequently affecting the durability of the leather for its purpose.

To understand thoroughly the effects of strain on the leather, it is necessary to have some knowledge of the construction of the skin or hide from which the leather is obtained. All animal skins consist of three

layers. The outer or top surface layer is called the epidermis. This is the hair side, and forms a covering to the dermis or corium, which is the true skin or skin proper. The underneath or bottom layer is composed of adipose tissue or fat cells, this being the flesh side.

In the manufacture of leather, the epidermis is removed by a process known as "unhairing,'" and the adipose or fat tissue is removed by "fleshing" the hide, leaving the dermis or true skin from which the leather is made. This is composed of fibres closely interlocked together. The more dense and closer these fibres are interlocked the better the quality of the material, and the more strain they will stand in lasting and in wear. The poorer qualities of leather, possessing looser fibre, will not stand so much strain, nor will they wear so well or keep their shape so long as the better qualities.

This is one of the reasons for a modification of the strains used in lasting. All lasting strains must be *pro rata* to the nature and quality of the upper material.

When an upper is received from the closing room, it is just a flat, dead, or dormant material devoid of last shape, possessing only the shape or design it was cut to, and it is the laster's work to impart last shape to the upper without destroying or distorting the design.

It is easily possible by stretching and straining the upper over the last in the proper directions to make it retain that shape for a little while, even when the last is withdrawn, but owing to the elastic nature of the material it would be impossible to retain that shape in wear, and so it becomes necessary to use a material of a different character in certain sections of the upper, a material that is not elastic like the upper, but of a more rigid nature that will mould to shape and retain that moulded shape notwithstanding the strain in wear. For this reason the upper is reinforced at those parts

which, can be made rigid without interfering with the flexibility of the shoe. Hence the reinforcements of heel-stiffeners, toe-boxing, etc., but even with these reinforcements, the shoe would soon lose shape in wear if the lasting strains have not been applied properly.

The bending of the foot in walking causes many wrinkles and creases in the parts of the upper that have not been reinforced, and so in lasting, strains must be used that will influence the material in such directions as will tend to counteract the distortions to which the shoe is subjected in wear and tend to pull the shoe back again in shape.

The fibres of the leather lend themselves to this purpose, as when suitable strain is applied to the upper both lengthways and across, as in lasting, the fibres become stretched, causing the upper to bind tightly to the last, and on the last being withdrawn, a certain shrinkage or contraction takes place as the fibres seek to return to their original state. Assuming that the last fits the foot, on the foot being inserted a partial re-stretching occurs, which is due to the fibres being tensioned up to a state of elasticity. Now, in walking, when the weight of the body is placed on the foot, the foot expands and elongates, causing a further stretching of the fibres, and when the foot is lifted off the ground or placed in repose, it goes back to its normal size and the fibres of the material shrink to their original condition. This shrinking helps to clear the wrinkles which are caused by the bending of the foot, and also helps to retain the shape in the shoe which it was intended to have.

This could not take place where the material is overstrained, or where the strain is insufficient.

The stretching and shrinking property introduced into the material by tensioning the fibres (which otherwise were dormant) is looked upon as one of the chief

principles of "draft." It could not be done by simply moulding or hammering the material into shape, although the fibres of upper leather are both plastic and elastic. To get the full effects of each in the lasted shoe the elastic property must be first introduced by straining.

By pulling, upper leather gets thinner, as the fibres have been stretched, but a property has been added to the material that it did not possess before. By hammering, sole leather gets thinner, but the fibres are compressed, making it impossible to return to their original state.

Let us briefly consider a few of the leather materials used in the uppers, and note their different natures, and the effects of strains used not in conformity with these materials.

Faced leathers, such as patents and enamelled leathers, are dressed with a hard shiny face or surface, and if subjected to a too severe strain the surface opens and cracks, because the enamel face has more stretch than the leather itself, and will therefore contract more after straining. This kind of material should be kept in a warm or moderate temperature, as any sudden cold or frost contracts the over-stretched enamel and causes it to crack, which spoils the appearance, and detracts from its usefulness as a faced material.

Glace kid is also a faced material, but prepared in a different manner, the pores of the skin being filled in and the face obtained by cold friction with glass rollers. This material will stand a fair amount of strain, but if strained too severely it becomes distorted, and the pores open and expose the fibres of the leather to the action of the weather.

Printed or embossed leathers are sometimes made in imitation of a natural grained leather, and though an imitation, their pattern or grain should be preserved

in lasting. Under severe strain, however, these materials will pull out plain and lose the pattern it was intended they should have.

Such leathers as buckskin, doe, antelope, etc., differ greatly from other leathers, being very soft and stretchy materials, but very strong in wear owing to their elastic nature. The material itself will stand a great amount of pulling, but in consequence of its yielding nature needs very careful handling, as any undue strain will soon cause distortion both to the material and the design of the upper.

Fabrics

These are of many kinds, and are also used in the manufacture of uppers. They include brocades, velvets, canvas, and cashmere. Here, again, the nature of the material varies. The materials need quite a separate treatment from leather, and strains in proportion to their strength and weaving.

Linings

Linings usually vary either in substance or quality from the outside cover, and should receive a proportion of strain accordingly, especially linen linings, which are so liable to become overstrained or broken.

This goes to prove that the various kinds of upper materials, with their varying amounts of stretch, need a corresponding proportion of strains allotted to them in the lasting process.

If these strains have been allocated suitably to the various materials, then we have achieved something towards a result, and if combined with a relativeness of pulls we get a further advance towards the ultimate result.

CHAPTER VI

RELATION OF PULLS

In lasting, although sufficient strain must be applied to tension-up the material, yet the balance of the upper on the last must be maintained. This means that in order to maintain the correct position of the sections and seams of the upper, all main pulls must be taken at certain positions on the last and with a relativeness of strength. Indiscriminate pulling only tends to distort the upper and destroys the uniformity of tension that should exist in the completed footwear.

We should remember that we are now confronted with, firstly, material; secondly, an upper cut to a certain shape; and, thirdly, a last or selected model, and strains must be applied that are suitable to these combined conditions. In the first place, suitable strain is required to preserve the characteristics of the materials; secondly, suitable strain is required to preserve the design of the upper; and, thirdly, to attain a suitable and uniform tension in the shoe when completed.

There can be no hard and fast rule as to the amount of strain necessary at certain positions on the last, but as a general inference we must consider that the last and upper are longer than they are wide, and consequently there is a longer length of material to influence. This, combined with the knowledge that, in walking, the bending of the foot causes transverse wrinkling across the front, implies that the maximum amount of strain should be applied at the toe-end, in a heel-to-toe direction.

As a guide for the beginner, in applying longitudinal strain, we will assume that the suitable proportion of

first pull over the toe has been determined, applying the maximum at this point. (See Fig. 29.)

The first pull is, say, 10 units, on account of its being the longest length of material. The second series is to be, say, 9 units, because of less length of material. The third series is to be, say, 8 units, these succeeding pulls being of relative

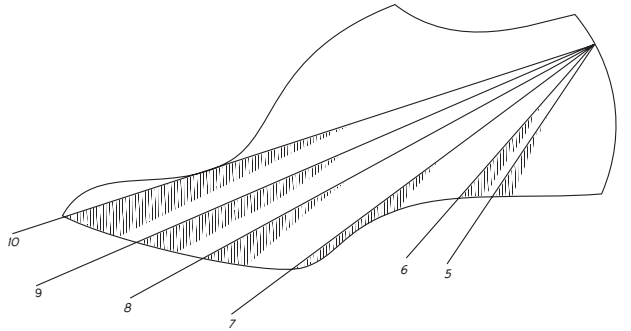

FIG. 29

strength and according to the position on the last.

In the application of transverse strain it will be noticed that the widest part of the last is at the joint, and also that the curvature of the last is more prominent at this point. This, together with the tendency of the shoe to spread over in wear at this part, implies that the maximum transverse strain should be taken across the joints, but in combination with the longitudinal strain. As a guide, see Fig. 30.

The pulls across the joint are to be the maximum of, say, 10 units. As the width decreases and last prominence is less acute, they are to be, say, 9 units, and so on according to the conditions.

Owing to the many different circumstances that

prevail, such as in designs of uppers, especially in present-day ladies' footwear, these pulls must only be taken as a guide and not as a fixed rule. All the pulls must be modified according to circumstances, but as a general principle all pulls must be subservient to the main or primary tensions over the toe. The whole principle is to blend the longitudinal strains with the transverse strains, and maintain the correct upper position on the last.

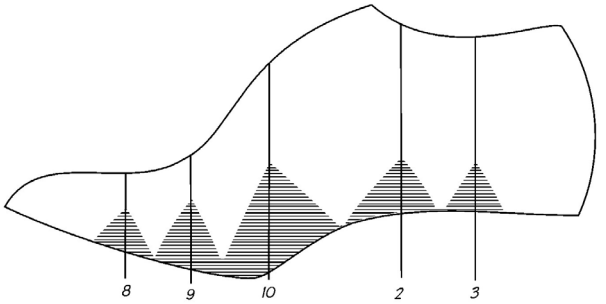

FIG. 30

There are many bad effects to be found in the completed footwear as a result of these strains not being taken in relation to each other. These do not always show while the shoe is on the last, but very readily assert themselves when the last is withdrawn. All unrelative pulls tend to upset the upper position on the last and destroy uniform tension. With a perfectly-cut and closed upper, if more strain is applied on one side than the other, the upper becomes unbalanced on the last, causing crooked sections and seams. (See Figs. 31 and 32, and compare.)

Strain applied in excess at the corners of the caps may not be noticeable while the shoe is on the last, but

presents a dragged appearance at these points when the last is withdrawn.

Excessive length strain over the toe spoils the appearance of the toe-caps, by pulling them out of the level, presenting a hollow or concave appearance, whereas the straight cap

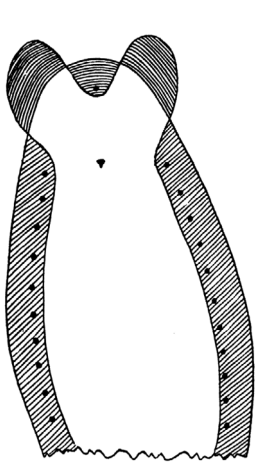

FIG. 31

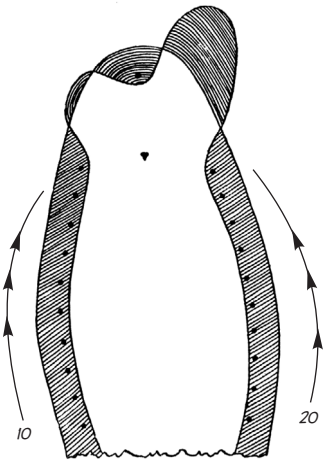

FIG. 32

should be at direct right-angles to the front seam.

If the transverse strain is in excess of the longitudinal strain, the shoe appears to be lasted "dead" when on the last, and when slipped off, a general fullness will assert itself along the sides of the upper, allowing the vamp portion of the upper to fall away from the shape of the last. This causes excessive wrinkling across the front early in wear and allows the vamp to spread easily over the sole at the joints.

The strains used in lasting one shoe of a pair must be relatively the same in the other, in order to produce a pair, and not a pair of "odd ones." Unrelative strains

in the pair are often the cause of many faults, such as variations in the length of caps, length of vamps, and, in a boot, a variation of leg position, all these variations having an effect on the general fitting properties of the pair through one shoe being lasted tighter than the other.

One could go on for a long time enumerating faults caused by unrelative strains, such as linings being distorted, wrinkled, or dragged out of proportion to the outside, but enough has been said to show the importance of an equalized and well-balanced strain suitable to both the material and design of the upper.

When this combination of strains has been correctly applied, we have achieved a certain result, i.e. a quality has been introduced into the material, this quality or property being known as draft.

CHAPTER VII

DRAFT

DRAFT being the resultant of a series of operations, the shoe should, now be in a highly-tensioned. state, making it possible to retain its shape even under the stress of wear. The laster is not the only person responsible for this state of tension, but being the last operator responsible for its introduction, a great deal is expected of him.

It is necessary to digress a little here to give a brief explanation of the other operations partly responsible for the introduction of draft.

In the first place, lasts are made with a rotund curvature of the bottom, to allow of easy progress in walking. If the bottom of the last was completely flat, the shoe would either become unduly bent and wrinkled across the front by the action of walking, or else the wearer would have to lift his feet up and put them down again practically in the same place, as in "marking time." To prevent this, most lasts are designed with a certain amount of spring or toe elevation, which permits the pedestrian to walk without the toe of the shoe being unduly bent upwards.

Again, when the wearer places his feet on the ground supporting the weight of his body, the toes have a tendency to spread and grip the ground to support the weight. This tendency brings the toe of the shoe nearer the ground line, increases the tension from heel to toe, and helps to clear the front from wrinkling. It is more obvious in the lighter grades of footwear than in the more heavy or rigid type of boot, so with a last of this

description we find that the tension produced is mainly heel-to-toe.

Again, most upper patterns are cut with certain amounts of toe-spring and seat-draft, causing the first strains of lasting to take effect directly through the upper from heel-to-toe. If these amounts have been suitably apportioned, it helps the laster in the introduction of draft.

While considering the principles of draft, it will be as well to note what treatment the lining should receive in lasting, especially linen linings, as too great a strain on these would result in breakage. For this reason the weaving of the fabric should be taken into consideration. Weaving is done by the intersecting of two distinct sets of fibres or threads, those passing longitudinally from end to end of the cloth forming the warp, and those crossing and intersecting the warp at right-angles forming the weft.

As the warp or length strands of the fabric are always considered the stronger, and as the length strains in lasting should always predominate, all fabric linings should be cut and placed in the shoe with the warp running from heel-to-toe, and the weft directly transverse, so that the strains of lasting come directly along the strands of the fabric, extending in these directions to stand the strains of lasting and pincering both lengthways and transversely.

The effect of the lasting strains on the fabric should be to tension up the strands. (See Figs. 33 and 34.) The tension on the warp, as in pulling over the toe, causes the weft strands to bow forward along the length line of the strain. The tension on the weft, as in transverse pulling, draws the weft strands straight again into their former position. By this means we get a blending of strains on both strands of the fabric, as the heel-to-toe tension retards the return of the weft to its former

state, and the transverse tension retards the return of the warp to its former state, making it possible for even a fabric to assume the shape of the last.

Linings that are cut or pulled on the cross become distorted and weakened and fail to give the necessary support to the outside. When cross-pulling is necessary, as in lasting the sides of the toe, only sufficient strain should be used to clear the lining round the feather.

The treatment of leather linings depends entirely on their nature and quality. Some are more dense in fibre and some

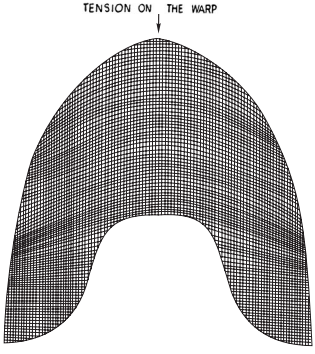

FIG. 33

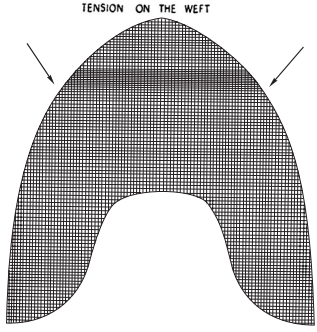

FIG. 34

more stretchy. In the case of a stretchy lining the laster must use great judgment, as the setting-up of draft calls for the removal of the stretch; yet it must be done in a manner that does not damage or weaken the material, as this would diminish the support to the upper instead of adding to it. Also the linings must not be overstrained in relation to the outside, as this will cause the lining to fall away from the upper, leaving a looseness between the two.

The lining must be utilized by the laster as an aid in the setting-up of draft and obtaining a permanent "sit" to the shoe.

Draft itself is invisible, but is nevertheless present in all well-lasted boots and shoes. This may be seen by the readiness with which the upper of a boot or shoe resumes its shape after a little distortion. For instance, take a boot in the left hand and pull upwards on the leg with the right hand; then loosen the pull and note the effects as the material seeks to return to the shape imparted to it during the process of lasting.

Complete draft consists of a resiliency or an elasticity composed of a network of radiating lines of tension extending in such directions as to combine with and support each other.

When these principles have been carried into effect, combined with the correct range and balance of the shoe. then the shoe may be said to be lasted, and the further part of the process can be proceeded with.

CHAPTER VIII

BOTTOMING–MACHINE-SEWN

THE results of the process of filling the bottom have such a great bearing on the well-being of the completed shoe that the operation calls for consideration. For this reason, many kinds of materials have been used and many substances invented. Among the most popular may be mentioned felt and cork-solution. Leather should not be used on account of its tendency to creak during wear.

The object in filling the bottom is to give a solid bed for the sole to be moulded to, forming a compact bulk of the whole bottom.

Felt is a tarred substance and makes a good filling, being easily prepared. It can be split to the substance required when warmed, or easily skived with a wet knife. Cork-solution is a mixture of ground cork and rubber solution, and for the cold process can be evenly spread in and levelled if pressed down with a broad-bladed knife, such as a putty knife.

The bottom should be only just levelled, i.e. the roundness of the bottom of the last should not be exceeded in the sole by overfilling.

SHANKS

In the waist we find the need of an additional support on account of the arched curvature of the last and the slimness of the construction of the sole and innersole at this part. The object of stiffening this part of the shoe is to preserve the shape of the last, and to throw the flexible properties of the shoe forward to the joints where the foot bends in walking.

There are many kinds of materials used for shanks, ranging from wood to steel, and many shapes of shanks are made suitable for the shape of the waist, style of shoe, and the amount of rigidity required, but as these special shanks are generally supplied already shaped and only require attaching, we will deal with the ordinary leather shank that the laster himself has to shape and fit.

What he first requires is a piece of leather of suitable substance, and then he shapes it according to the shape of the waist.

For square or wide waists a stout shank is not needed, only one just sufficient to fill in the cavity without any abrupt edges. This is because the innersole and the sole are wider and generally left of full substance.

For a bevel or narrow waist, a stouter shank is required. The waist of the shoe being narrow, a wide shank piece cannot be used, but it must be rigid enough to strengthen and support the arch of the shoe, and stout enough to reproduce a cross-roundness or bevel in the waist of the sole.

The length of the shank is a point that also claims some consideration. It should extend from the joint to well under the breast of the heel, even to the end of the seat cavity. This prevents any break occurring at the breast of the heel, and ensures perfect rigidity to this part of the shoe, and thus retains the shape of the last.

Seat-filling

This is one of those small but important items that often receive scant attention. With machine-attached heels many faults can be found with the seat. It should be filled and rounded, to form a solid bed for the cup of the heel; otherwise, when the pressure of the heel-attacher is applied, the

innersole is often forced down by the attaching nails to the level of the sole, and the breast of the heel held up by the shank piece is compelled to rise, throwing the heel out of range, and making it uncomfortable in wear.

Shaping the Shank. (See Fig. 35)

The ultimate appearance of the waist depends on the shape of the shank, and the lighter the sole the better the fitting and shaping of the shank should be.

In order to produce the correct bevel, the forward end of the shank should be skived, with the end of the skive coming level to the flat of the forepart and the full substance of the shank extending down the curvature of the waist.

The rear end of the shank should be skived to the substance of the transverse roundness of the seat required for the bed or cup of the heel.

Both sides of the shank should be reduced in such manner as to reproduce in the sole the correct bevel required in the shoe.

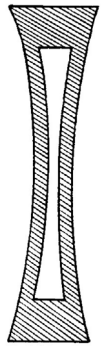

Fig. 35

It is always safer to shape the shank prior to attaching, to obviate the danger of the knife penetrating the upper or innersole, and to ensure a pair being produced.

For Single-sole Work

The shanks can now be attached and secured in position with two or three brads of suitable length, always avoiding the plug-holes in the last. Then we can proceed with the temporary attachment of the sole.

Blinding the Sole On

Assuming the sole has been mellowed, the “backing ”may now be removed. This is called “fleshing the sole.”

On the flesh side of the sole there is always a certain amount of loose flesh, dirt, or backing, and this should be removed on all single-substance work by lightly skiving.

It is not our object to reduce the sole in substance, but to clean the edge ready for finishing, as this “backing" roughs up under the hot iron of the finisher, making it very difficult to obtain a clean-finished edge.

For the temporary attachment of the sole, blinders are used, consisting of brads or rivets driven through the upper and innersole at intervals. Usually 8 will be found sufficient—-7 in the forepart and 1 in the waist, i.e. 1 at the toe-end, 3 along each side of the forepart, and 1 in the centre of the shank. These must be driven in *perfectly upright,* with the points *just clinched* on the plate of the last, then cut off to two-thirds the substance of the sole.

Much trouble can be avoided by carrying out these directions, as a blinder not driven in upright will bend over when the sole is tapped on; a blinder not clinched will be driven farther home when the sole is tapped on; a blinder cut off too short fails to hold the sole; a blinder left too long penetrates through the sole and causes trouble in the finishing.

The prepared sole should then be taken and bent a little both lengthways and across, to conform it somewhat to the shape of the bottom. This will give a better chance of securing the correct position it should occupy.

The sole should now be positioned on the shoe with an equal margin of edge showing at the toe and joints. The shoe should then be replaced on the stand and the toe-blinder tapped home with the flat of the driver. The shoe should be again examined, and if the sole is still straight the remaining blinders tapped home. The

driver is a far better tool than the hammer for this purpose.

The seat of the sole should, then be balanced in the same way and secured with brads of suitable length.

The securing of the seat calls for a deal of attention. It should be secured just far enough round to be covered by the heel. We must remember that the seat is the foundation of the heel, and therefore requires to be secured firmly and solidly. If the brads are placed too far in, they allow the sole to be lifted or sprung around the edge, and to prevent this and ensure solidity around the seat, the brads should be driven in to a position about $\frac{1}{4}$ in. from the edge of the sole *after the seat is trimmed up.*

Bedding the Sole

This is another of those small processes that count for so much in the results. While the sole is in a mellow condition it should be bedded to conform to the bottom shape of the last. This can be done by gently hammering the forepart of the sole flat to its position and with the small face of the hammer bedding the waist down to its rounded and curved shape.

If a cloth or the apron is drawn tightly over the sole, this will greatly assist in the process, and also prevent the sole springing from the blinders. The better the sole is bedded, the better the chance of perfect sole-sewing and the less trouble we get in the later processes.

The sole-channel can now be thrown *well open* for the accommodation of the sewing thread.

The shoe should be left on the last until all the components are perfectly dry. This allows the upper to "set" to the stretch of the lasting, and the more rigid leather parts to dry and mould to shape. The shoe can then be slipped off the last for sole-sewing.

CHAPTER IX

VARIATIONS IN ATTACHMENT OF MACHINE-SEWN BOTTOM-STOCK

THERE are many points in this method that have to be varied to suit different styles of footwear, as, for instance—

1. Stitched foreparts.
2. Three-quarter stitched.
3. Stitched-to-heel.

All these makes possess a middle-sole, i.e. a double substance in the bottom.

STITCHED FOREPARTS (FAIRE-STITCHED)

The middle-sole for this style extends to the joints only. It should be balanced or placed in position and secured with brads at intervals, then skived across the joints. The skive should not be too wide or too abrupt; the joint-line should be defined and the skive let drop into the curvature of the waist, leaving the flat of the middle the full length of the forepart.

The shoe is then slipped off the last, and the middle is sewn on with the Blake machine.

The shoe is next pulled back on the last and the shank attached. In this case the skived end of the shank should be lapped evenly over the skived edge of the middle and secured to prevent friction at this point.

See that the middle-sole is perfectly flat before attaching the sole with blinders driven through the middle-sole and shank, as in the former method.

When the channels are opened (there should be two, a stitch channel round the forepart and a sewing channel in the waist) and the shoe slipped, the sole is then

permanently attached by being stitched around the forepart and "Blake" sewn in the waist.

Three-quarter Stitched

The method in this case is the same as in the preceding one, except that the middle-sole extends under the breast of the heel on the outside, and the sole is stitched from the outside corner of the heel to the inside joint, the inside waist being "Blake" sewn, thus forming a square outside edge and a bevelled inside waist.

This extension of the middle on the outside waist is usually made by the addition of a waist-piece being skived and lapped evenly over the skived edge of the middle-sole and extending down the waist under the breast of the heel.

Stitched-to-heel

In this case the middle-sole or "through" extends right through to the heel. This may be secured with the "Blake" sewn seam or by metal attachment by the "screwing" machine, according to the "weight" and purpose of the footwear.

The "through" is attached in the same manner as before, and, after sewing, the sole is attached, then stitched right round to both corners of the heel, thus forming a square-to-heel edge.

There are other variations of this make of footwear, but the principles and methods of lasting are the same as in the preceding methods, the variations being in the bottom attachment only, such as the "screwed" or "wire-sewn" methods, these being used on very heavy work, and designed for solidity and hard wear.

The Screwed Boot

The sole is attached either in the channel or aloft, by the screwing machine driving a length of screwing

wire through the bottom-stock, upper and innersole, then cutting it off to a suitable length. This method is very strong, very waterproof, and better than nailed. or rivet work, as the thread on the screw allows a grip to the material even when the sole is worn down very thin.

Wire Sewing

This was designed in the first instance to take the place of Blake sewing. It is very secure, but very rigid, and should only be used on the heavier kinds of footwear.

The machine drives a length of wire in the sole-channel through all substances of bottom, the point being deflected and turned back into the innersole when it meets the cup on the horn of the machine, and the top part in the channel being cut off and turned down into the substance of the sole.

Now that the bottom-stock is permanently attached, the bench-man is required to lay the channels ready for the heeling process.

Machine-sewn Channel-laying

In the first place, cut off all the ends of sewing thread and sprinkle a little french chalk inside the shoe. This will help to ease the shoe on and off the last, and prevent the wax on the thread from sticking to the iron plate of the last.

Then secure the same last as the shoe was made on. If it is of the “Easy-exit” type so much the better. Open the “hinge” of the last and place it on the stand of the jack. Then force the toe of the last as far into the shoe as possible.

Insert the shoe lift into the back of the shoe, to guide the stiffener portion over the seat of the last, at the same time raising the toe-end with the other hand, making sure the lining is clear and the stiffener is not

curled. (For method of using the shoe lift, see description of "Tools.") Make sure that the shoe is replaced firmly and solidly on the last.

The sole must then be wetted (this can be done best with a brush), not only in the channel but all over the bottom. This should be done thoroughly, as the channelled or severed portion of the sole takes the water more quickly than the solid part and is liable to stain in drying out.

A little paste, cement, or rubber solution placed in the channel will hold it to its position after being laid.

Next take the driver with both hands and with an outward squeezing motion press the channel back to its original position, commencing from the centre of the sole and working the driver outwards and forward to remove all creases from the back of the channel.

The edge of the sole should be forced up to stand out square from the feather, and the bottom shaped. This may be done with the large hammer, using the large face to make the forepart flat, and the small face to shape the waist. The hammer should be used from the centre outwards to "spread" the leather and help to remove any roundness that may have been caused by the sole-sewing.

The bottom can now be sleeked with the stick, using a little soap and water as a lubricant to prevent "burning " the sole with the friction. The notched edge of the stick should be brought tightly up to the edge of the sole, so that with an inward pull and a downward pressure at the same time as the stick is in motion, it closes the channel and helps to form a square edge to the sole.

See that the bottom of the sole is kept clean as this helps in the finishing.

The forepart must then be gently tapped round with the curved end of the toe-beater, care being taken not

to mark or bruise the upper. This operation is made necessary in machine-sewn work by the feather of the innersole being pushed out with the perforations of the needle in sole-sewing. The toe-beater should be held firmly up to the feather and gently tapped round to "set" the perforations and clearly define the feather line.

The seat line should then be tapped round with the straighter edge of this tool, and the seat trimmed up. The seat should not be trimmed too close (under-seated) nor left too full, but with a slight margin as a guide for heel-building.

All middle-soles should be trimmed up perfectly square to the sole, with the knife held perpendicular to form a square edge.

Older Methods of Making on the Bench

Prior to the introduction of the sole-sewing and channelling machines, bench-work consisted of the making of the riveted and pegged types of footwear. This class of work is more heavy and rigid than the class of walking shoe commonly used to-day, and the invention of these machines made it possible to produce a lighter and more flexible grade of footwear, which very soon superseded the more rigid kind, except in parts of the country (such as mining districts) where a rigid boot is necessary, and for those whose occupation calls for this class of work.

In the making of this class of footwear the methods and principles of lasting are the same as for the heavier kinds of machine-sewn work, the difference being in the method of attaching the bottom-stock. The innersoles should be stouter and of a more rigid character than those used for machine-sewn work, in order to give a firm foundation for sole attachment.

In riveted work, the middle-sole or through should

be firmly attached with rivets of suitable length before the sole is put on. This makes a good foundation for repairing, as the top sole can be stripped off and repaired without disturbing the middle-sole. Brass rivets of correct length should be used to attach the sole, as these are non-rusting, and they should be spaced about one-quarter of an inch apart all round the sole, and driven into the same position as the thread seam of machine-sewn work would occupy.

Pegged work is made practically the same, except that wood pegs are used for sole attachment instead of rivets. A peg-awl is required to make the holes before the pegs are driven in. This awl should be slightly smaller than the peg used, and the pegs should be well dried and shrunk before using. Damp pegs shrink in drying and lose grip, dry pegs swell with moisture and hold tighter. This class of work, having no nails in the bottom, was greatly used as a measure of safety in dangerous occupations, such as in gunpowder factories and magazines. It was also in great favour for deck shoes on board ship, as there were no nails to damage the deck

CHAPTER X

BENCH LASTING–WELTED SYSTEM

At one time there were two distinct bench-crafts, one the welted "hand," the other the machine-sewn "hand," because there were two different methods of making, and the welted was looked on as being a better class of work.

The present-day bench-man should be able to turn his hand to either. The fitting of the component parts of the upper and the assembling are exactly the same for this method of making as for machine-sewn, but the preparation of the innersole is vastly different. The machine-sewn innersole is feathered only, but the welted innersole is channelled as well, and for this reason the innersole selected must be of a good quality, more compact or denser in fibre, and stout enough to carry the channel without lessening its wearing qualities.

Strictly speaking, the selection of materials is part of the fitting-up in the "rough stuff" room, or bottom stock department, yet should a faulty innersole come through (it may be faulty in selection, or faulty in the channelling) the laster should reject it, to prevent loss and trouble in the later processes.

Shaping the Innersole

The method of "press-cut" shaping as used for machine-sewn innersoles is found unsuitable for welted work, as this method is apt to produce a "floating " edge to the innersole, i.e. an edge out of the perpendicular.

It is essential that the welted innersole should have a square edge for correct channelling. For this reason

it is shaped or rounded, by machine, such as the "Planet" sole-rounding machine, and for this purpose wood shapes or blocks are made to the pattern of the bottom of the last, the innersoling material is clamped to the block shape, and the machine is set in motion. A knife fixed in a vertical position travels around the block in a circuitous manner, rounding the innersole with a perfectly square edge. After shaping, the innersole is ready for .

CHANNELLING

This is the most important operation in the preparation of the welted innersole, and indeed is a very vital point in the

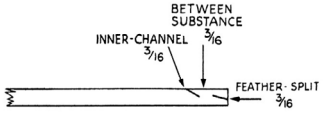

FIG. 36

construction of a welted shoe, and one to which every attention should be given. We must remember that the channel has to stand the strain of the sewing in of the welt, has to carry the "weight" of the shoe, and must be able to stand the strain placed upon it in wear.

The channelled portion consists of three parts, two cuts or channels, and what is known as the "between substance." (See Fig. 36.) The outer-channel, called the feather-split, forms the feather of the shoe when the lip of the channel is turned up, the inner-channel is that to which the welt-sewer works, and the between substance is that to which the attachment is made.

For average work, the width of the whole channelled portion, from the edge of the innersole to the extreme end of the inner-channel, should be $\frac{9}{16}$ in. This gives $\frac{3}{16}$ in. to the feather-split, $\frac{3}{16}$ in. to the inner-channel,

and $\frac{3}{16}$ in. for the between substance. These measurements may be modified for very light or very heavy work.

As the outer-channel or feather-split has to accommodate all substances of the upper, the width of this channel may vary

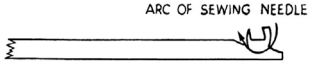

FIG. 37

in parts, being a little wider at the corners of the seat and. around the toe to take the extra substance of stiffener and toe-box respectively.

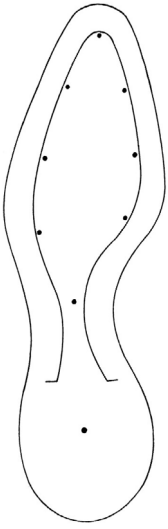

FIG. 38

The innersole is channelled on the flesh side, and the depth or inner-ends of the channel cuts (from this side) should be one-third the substance of the innersole for the following reason. The needle of the welt machine, in sewing, describes an arc, striking in at one-third the substance, and the thread is carried by its radius to a greater depth into the denser fibres of the innersole near the grain side, thus giving a good holdfast to the welt seam. (See Fig. 37.)

The innersole should be prepared up to this stage prior to reaching the laster, unless he is required to shape all the bottom-stock by hand.

ATTACHING THE INNERSOLE. (See Fig. 38)

The welted last is made somewhat different from the machine-sewn last, having an iron plate on the seat end only. This means that the innersole must be attached differently.

In the first place, the innersole should be just slightly damped down to the heel-line, leaving the seat end quite dry on account of the iron plate on the last. It can then be positioned and tacked on the last. Usually $\frac{3}{8}$ in. tacks will be found long enough for this purpose, and these should be driven right home to hold the innersole fast and give a clearance for sewing. Having a rather large head and fine shanks, they can easily be removed with the tack knife after sewing.

The position of these tacks should be just inside the edge of the inner-channel, to hold the edge of the innersole as solid as possible and avoid the track of the needle in sewing.

The feather-split should then be scored or cut across at the seat-line to form the beginning and finish of the welt seam.

The lip of the feather-split should be turned up in a vertical position to form a recess for the upper and welt. The hammer of the pincers will be found very suitable for this purpose, at the same time keeping the feather level and full to the last.

The seat of the innersole should be prepared in the same manner as for machine-sewn work. If the seat is damp, a piece of paper placed between the innersole and the plate of the last will prevent any stain occurring from the contact of the iron and leather.

Lasting

Assuming the upper is assembled as in the machine-sewn method, and the preparation of the innersole is complete, we can now proceed with the pulling-over.

All the methods of pulls, as explained in machine-sewn lasting, are applicable to this process, the difference between the two makes of footwear being in the method of attachment.

In the construction of the machine-welted shoe, we

try to produce a facsimile of the hand-sewn, for the reason that there should be no grindery showing on the innersole, and all the lasting rivets are withdrawn (with the exception of the seat) prior to welt-sewing.

The lasting rivets should be of fine make, about $\frac{5}{8}$ in. long, with a fine shank, like a gimp pin. These can be driven easily without playing havoc with the last, and withdrawn easily without leaving large perforations in the upper and innersole.

In lasting, the rivets should be driven through the upper and solidly into the last to hold the tensions imparted by pulling, and must be placed well into the shoulder of the feather-split.

All welted work is lasted to the feather of the inner-sole, and all rivets should be placed well in so that the sewing seam takes up all perforations. By being placed well in and level, they also assist the laster in the bracing process.

Placement of Uppers on the Last

In some factory systems the patterns and uppers are cut rights and lefts or bear a mark indicating which last they are intended for. This is not always the case, as it takes extra time in the preceding departments and often leads to mistakes occurring in the fitting and closing of uppers, but no doubt, where this system is carried out, we get better results regarding the positioning of uppers on the last.

In the main, however, patterns are cut intended for either last—right or left—i.e. cut as a mean between the two. This is accurate enough for average requirements, and it is then left to the laster to decide which last they are most suited for.

Although this is the quicker and less troublesome method, yet there are many designs and styles of uppers that must be cut specially for right and left last, and

it is the laster's work to see that these are made up on the last for which they are intended.

All button boots and shoes, all bar or strap shoes with buttons or buckles, should be placed with the fasteners to the outside of the last. Boots cut with a three-quarter golosh should be positioned with the join of the golosh corning to the inside waist. With all fancy designs of uppers carrying ornaments or trimmings, the laster should ascertain which last they are intended for prior to commencing the lasting process.

Although the pulls used in lasting are substantially the same as in the machine-sewn methods, yet there are many points in this process of welted that the laster would do well to consider.

It is essential for the feather of the innersole to be perfectly level and full to the last, and all pulls must be taken with a view to preventing the feather curling over.

If we take a close-in-feather pull, drawing the upper up with a wiping-up motion that catches the innersole, we are bound to get this trouble; it is a bad fault, making it impossible for the welt-sewer to get a level seam and a close-set welt.

This occurs mostly around the forepart, and to prevent it, the pulls should be taken a little wider or more outward, with the lining clear of the feather, before bringing the upper over the last and securing.

Lasting the Toe

There is only one method used in lasting the welted toe, and that is the "pleating and clearing" method. The "cutting-in" method (see machine-sewn lasting) *is not used* in this process.

All pleats must be taken small and extend well over the feather line, and with a view to the splitting-up or clearing of pleats entirely during the bracing process.

Lasting the Seat

The seat may be cleared and secured in the same way as in machine-sewn, with tacks of suitable length, but extending round only to near the points where the feather-split is turned up. The seat must be secured quite solid, and the seat-line clearly defined.

Bracing

This is another of those small processes that count for so much and yet are so little thought about. It is a temporary operation, having no part in the actual wear of the shoe, but is very important as regards the ultimate fit and appearance to the wearer.

Consider this point and the process. Assume we have lasted the shoe nicely, it is perfectly-balanced, with all the necessary strains placed on the upper to bring it in contact and make it fit the last, and all loose material and wrinkles around the feather removed, in fact, we have a very nice shoe up to this point. Now, before we can have the welt sewn in by machine, we have got to have all the lasting rivets taken out (except the tacks around the seat). This looks like spoiling all the laster's work, but is what makes bracing so important, and is why we brace or sew the upper temporarily to the innersole to hold it in position for the welt sewing.

If this is done in a loose or careless manner, when the lasting rivets are removed, the upper recedes from the feather, the lasting tensions are reduced or lost, cap and vamp lengths are spoilt, and the whole upper sags on the last.

CHAPTER XI

MAKING THE BRACING THREAD AND TRIMMING THE INSEAM

BEFORE proceeding with the actual bracing, it is necessary to prepare the thread. For this purpose .procure a ball of No. 15 hemp, which can be stranded out to as many cord or strands as required. When one sufficient length has been pulled out, this should be placed on the knee and unravelled with the hand; then if pulled it will be found to part quite easily, leaving a finely tapered end. This should be repeated, and all the tapered ends brought together until sufficient strands have been obtained, the usual number of strands being 7 for men's or heavy work, and 5 for light or ladies' work. The thread should then be lightly waxed and rolled on the knee with the hand, twisting and binding all the strands evenly together into one cord. A knot is then tied at one end and a bristle attached at the other, making what is known as a single thread.

The bristle may be attached by either one of two methods, the first known as "rolling the bristle on," the other as "splitting the bristle."

The first method is more commonly used for this purpose, and can be accomplished as follows: First wax the tapered end of the thread carefully and thoroughly, then take the bristle in the other hand, and take two or three turns of the extreme end of the thread along the bristle towards the root-end of the bristle, and about $1\frac{1}{2}$ in. to 2 in. from the root. Then reverse the thread and wind it closely along the bristle towards the forked or feathered end. When sufficient of the tapered end of the thread has been rolled on,

make a hole with the point of an awl through the thread close up to the stem of the bristle, and pass the root-end through. By drawing it tight the bristle is locked on the thread.

The second method makes a finer attachment of the bristle, and can be used where very fine sewing is needed. The fork of the bristle is opened to about half its length. The finely-tapered end of the thread is then placed between the fork, and wound round one branch of the fork to its full length. The thread and fork are then wound round the other fork, plaiting and twining all three together level and compact. Finally, a hole is made through the thread with the awl, and the bristle locked on in the same manner as before. The root-end of the bristle is cut off and the thread is ready for use.

Sometimes a curved needle is used instead of the bristle, but it requires a larger hole than the bristle, and on some materials this is apt to prove detrimental.

A sewing awl with a curved blade should be selected. The flat point is suitable for most materials, but unsuitable for patent leathers, as this blade cuts its way through the material and the hole made is liable to split or be extended when the thread is pulled in. A round-pointed awl is better for all such faced materials.

The Process. (See Figs. 39 and 40)

Place the shoe on the jack and turn the toe towards you. Commencing on the left-hand side of the shoe well down under the back joint, pass the awl through the upturned lip of the feather-split and upper. Let the awl emerge slightly above the shoulder of the feather-split, so that when the welt is sewn in, the bracing thread is just above the welt seam, then pass the bristle end of the thread through the puncture made, bringing the knot on the inside of the lip. Make another puncture with the awl farther along the forepart, working

towards the toe, and pass the bristle end of the thread through this, from the outside, pulling the thread tight in to the lasting rivets. If the position of the first hole has been decided on correctly, this should bring the thread binding around the

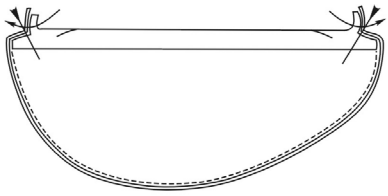

FIG. 39

curve of the joint (see Fig .40). Then, with the thread tight in the left hand, take the pincers in the right hand and remove those lasting rivets just inside the loop of the thread, pull on the upper with the pincers to equalize the strain around the feather, at the same time drawing the thread tight into the feather-split, and tap the feather level with the hammer of the pincer, setting the stitch and forming a level recess for the welt.

The length of the stitch taken depends on circumstances. For a tight or very heavy upper the stitches should be shorter, but for the ordinary fitting upper use as few stitches as are consistent with solidity.

Next, make another puncture with the awl close to the last one, and pass the thread through, this time from the inside of the lip, thus bringing the long stitches on the upper and the short stitches on the lip of the innersole.

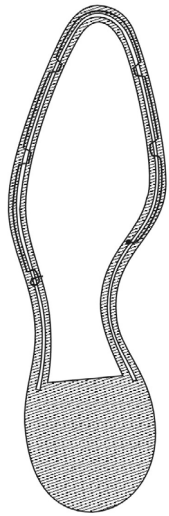

FIG. 40

This will be found quite easy if the awl used is consistent with the substance of the thread, but if the hole made is too large the thread is liable to run out loose. (This is a point that should be watched.)

Continue the process up to the side of the toe, then take a sweep of thread right round the toe, passing the thread through on the opposite side. Remove the lasting rivets, straining the thread in tight, manipulate the pincers to split up the pleats around the toe to leave the feather quite clear and level, then press the edge of the upper slightly outwards over the line of the thread, at the same time drawing the thread in very tight, giving the sort of clamp and wiper action obtained on a bed-lasting machine.

Continue down the other side of the forepart until the curvature of the waist is reached, then fasten off the thread either with a knot or by taking another small loop through.

The inner-channel should now be wetted and thrown well open, all lasting rivets removed, and the edge of the upper trimmed off neatly and level with the vertical lip of the innersole, thus giving a clearance for the welt-sewing machine.

Trimming the Inseam

Assuming the welt sewn in, the bench-man can proceed with the bottoming process. All tacks used to position the innersole must now be removed.

The inner-channel should be solutioned and laid down over the thread seam. This helps to protect the stitches and strengthens the innersole. The surplus material above the welt seam should then be trimmed off, leaving at least $\frac{1}{16}$ in. above the stitches as holdfast for the welt. This must be carefully carried out, as much damage may be done if the trimming is too close.

The ends of the welt should not be left abrupt, but

skived off neatly to conform to the range of the shoe. They should be perfectly tight and solidly sewn in, but sometimes in machine welts the end may be a little loose where the thread is cut off. This is a bad fault if left, and the bench-man will often have to put a stitch in here to tighten the corner in.

The welt should then be levelled up to stand out square from the feather. A welt-beater or the flat end of the toe-beater can be used for this purpose. The welt should be turned up, the flat side of the toe-beater placed under the feather, and the welt and seam gently tapped down to it.

There may be a little difficulty in levelling the toe end of the welt. If we measure the welt before sewing we find it measures the same along both edges, but in sewing, the outer edge of the welt is forced to occupy a larger circumference than the inner edge, meaning that the inner edge has buckled and the outer edge has been stretched. This makes the welt bind to the sides of the last, especially around the toe. In light welts this should clear and level up easily, but if the welt is very stout and binding very tight, two or three small slanting cuts (oblique) just round the *edge* of the welt will allow it to stretch to the proper proportions.

Filling the Bottom

It will generally be found that the cavity between the edges of the upper is greater than in machine-sewn, but the principles regarding under- or over-filling remain the same.

The bottom-filling should be a good, light and flexible one, not brittle or one that will break up and work loose in wear.

All filling should be stuck in with paste or solution to hold it in place.

If felt is used, this should be well pressed down to

form a solid bed for the sole, and to prevent it rucking up in wear. Cork-solution should be well pressed into the crevices of the inseam for the same reasons.

Shanks should be solutioned into position, and the shaping and preparation carried out according to the style of shoe and shape of the waist, as in machine-sewn preparation.

There are many special manufactured shanks used. Some are attached direct to the innersole, as the "spring waist"; others are leather shanks reinforced with a steel spring, all being used to strengthen the waist and keep shape in the shoe.

CHAPTER XII

SOLING

THERE are several methods the bench-man may have to use in bottoming or preparing the work for the stitching process.

THE FIRST METHOD

The simplest is where the sole is rounded to shape and channelled prior to reaching the maker. In this case the sole first requires mellowing (see preparation in machine-sewn), then the flesh or backing removed and the waist reduced according to requirements.

If for a square waist, very little thinning down is necessary on account of the square edge required all round. But if for a square outside waist and bevel inside, then the inside waist of the sole is reduced by skiving to the substance required to form the bevel.

If for a bevelled waist, then both sides of the sole in the waist are reduced. Care is required not to reduce the sole too thin under the depth of the channel, or this may be cut through in the stitching.

The welt may be reduced or thinned down a little in the waist, care being taken not to cut the welt stitches.

The sole can then be gently hammered on the flesh side, to set or condense the fibres of the material, and help the sole to conform to the shape of the last.

The sole is then balanced in position and temporarily attached (usually in this case) with rivets, one at the toe and one at each joint, not driven right home, but so that they can be pulled out after stitching.

The seat of the sole is secured round with brads, and

the sole then bedded down. The channel is opened and the shoe is then ready for stitching.

The Second Method

This is more difficult, the soles being given out in the square, i.e. roughed out, not rounded to shape, and the shaping left to the bench-man. It allows for deviation from standard patterns to suit individual types of feet, as in bespoke work, such as odd feet or very twisted shapes.

We should first ascertain the width of welt required in the finished shoe, whether for close welt, half-wide welt, or wide welt, to know what margin of edge to leave. Then the shaping may be carried out either "direct" to the welt or by a "pattern."

In the former case, the sole (after mellowing) is attached with rivets, one at the end, one at each joint, and one in the seat. Then it should be well bedded down to the welt, especially in the waist, and the welt boned back to the sole to keep both in contact.

The sole and welt are then both rounded together to the width required, and the waist shaped according to the style of shoe.

The sole should be held firmly in position with one hand to ensure correct width, and the knife held perpendicularly to form the square edge so necessary for good channelling and stitching.

After shaping, the rivets can be removed, and the shaped sole can then be attached to its fellow one, and the latter rounded to it, by this means obtaining a *pair* in width and dimensions.

This method of rounding requires some little experience, as a slip of the knife is likely to cause much damage to both welt and upper. For the beginner it would be safer to round the soles to a pattern.

To obtain a pattern, take an impression of the welt

seam, by marking round the seam with ink or a piece of chalk, then laying a sheet of paper over this and. smoothing it down to obtain a clear impression. Hold the paper firmly to the roundness of the bottom to obtain the correct width, and make sure the paper is well in the hollow of the waist to obtain the correct length. Then shape out the paper to the impression. Try the pattern on the seam to see if it is correct. If so, take another piece of paper and cut a larger pattern from the first one, leaving the margin of allowance from seam to edge of the sole either for close welt, half-wide, or wide welt. The pattern can then be placed on the sole and the sole rounded to it.

The soles may then be sent in for channelling and afterwards prepared and attached as in the first method.

The Third Method

The soles are received in the square, and after mellowing are attached by solution. This is undoubtedly the better way, as the cement or rubber solution helps to waterproof the bottom, beds the sole more to the shape of the last, and cements the welt and sole together, holding them both firm and solid for the stitching.

All thinning of the waist must be done prior to the attachment. The sole should be laid on the bottom and the waist marked off, from the joints to the end of the welt, then the sole reduced at this part to the necessary substance. Also (if necessary) for very light waists the welt should, be thinned down at this stage.

The whole bottom of the shoe should now be coated with solution, carrying it right out to the edges of the welt and to the end of the seat (if the sole is long enough to go right through) or as far as the sole extends.

The sole should now be roughed up on the flesh side. This can be done with the rough edge of a rasp, or by

scoring across with the point of the awl. The scoring must be carried, out to the edge of the sole, as it forms a key for the cement. Both shoe and sole should then be left a little while until the solution becomes tacky.

The sole can now be balanced in position and pressed down tight through the centre, then pressed outwards to the edges, excluding all air from between the shoe and sole. If the edges of the sole are pressed on first, an air pocket forms in the

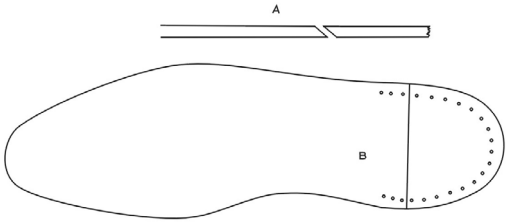

FIG. 41

centre and will soon strip the sole off.

The sole can then be bedded to shape and the welt well boned up to the sole, forming a solid edge. If the sole extends right through, the seat can be trimmed up and secured with brads. In most of the heavier kinds of work, however, the soles only extend to somewhere under the heel (this is for reasons of economy) and require piecing to bring them to full length.

THE PIECE-SOLE

In order to maintain the range of the shoe and the correct balance or pitch of the heel, the piece-sole must be up to the full substance of the sole.

There are two methods of attaching the piece-sole, one by "lapping-over," the other by "springing." (See Figs. 41 and 42.)

The method of "lapping" is the one most generally used. The sole-seat is skived across with a slanting cut (not too abrupt), and the piece-sole skived across at the same angle (as Fig. 41 (A)), then brought together and the skive lapped evenly over and secured to form a close join (as Fig. 41 (B)).

In the method of "springing," the sole-seat is cut quite square and stunt (as Fig. 42 (A)), and the piece-sole is slightly hollowed out (as Fig. 42 (B)), but with the edges that are to join up perfectly square. The seat end of the sole is secured in position, and the hollowed centre of the piece-sole is secured tight up to the centre of the sole seat (as Fig. 42 (C)), the corners of the piece-sole then being sprung back on to the sole seat forming a close-up stunt join (as Fig. 42 (D)).

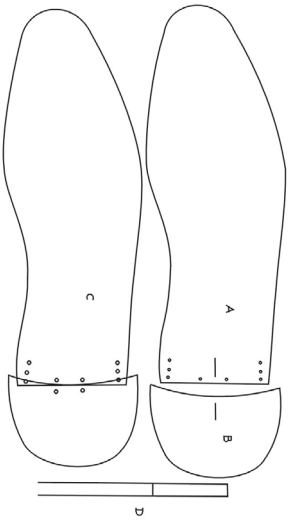

FIG. 42

The seat can then be trimmed round and secured.

The shoe is next passed to the sole-rounding machine, which, being fitted with adjustments for different widths of welt, rounds the sole to shape and channels it at the same time. A small accessory machine opens the channel and the shoe is ready for stitching.

After the shoe is stitched, it returns to the bench for

THE CHANNEL-LAYING

For square waist work, this is a fairly easy job. The channel for stitched work is quite different from that

for the machine-sewn, owing to the different type of seam. A comparatively small channel is sufficient to bury the stitching thread, and this channel is cut more straight and not so deep as the machine-sewn, usually being placed about $\frac{1}{16}$ in. from the edge of the sole, making closing an easy matter, and moreover it should not require any solutioning, as there is no danger of its lifting or curling in drying.

If the sole is still mellow there is no need for further wetting. The ends of the stitching thread should be cut off both in the channel and on the welt.

The driver should then be used with an outward motion to clear all creases from the back of the channel. The edge of the sole should also be drawn inwards with the driver, helping to bring the lip of the channel in contact.

The sleek-stick may then be used as in machine-sewn channel closing, care being taken to use the notch of the stick to maintain the square edge to the sole.

The welt should next be trimmed up perfectly square to the edge of the sole. Make sure to hold the knife perfectly upright, otherwise a floating edge results which causes trouble in the finishing.

The "shaped" or "bevelled" waist work requires a little more careful handling.

One of the essential good points in a light shoe is a *close waist.* A waist left thick and stodgy spoils the appearance of a light shoe and makes it impossible for the finisher to set it with a close waist iron. This can be avoided if the sole preparation has been correct.

In laying the channel, the welt should first be trimmed out in the waist close up to the sole, then the waist should be bedded or hammered down close to the upper to form the bevel, leaving the seat and forepart quite square. After the channel is closed, the forepart can

be trimmed up to form a square edge, and the seat rounded to shape as a guide for heel-building.

For machine-attached heels, the shoe may now be slipped off the last, which is quite easy if working on an "Easy-exit" last. Remove the lacing (if any) or undo the buttons (if any) and remove the wedge of the last. Place the last on the stand, then press-the toe of the last down with the left hand, at the same time easing the shoe up the back with the right hand. If working on a solid last, the back of the shoe should be eased up gradually to prevent breaking up the waist and broken back seams.

There are many other sewn methods of attachment of even a more flexible character than those already described. The preparation and making of these come under the heading of "bench-work," and the bench-man of to-day should have some knowledge of the construction and methods of making these classes of work.

CHAPTER XIII

THE MACHINE TURNSHOE AND THE VELDTSCHOEN

THE machine turnshoe is very light and very flexible, and, as the name implies, it is made inside out and then turned. This method is used for many classes of light work for men's, women's, and children's. (See Fig. 43.)

In the preparation of upper reinforcements, the stiffener and toe-box should be light and mellow to allow of easy turning. The bottom edge of the stiffener, which is sewn in around the seat, should not be skived away as thinly as in the previous methods, but left stout enough to form a firm base line around the seat after turning.

The preparation of the sole is a very important item for this class of work, as it acts as the *innersole* during the making, and as the *sole* after the shoe is turned. The sole must necessarily be light, and should be selected for its flexible and wearing qualities. A harsh tannage of leather is unsuitable for this purpose, as the grain is apt to crack and split up during the turning of the shoe.

The sole is rounded to shape with a margin of allowance over and above the size of the last, according to the substance of the upper and the formation of the edge—whether for light edge, stout edge, or mock welt—the margin of allowance varying from $\frac{1}{8}$ in. all round to $\frac{1}{16}$ in. in the forepart, with $\frac{1}{8}$ in. round the seat to allow for the extra substance of the stiffener.

It is then channelled, the Universal Channelling Machine being ideal for this purpose, as it is fitted with an easy adjustment to cut any particular feather

required. The sole is then moulded with the exact margin of allowance bent to fit over the edge of the last, forming a recess for the accommodation of the upper.

The sole is next positioned grain downwards to the last,

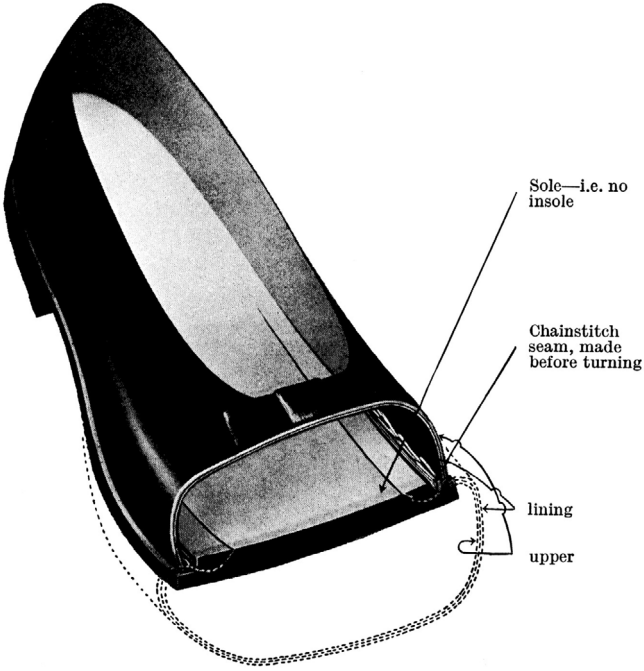

FIG. 43 THE MACHINE TURNSHOE
(*By courtesy of the British United Shoe Machinery Co., Ltd.*)

with the margin over the edge of the last and temporarily attached, keeping the feather close down, to allow the upper to be brought as close to the last as possible.

When the upper is assembled, it is turned inside out and positioned on the last with the lining outside. The

upper should then be placed with the seat flush over the edge of the sole, as hoist methods are not applicable on account of the extra length of sole.

Although the same principles of lasting apply here as in other methods, yet there is need for some slight variations.

In this work, as in all court shoes, the lasting strains should be taken more longitudinally to ensure a tight grip around the top edge of the quarters. As the uppers are very light, only very fine tingles should be used in lasting, and these should be placed into the between substance and not driven right through, on account of the discoloration and markings on the grain side of the sole. For this reason, as few tacks as possible should be used in the lasting. Sometimes copper tacks are used to avoid discoloration.

When pulling over, the upper being inside out, the laster must exercise a little care to get the correct position of the seams on the last. When the forepart is pulled over, the lining should be cut on both sides near the feather, just below the back joints, to allow it to be turned back over the stiffener. This part of the lining is not lasted in, or sewn, but stuck down after the shoe is turned, only the upper and stiffener being lasted and sewn in. After the lasting is completed, the shoe may be braced, but usually this is not done. The surplus material is trimmed off and the shoe is sewn with the tingles in. These, being very fine and soft, do not damage the machine needle or interfere with the sewing.

The sewing is done on the welting machine (omitting the welt), or on the turnshoe sewing machine, both being somewhat similar.

After sewing, the seam is trimmed and the inner-channel solutioned down. The shoe is then slipped off and turned.

The Second Lasting

There is no shoe that is subjected to greater distortion or greater stress in the making than the turnshoe, and for this reason everything that can possibly be done to assist in the turning of the shoe should be carried out.

The soles being the most rigid part should be thoroughly tempered and mulled, and wherever possible the uppers should be mulled also. This not only assists in the turning, but greatly helps in the second lasting and the shoe sets much better after drying.

Commence turning at the seat end, first the stiffener, then the waist and forepart, right out to the toe end. A turn stick may be used for this purpose, and it should prove fairly easy if a little care is taken and the shoe is properly mellowed.

The next difficulty is to clear the lining. First it was outside, occupying a larger area, now it is inside, with a less circumference to cover. This is the reason why it is not sewn in, as then it would be impossible to clear it.

The stiffener should now be pasted and the lining smoothed out and stuck down. The lining at the base should be trimmed round, leaving just sufficient margin to cover the seam.

The shoe will now show a deep cavity inside between the seam, and if pulled on the last as it is, the sole would cave in. To prevent this and allow the bottom to dry flat, a filler sufficiently stout should be tacked on the bottom of the last to fill up this cavity. The shoe is then pulled back on the opposite last to the one it was made on, i.e. the right on the left, and the left on the right. The uppers require to be smoothed on to the last and gently tapped round, taking care that the linings are clear and the stiffeners and toe-boxing are not curled.

The bottoms should then be sleeked to shape with

the stick. On no account should they be shaped with the hammer, as hammering will often burst the sewing seam. A wood mallet is better for this purpose, if really necessary.

After drying; the shoes are slipped, and the inside cavity is

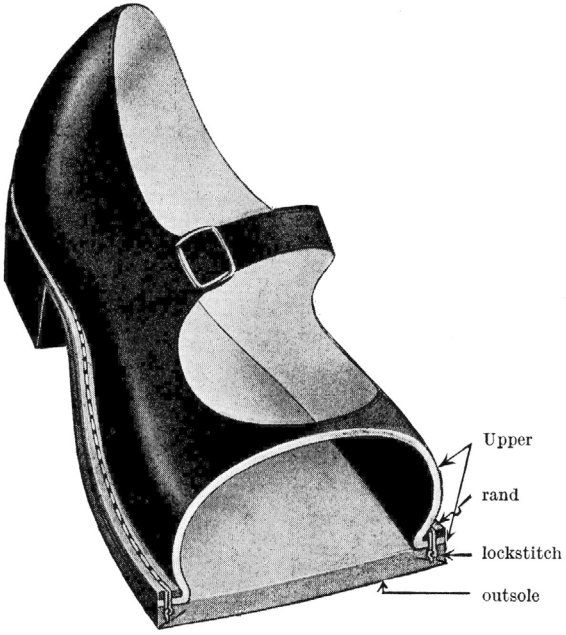

FIG. 44 THE VELDTSCHOEN
(*By courtesy of the British United Shoe Machinery Co., Ltd.*)

fitted with shank and fillers to level up the bottom.

THE VELDTSCHOEN

This was originally a South African type of footwear, but is copied now mostly in children's shoes and some kinds of slipper work. It is a very flexible make of shoe,

having no innersole and only one vertical thread, seam of attachment, and that outside the shoe, leaving the part of the sole next the foot free to flex.

In the original shoe, the upper is turned outwards all round to the edge of the sole, then the sole and the uppers are stitched together with the upper forming a kind of welt.

In the machine veldtschoen (also known as "stitch-downs"), some alterations have been made, and the work adapted to the stitching machine. In this method a seat-piece is provided, being skived away at the breast, then positioned on the seat of the last. The heel-stiffener is now fitted into the upper, and the seat of the upper is lasted and secured to the seat-piece, leaving the waist and forepart of the upper loose. The sole, which is press-cut to shape and channelled, is now positioned on the last, and the upper is slightly nicked or cut at the corners of the heel to allow the edge to lay along the flat of the sole. The upper is then strained over the last and lightly secured with tingles along the outer edge of the sole. (See Fig. 44.)

The shoe now goes to the stitching machine, which is fitted with a special part for this purpose, called a veldtschoen table, carrying a thin ribbon welt or rand, which in the process of stitching is carried around the flat edge of the upper, combining the welt, upper, and sole together in a solid edge. The channel is then laid and the shoe completed by the ordinary method of stitched work.

CHAPTER XIV

TEAM SYSTEMS

WITH the introduction of machinery into the shoe trade came many remarkable changes in the methods of working. New systems of making shoes have been developed in recent years, and older methods have been considerably revised.

Time was when it was either “seats-men” or “bench-men," the seats-man doing the hand-sewn work, and the bench-man doing such work as riveted and pegged. Then came the sole-sewing machine, with its accessory machine, the channeller, which considerably altered the methods of bench work, and produced a much lighter and more flexible shoe than the old type of footwear. With the coming of the sole-stitching machine, further alterations in the methods of bench work were evolved. These machines were responsible for the introduction of the machine-sewn method of making, with all its variations, such as stitched foreparts, etc.

When the welt-sewing machine came into vogue, a new system of bench-making was developed, as this machine, in conjunction with the stitching machine, made it possible to produce a machine-welted shoe which was almost a facsimile of the hand-sewn.

Then came a development of machinery in the actual lasting process, and many ingenious devices were brought out, tried, and adopted from time to time, only to be superseded by others more ingenious, until at the present day there are many systems of machine lasting, and many complete plants of lasting machines

for practically every description of work and method of making.

Before this stage was reached, however, there were many systems tried both for the speeding-up of the process and to obtain a uniformity of work in the bulk.

Each man on the bench had his own way of working, and with an order of work, say 12 dozen pairs, given out to twelve different men, it was often found that there were twelve different results. Maybe one tied his uppers up too tight, another too loose, or one strained his uppers over the last more than the other, and so on, making the whole gross non-uniform in the fittings, in the appearance, and in length of caps and vamps.

For these reasons (and maybe others) the process of making was divided, and "team" systems were introduced. "Practice makes perfect," and no doubt the continual repetition of a job makes the operative very proficient and expert, and, providing the others on their part link up with his proficiency, then good results should be the outcome.

Team systems were first introduced on the hand or bench method principles, and then later organized in conjunction with lasting machines, but the arrangement of the team depended on the class of work being produced, the type of lasting machine used, and on workshop facilities. These teams consisted of a number of operatives, and as the whole process of lasting was divided between them, the benches were arranged so that the work followed from one to the other in regular succession.

The Hand Team For Machine-sewn Work

This would be comprised of firstly the assembler, whose work consisted of tacking-on the innersoles, and the placement of the heel-stiffener, side linings, and

toe-box in the upper (all these parts having been skived and prepared previously in the bottom-stock department). The work was then passed to the puller-over, who positioned the upper on the last, "drafted" it, and part-lasted it in the waist and forepart. The next operative completed the lasting of the toe and seat. The shoe then had the bottom filled in and the sole temporarily attached and prepared for sewing by the next operative.

This arrangement of team was suitable for machine-sewn work only.

A Welted Hand Team

Some alterations had to be made in this case, as after the lasting was completed the shoe passed to the next operative for bracing and trimming preparatory to welt-sewing.

The welt-sewing operation caused a break or a finish to the actual lasting team, and the shoe then passed on for inseam trimming, bottom filling, and sole attachment preparatory to stitching.

These teams were arranged on the time principle, i.e. the process was divided in proportion to the number of the team and the abilities of each member, so that each operator took about the same time on his part, thus avoiding any waiting or over-lapping.

With the advent of lasting machines came other arrangements of teams, bringing about a sub-division in the process of bench work between *hand and machine,* and a combination of hand and machine principles.

Here, again, teams are arranged according to the kind of work, machine-sewn or welted, being made, and also the type of lasting machine used and the number and description of other machines used in conjunction with it. One arrangement of team is not suitable for all methods of manufacture.

Hand and Machine Team (for Machine-sewn)

Some of the earliest machines used in this arrangement were the “Magnetic” and the “Boston” tacking machines. These were not really lasting machines, as the operator had to manipulate his own hand pincers while the machine did the tack driving.

As no doubt these machines are now obsolete, not much good will be gained by going into a description of their actions. Suffice it to say they were soon superseded by the “Consolidated Hand-method Lasting Machine" (known in short as the “Consol”), but the arrangement of the team was the same, except that the capacity of the “Consol” was much greater and this required more “pullers-over” to keep pace with the machine.

The first process was the “assembling ” and preparing of the uppers, last, and innersoles for the

Pulling-over

This process had to be done by hand prior to the introduction of the pull-over machine (and still is, where the machine is not used). The shoe was positioned on the last and drafted at four points only, the toe-end, sides of toe, and back of seat, leaving the other draft pulls to be taken by the machine according to the method of lasting used by the operator.

A number of pullers-over were required to keep pace with the speed of the machine. After the operator had completed the lasting, the shoe was tapped up by hand on the bench or passed to the “pounding-up” machine (if one was included in the departmental equipment), where the upper was levelled and the feather-line defined. The bottom was then filled in, and the bottom-stock attached, as in the hand method, or by the sole-attaching machine, if one was also included in the process.

Hand and Machine Team (for Machine Welted)

Here, again, the arrangement of the team varied, because of the type of machine used for this work, known as the bed-laster (which is now used for the wiping-in of toes and seats only), and in the absence of the pull-over machine—the bed-lasting machine was in vogue much earlier than the pull-over—the work had to be "assembled," as in the former method, then positioned on the last and pulled-over by hand.

Some of the older types of the bed-laster, such as the "Triumph" and the "Fergusson," were equipped with side pincers for the lasting of the waist and sides of the shoe, some were fitted with an arrangement of "tackers" for the driving of tacks by compressed air, and others were fitted with loose tackers operated by a blow with a "maul." The side pincers were afterwards dispensed with, as it was found that this part of the process could be done quicker and better by hand. The work had therefore to be pulled over and part-lasted on the bench, and the bed-laster became practically a "wiping" machine for toes and seats only.

Many devices were tried on this machine to dispense with the hand-bracing, but they were only partly successful until the coming of the bracing machine and the side-laster.

This preamble shows the gradual development of the lasting machines, and the gradual changing from hand or bench methods to the *all-machine systems* of the present day. The "missing links" were provided with the invention of the pull-over machine (completing the machine-sewn machine system) and the side-laster in conjunction with the pull-over machine (completing the machine-welted lasting system).

CHAPTER XV

MACHINE LASTING–MACHINE-SEWN SYSTEM

THE installation of complete machine systems caused great changes in the working of other departments, more particularly in the bottom-stock and fitting-up departments. It is here that all the components of the shoe (except the uppers) have to be specially prepared for the machines, and the success of the lasting plant greatly depends on the correctness of this preparation.

Machines are not human, and cannot differentiate between correct and incorrect preparation; in other words, all work must be correctly prepared and *adapted* to the machine, as the machine cannot adapt itself to all and every circumstance in spite of the many clever devices and adjustments that may be fitted.

THE PREPARATION OF COMPONENT PARTS OF THE BOTTOM-STOCK

Many machines were brought into use in this department, such as skiving machines, feathering and channelling machines, insole and sole moulders, stiffener moulding machines, etc.

THE INNERSOLE

This should be quite tight and firm to prevent spreading in the lasting and the later processes. It is press-cut, then feathered and moulded by machine to the shape of the last it is intended for. These two items are important to the lasting operator, and the innersole should be moulded to fit the last snug and close. Badly-moulded innersoles, with the break of the joint in the wrong place, stand up from the flat of the last, making good lasting impossible at that point.

Sometimes the innersole becomes twisted and distorted by too many being moulded at the one time and the innersole being used dry, making it impossible to position it correctly on the last. If the innersole is moulded in a damp condition and then left to dry, a much better shape and fitting will be obtained.

The heel-stiffener (when prepared in this department) is first skived by machine. This is an important operation, as the width of the scarf or skive must be correct, and the knife set at an angle to produce a level skive, terminating with a feather edge. A short blunt skive around the top edge makes the outline of the stiffener plainly visible through the upper when the shoe is made. The correct width of skive helps to rectify this by permitting the top edge of the quarters to pull in and hug closely to the last, and also imparts a flexible quality to the top edge, which is so desirable in a good-fitting shoe.

The stiffeners are then wetted in the bulk and moulded to shape, the moulding machine being equipped with moulds made to the shape of the seat of the last. The stiffener is placed over the mould and the machine set in motion. With tremendous pressure the machine shapes the stiffener, and the bottom edge is wiped over and crimped to the shape desired. (See Fig. 45.)

The correct fit of the stiffener to the last is a very important point both in the lasting and in the ultimate appearance of the shoe. Whether it is used dry or in a damp condition in lasting, there cannot be any further moulding to shape, as all further attempts only result in distortion. If manufactured stiffeners are used, they should be selected not only for size but for the shape and contour of the last.

The toe-puff used in this system must be of a kind that is easily adaptable to the process, and for this reason the heated puff is very generally used. This

gives uniformity of shape, combined with lightness of substance, and remains soft for lasting while it is kept hot, and sets hard as soon as cold, which is an advantage in a quick process where the work is slipped off soon after lasting. It is composed of fabric impregnated with a wax compound, and requires a temperature of about 130° F. to make it workable. For this reason a special arrangement of either vapour, gas, or electric heating is fitted near the pull-over machine for the convenience of the operator.

The preparation of the bottom-stock for this process calls for a deal of consideration. The sole *must fit.* It should,

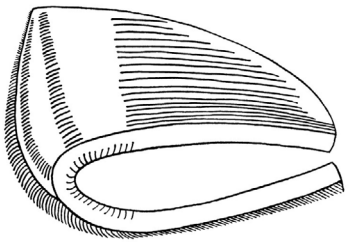

FIG. 45

therefore, be cut to a corresponding pattern with the innersole with just sufficient margin allowance for the substance of the upper and the width of the edge. Then, if channelled correctly—usually $\frac{1}{8}$ in. In from the sole-edge for a close welt (wider for extra widths of welt)—the sole will lay flat, and the channel will be brought level with the lay of the innersole, and thus assist the sole-sewer to sew a level seam without canting the shoe in sewing.

This tilting or canting of the shoe causes the bottom to become round, owing to the sole being forced inwards towards the centre during the operation of sewing, giving a lot of trouble in channel-laying and causing a bad fit to the sole.

If middle-soles are used they should now be skived across the joint or tacked or solutioned in position on the sole.

Shanks may be shaped and fitted in position in the same manner.

The bottom-stock is now ready for moulding. The sole should be just mellow, to conform to the shape of the mould. The transverse rotundity of the moulding is important to make the sole bed close to the upper in the waist, but the longitudinal curvature is more important still. The break of the joint must be in the right place to get a correct fit, and once moulded to shape should never be disturbed or distorted.

The channel is then opened on a small accessory machine with the sole still mellow. This should be an easy matter if the channelling is correct. No force should be required, thus preserving the shape of the mould and leaving intact the whole of the bottom-stock to be attached in the bulk.

The "Consol" or "Rex" System of Lasting

In this system the work is lasted on the "heel-seats-up" principle, commencing directly opposite to the bench methods of lasting. The first tack in bench methods is at the toe-end, whereas in this system the first tack is at the seat end, the patterns and uppers having been specially cut and adapted to the system.

The divisions of the process, and the machines used, may be enumerated as follows—

The Assembler.
Pulling-over Machine.
"Consol" Lasting Machine.
The Pounding-up Machine.
Bottom-filling.
Sole-attaching Machine.

The Assembler

The assembler is responsible for the correct placement of the innersole on the last, and the pasting and correct insertion of the heel-stiffener and side linings. The upper is positioned at the back on the last with the lining and upper cleared and strained forward. The correct height of the back is determined and the upper tacked down and secured to the innersole with one or more tacks at the back seam.

If the "Rex" Assembling Machine is used, the upper is held in position on the last by a clamping device, and the seat of the upper wiped over while a pincer takes a length strain, clearing the lining and upper forward, drawing the upper tight at the back seam, and giving it a "set" to the last. Then with the upper still held tight, from one to five tacks are driven to secure the seat in position. If the upper is positioned correctly with the lining cleared and some of the stretch removed from the material, this should make it better for the pulling-over.

The Pull-over Machine

The toe-puff is now inserted and a little french chalk sprinkled on the lining. The operator then proceeds with the pulling-over.

There are many types of pull-over machine used for the different classes of work. The two main types are the Upright Pull-over Machine and the Inverted Pull-over Machine (called the I.P.O.), and the main principles involved in these machines are that the former strains the upper over the last, and the latter pushes the last up into the upper.

The "Inverted" Machine

This is constructed so that the operator has a full view of the shoe while the pulling-6over is done. The

operator positions the upper on the last, then positions the shoe in the machine, feeding the upper into the pincers. The machine functions with a treadle trip, and the pincers grip the upper in a downward direction, while at the same time the last is forced upwards into the shoe. Then with a second motion the pincers are forced over the feather, the tacks are carried through the feed tubes to underneath the shoe, and at the moment of the pincer release the tacks are driven upwards by compressed air, thus securing the upper in position.

The "Upright" or "Rex" Machine

The "Upright" machine is constructed in many models, some with three pincers, others with five, some for machine-sewn work, some for welted, some for ladies' work only, others for men's. Perhaps the most useful model, but most complicated, is the five-pincer combination machine, constructed to take either ladies' or men's work, and to do either machine-sewn or welted work. (See Fig. 46.)

The machine is very rapid in its action, is power-driven, and operated by treadle. It is fitted with two tack-pots, one containing the tacks for machine-sewn work, the other for welted, and a double set of feed-tubes for conveying the tacks to the driving mechanism. Either tack-pot can be cut out of action when not required. It is equipped with many self-adjusting devices which allow the mechanism to conform to any shape or size of last, and these adjustments, in addition to many others, the operator can make as the necessity arises.

The action of the machine is very complicated, and a brief description here may give a better understanding of the process. The whole operation of pulling-over and tack-driving is completed with one full revolution of

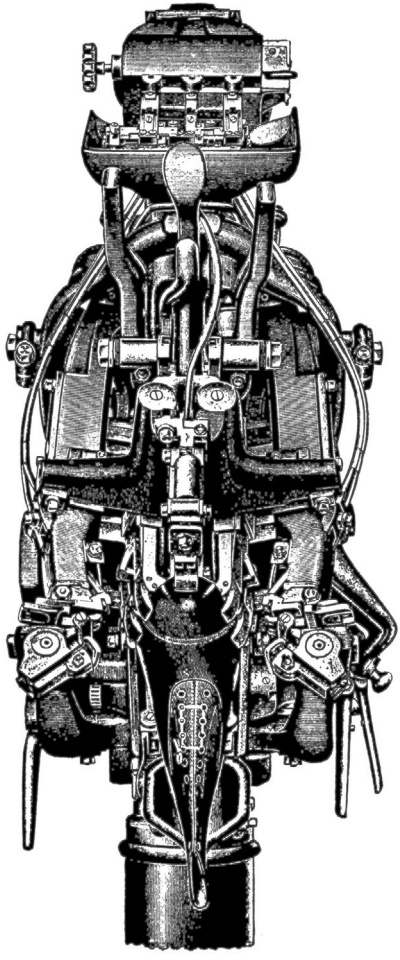

FIG. 46 REX PULLING-OVER MACHINE
(*By courtesy of the British United Shoe Machinery Co,. Ltd.*)

the machine, this requiring two separate trips or pressures of the treadle, each giving a half-cycle to the machine. The first half-cycle is responsible for the positioning and straining of the upper on the last. Then comes a pause in the action of the machine, bringing it to what is called the "pincer-closed-stop position." The second half-cycle is responsible for the driving of tacks and the release of the shoe from the machine.

What really happens is that the operator places his foot on the treadle, releasing the trip brake and bringing the friction plates on the lower shafting together. The power supplied from the main shaft is conveyed through the belt to the driving-wheel, and this sets the machine in action through the medium of the intermediate gears revolving the camshaft of the machine, which is equipped with the main cams of various shapes (some grooves and some eccentric), each giving the various actions to the different parts of the machine.

Many improvements have been made on this machine since its first inception, one of the most important being the introduction of the oil-check.

Adjustments of Tension for the "Rex" Pull-over Machine

The Oil-check. (See Fig. 47.) In the early type of this machine, the pull of the pincers was rather drastic and abrupt, often causing damage to the uppers and undue straining at those points. This led to the introduction of the air-check, somewhat controlling the force of the pull, then later the oil-check, which allows the operator by adjustment to control and regulate the pull.

Considering the many and various upper materials used at the present time, and the varying amount of stretch in each, the oil-check is a very necessary addition to the machine. The skilled operator, with a

glance at the uppers and the shape of the last, knows almost immediately how much check to put on the pull of the pincers.

The mechanism consists of a dashpot (filled with oil) and a valve and piston rod, controlled with an adjusting

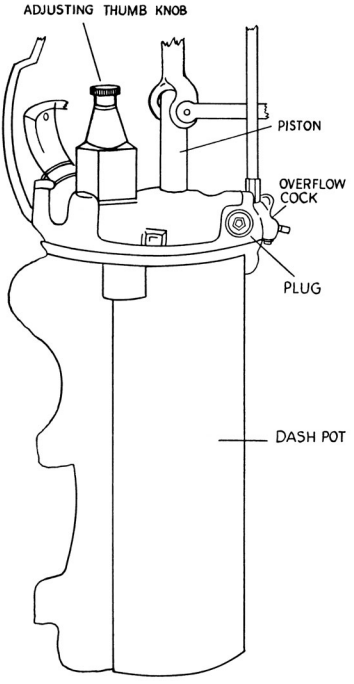

FIG. 47

thumb-knob to regulate the updraw of the pincers. By turning this knob clockwise it opens the valve and allows the pincers to travel up quicker, giving more pull for heavier materials. By reversing the knob it slows down the action of the springs, gives a more gradual pull, and applies the strain over a longer period, this

gradual and smoother tension being beneficial to many of the lighter kinds of materials.

To Fill the Dashpot. The machine should be brought to the "pincer-closed-stop position." The overflow cock should be opened and the plug removed from the pot cover. Gently pour in a fine oil (the No. 3 oil is supplied by the B.U. Shoe Machine Co. for this purpose) until it runs out of the cock, replace the plug, and close the cock. The release-lever (the large lever on the left-hand side of the machine) should be worked up and down a few times to displace any air that may be trapped below the piston, then more oil added as before. As a. final test, close the valve with the adjusting knob, pull the release-lever right forward until the pincers are wide open, and then release it. The lever should quickly return to a vertical position, closing the pincers and remaining almost stationary or travelling backwards very slowly. From this position a turn of the adjusting knob will give a faster or slower pull to the pincers, according to needs. The machine, being constructed to take all sizes of lasts, is fitted with adjustments for this purpose.

Adjustments for Width and Length

The Shoe-rest. This is equipped with three serrated feet to grip the innersole and prevent the shoe slipping during the updraw of the machine.

The whole body of the shoe-rest may be raised or lowered by an adjusting thumb-screw to suit the "spring" of the last, or, should the last have a very flat bottom like the slipper or tennis shoe last, or on the other hand have the toe raised well off the ground, extra toe elevation may be obtained by an adjusting fulcrum screw fitted to the front foot only.

The front foot is fitted with a rack-bar, and can be extended to any length of last.

Provision is also made here to get a correct drive of the tacks. The driver-bars in their descent reach a certain position and the shoe must be there to meet the drivers. The perpendicular height or position of the shoe can be adjusted to suit either the shape of the last or the difference between the drive of machine-sewn tacks and the drive of welted tacks. For this purpose shims or spacing plates are provided, which may be slipped under the cross-feet of the shoe-rest. These shims are made in varying thicknesses, from $\frac{1}{64}$ in. to $\frac{3}{64}$ in., and can be used singly or coupled together to give the correct spacing required.

Adjustment for the width of the last and to get the correct spread of the pincers is made by the pincer-locating shaft, which runs through the machine from left to right, and connects up with the back of the pincers. A smart tap with the hand releases the clutch, and the shaft may be turned, widening or closing the pincers to the required spread.

The side pincers should be set to the full width of the last without dragging the innersole in their upward course. The front pincers should be set 1 in. in front of the front foot of the shoe-rest. This gives a solid position of the last for the over-the-toe pull.

The Heel-rest. This closes on the seat end of the shoe, working up and down on slides, and can be adjusted to any length of last. It is also fitted with a "swing " to left or right to accommodate the twist of the last. All these adjustments can be made in a very short space of time, and once set there is no need for alterations until other circumstances arise.

The operator then positions the front of the upper on the last, and feeds the shoe *centrally* into the machine. The toe of the last must be presented centrally to the front pincer, leaving the twist of the last to the swing of the heel-rest. It will be noticed that the back of

the front pincer is slightly hollowed out to receive the rounded shape of the toe. The upper is then fed centrally into the front pincer. A backward twist of the wrist brings the joint of the last on to the shoe-rest, the operator at the same time feeding the upper evenly into the side pincers, taking care to get an even amount of material into each pincer jaw and maintaining the position of the upper on the last.

The whole art of pulling-over is to see that the last and upper are positioned centrally into the machine.

The Machine Action

As the first trip is taken, the pincers close on the upper and commence their upward pull (the updraw). A cam action brings the shoe-rest downwards, forcing the last into the upper at the same time as the pincers pull upwards, thus giving a double action and a resistance to the pull of the machine. The heel-rest is brought up, gripping the back of the shoe against the pull of the pincers, and holding the shoe solidly in the machine.

The front pincer takes the first pull, then eases a little, while the side pincers take their pull together. The front pincer then pulls again, increasing the length strain on the upper.

The simultaneous pull of the side pincers is one of the good features of the machine, as it gives a balance of strain to both sides of the upper and helps to maintain its position on the last, whereas in bench work only one side can be dealt with at a time, and often corrections have to be made to impart a balance of strain and get the correct upper position.

Meanwhile, other parts of the machine have been busy. An eccentric cam action causes the tack-pot to take a half-revolution, distributing the tacks to the various raceways, at the end of which the separators

work. Each one coming forward picks off the end tack and passes it through the throat-plate into the feed tubes, where it is conducted to the tack-blocks, ready for driving. The separators now close the raceways, only allowing one tack through at a time.

This is the end of the first half-cycle, bringing a pause in the action of the machine, while the pincer strain on the upper gradually develops. During the pause the operator can see if the upper position is still correct, as it is at this stage that all errors in the upper position must be corrected. The machine is fitted with many devices for this purpose.

There is a small lever on the right-hand side of the machine, called the tip or cap-straightening lever, the shaft connecting with the back of both sets of side pincers. If the toe-cap is slightly out of position, by manipulating this lever either set of pincers may be brought forward and the other backward, thus adjusting the cap to the desired position. The action is self-locking, and holds the cap to the position set.

On the front face of the machine are three levers, called the updraw levers. The centre one (front updraw lever) is connected with the front pincer, and may be used to take up a little more of the upper, or, by an upward push, to increase the length tension in the shoe. The right and left levers (side updraw levers) are connected with the side pincers, and work on a hinge-bearing, allowing either side to be pulled downwards and the other upwards. They may be used for seam-straightening. Should the front seam of the shoe be a little out of position, by manipulating these levers, pulling one down and pushing the other up, the upper can be "hinged " over on the last to the desired position.

Should the upper be badly positioned on the last, beyond adjusting, the operator should release the shoe from the machine. This may be done by pulling the

release lever (mentioned, above) right forward, opening the side pincers, and then releasing the toe-end of the upper with the front updraw lever. Take a trip of the machine, and make a fresh start.

There is one important point that the operator should carefully watch during the pause of the machine, namely the *inner sole position.*

The shoe-rest holds the innersole tightly, but the last is apt to slip forward when the heel-rest clamps the back of the shoe, dragging the innersole back from the toe of the last. If left in that position it would cause endless trouble in the later processes. On the left-hand side of the machine there is a ratchet-handle connected with the shoe-rest for correcting the innersole position, *and this should be used* until the correct position has been attained.

Too much emphasis cannot be placed on this point, as many bad faults occur through its neglect. For example, the "Consol" operator will be pleating the toes on the bare iron plate beyond the feather of the innersole, and the pounding-up machine will be pounding on the iron plate, cutting all the substances through again. The sole-attacher positions the bottom-stock to the outline of the last, and this position proves correct while the shoe is on the last, but wrong when the shoe is slipped. The sole-channel not being in relation to the innersole often causes the operator to miss the innersole in sewing, the fault becoming more aggravated at each process.

All the necessary adjustments having been made, the operator should hold the shoe firmly up to the shoe-rest, placing both thumbs at the bottom of the instep with the fingers around the waist of the shoe, and then the second trip may be taken.

The action of the machine is so rapid that the motions can only be followed with difficulty. What actually

takes place is that the moment the machine is set in action the clamp-arms close in on the sides of the upper. At the end of the clamp-arms is a very ingenious mechanism for holding the upper tight at the moment of the pincer release and wiping the upper over the feather for the tack drive. This gives a clamp and wiper action which may be likened to a mechanical thumb (doing the same work as the thumb of the hand laster). It is composed of a clamp-presser-slide and a wiper-slide working

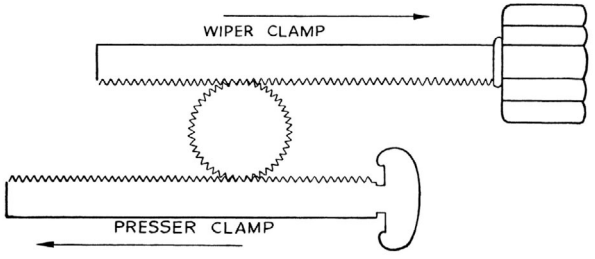

FIG. 48

on a circular gear. The clamp-slide is fitted with a swivel end and rubber cap, to conform to any curvature of the last and hold the upper firmly without damage; and as this comes in contact with the last it forces the gear to revolve, bringing the wiper over the feather. (See Fig. 48.) At the same time the pincers close inwards over the feather (the overdraw).

The clamp-arms are closely followed by the expander-arms (containing the drivers), bringing the tack-blocks over the feather. The drivers begin to descend, and strike the release-latch on the pincers, releasing the upper. The driving bars immediately drive the tacks home, securing the upper on the last. A further revolving of the cams brings all the parts back to their original position, the shoe is released, and the machine comes to rest.

The whole process of pullmg-over, adjusting the shoe, and tack-driving, takes but a small fraction of time.

There is also an adjustment for the placement of tacks. In machine-sewn work the tacks should be placed in $\frac{3}{8}$ in. from the feather-edge, and it may be necessary to alter this position for some reason, such as tight-cut uppers.

On the ends of the expander-arms underneath the tack-blocks is a placing-gauge, held with a binding screw. This may be loosened and the gauge adjusted to the position required.

The shoe is then passed on to the "Consol" lasting machine, which completes the drafting and further lasting of the shoe.

CHAPTER XVI

THE CONSOLIDATED HAND-METHOD LASTING MACHINE

As the name implies, this machine is constructed to follow the same methods, the same manner of pulls, and the same direction of pulls as the hand laster. There is no doubt that a skilled operator who understands the principles of lasting and makes good use of the mechanical adjustments on this machine can copy every action that is used by the hand craft, but the efficiency of the pulls depends upon the manner in which the operator positions the shoe to the machine. (See Fig. 49.)

Presenting the shoe to the machine at the correct position, and at the correct angle, together with the correct manipulation of the pincer, is the whole secret of "Consol" lasting.

There have been many types of this machine in the past, and many improvements have been made, the old "straight" pincer pull, and the straight tack drive, giving way to the twist motion and the angle drive of the present day. These are very distinct advantages in the process of lasting.

The Machine Action

The machine is operated by treadle, but the treadle action is quite different from that of the pull-over machine. One distinct pressure and release on the treadle produces one pull and one tack drive, and continual pressure on the treadle produces a run of the machine as long as the operator desires.

Immediately the machine is set in motion the pincer

goes forward in a downward direction with the jaws extended towards the edge-gauge (where the feather of the shoe should be positioned). As it reaches the extent of its forward motion the jaws close upon the upper by means of a closing-rod and.

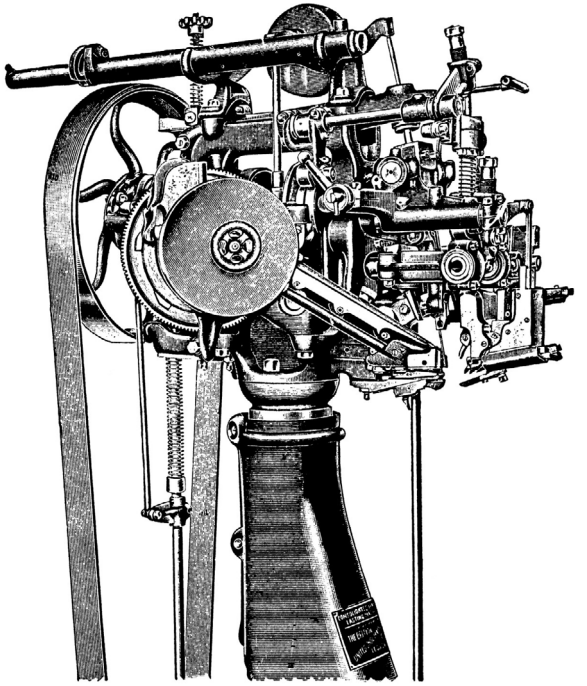

FIG. 49. CONSOLIDATED HAND-METHOD LASTING MACHINE
(*By courtesy of the British United Shoe Machinery Co., Ltd.*)

spring connected with the pincer-bar.

Then the revolution of the cam causes the pincer to take an upward direction (the updraw), taking the upper with it, followed by a backward direction (the

overdraw), drawing the upper over the feather of the shoe. (This action closely resembles the leverage and over-the-feather pull of the hand-laster.) At this moment the tack-carrier containing a tack comes forward, wiping over the feather, and almost simultaneously with the release of the pincers, the driver descends, passes through the tack-carrier, and drives the tack into the shoe.

The Mechanism of the Machine

This is very complicated, and in order to explain it, the operations must be taken sectionally.

Tack Delivery is carried out by means of a tack-pot made in two halves, each section being a reservoir for two different length tacks. The correct length of tack must be placed in the right reservoir.

The longer tacks—usually $\frac{5}{16}$ in. for ladies' work—should be placed in the *inside* reservoir to ensure their coming down on the *inside raceway,* as this raceway is brought into action for the lasting of toes and seats. The shorter tacks used—-usually $\frac{1}{4}$ in.—should be placed in the *outside reservoir* to be used for the waists and foreparts.

The tack-pots are driven by a vertical shaft fitted with a spiral gear, receiving its motion from the spiral driving-gear on the main shaft of the machine.

The revolving of the tack-pots throws the tacks on to the receivers, which in turn feed the double raceways inside. The tack-pots are fitted with hoppers equipped with clearer-fingers to prevent overcrowding or jamming of tacks, only passing those correctly placed in the slides. A plow-point and cover keeps the tacks level and ensures an even feed to the machine.

These tack-pots and raceways must be kept very clean, and free from oil, etc., in order that the tacks may pass off freely.

The raceway-end, which is affixed to the bracket, contains a tack-separator working on a rack-slide and segment gear, moving backwards and forwards, separating one tack at a time from the raceway. This passes through the throat-plate into the carrier-box, which in turn conveys it forward ready for tack-driving.

The Driver Action is obtained by means of a torsion spring, encased at the top back of the machine. This is a flat bar of steel firmly fixed at one end and twisted as the driver-bar is forced upwards by the lifting cam on the main shaft, giving a short, sharp, but powerful drive.

The Pincer Action for the twist motions is controlled by the knee lever, giving three definite positions of pull—central or straight pull, right, and left twist motions. The operator may also use any intermediary position. The amount of twist can be increased by the adjusting screws, near the base of the lever, which works in conjunction with the pleater mechanism.

Pleater Mechanism. This is a combination of mechanism and adjustments to allow of perfect pleat formation being accurately timed with the driving of tacks. The pleater mechanism receives its motions from the pleater and pincer closing cam, the mechanism giving motion to the pleater segment and gear, which in turn operates on the pleater-rocker mechanism at the pleater and pincer-bar-crosshead. This combination gives the peculiar cross-pull and pleating motion to the pincer.

Adjustments may be made for the size of pleats by the pincer-twist adjusting-lever.

The machine is sometimes fitted with a knife attachment for "cutting-in" toes on heavy work.

Lasting Methods

There is no definite prescribed method to follow in lasting. Where to commence and where to finish greatly

depend on the shape of the last and the fit of the upper, etc. The greatest difficulties are experienced when clearing the loose material in the waist and binding the upper around the joints and sides of the forepart. Moulded stiffeners also give a lot of trouble in the lasting unless the mould of the stiffener conforms *exactly* to the shape of the last.

The shoe should be presented to the machine with the innersole on the shoe-rest, and the feather of the shoe level, and in contact, with the edge-gauge. The innersole should be at the correct angle for the wiper to travel tightly and smoothly over, levelling and holding the upper to tension at the moment of the pincer release, ready for the tack drive. This angle of the shoe should be maintained through the whole process of lasting to obtain a clear and level feather-line.

Some operators commence lasting just above the joint, taking two or three pulls around the joint with a forward twist motion to "set" the shoe on the last, then deal with the sides of the seat at the corners of the stiffener, completing the waist, and then the forepart and toe, leaving the seat till last. Other operators may start at the side of the pulling-over tacks, and take a run down the length of the shoe to the side of the seat, using the twist motion of the pincer suitable to the curvature of the last and clearance of the material. Again, others may take the draft pulls at the sides of the seat and commence by lasting the seat in, leaving the toe till last.

A skilled operator will soon find out the best method for the different lasts and materials in hand.

In Toe Lasting

Pleats should be taken small and in regular formation, commencing closely at the side of the centre tack, and binding and clearing the upper tightly around the

feather. The tacks are driven into the depth or between the pleats, allowing all surplus material to be trimmed off over the heads of the tacks, preventing "bunching," and ensuring a flat bottom.

The "overthrow" of the pincer must be sufficient and in the correct direction to ensure perfect clearance of the feather.

In Seat Lasting

It should be remembered that the height of the back of the shoe has been determined, and to apply the pincer pulls here would be all wrong. Therefore, the seat can only be wiped over, but this wiping should be very clean and tight to make a snug seat.

The operator lowers the shoe as the pincer comes down, raises it on the updraw, catches the wiper firm and solid on its forward travel, and the tack is driven home. He times his movements with the action of the machine, at the same time tracing the shoe round on the edge-gauge to get a clean wipe all round.

Adjustments

There is an adjustment on the machine that must be used for lasting the toes and seats. This is a combined mechanism with the edge-gauge and the raceway-shifter.

The edge-gauge is composed of two parts. The first is the *stationary edge-gauge,* which is used in the lasting of the waists and sides of the forepart, the shorter tacks then being in use. Owing to the extra substance of the stiffener and toe-box, longer tacks are required for lasting these parts.

Directly underneath the stationary gauge is the *sliding edge-gauge.* This is brought forward, automatically locking itself in position. It is fitted with a swivel

end, which will accommodate itself to any curvature of the last, being most suitable for toes and seats where the last curvature is more acute. As it is brought forward for use, being connected with the raceway-shifter mechanism, it automatically adjusts the raceway (containing the longer tacks) at the same time.

There are many other adjustments that can be used, both for the smooth running of the machine and the betterment of the work, and the operator should make full use of them.

For the convenience of the operator, all the parts are catalogued with the names and corresponding numbers, and all the adjustments will be found quite easy by following these.

The Raceways. It is very important that the raceway should be in perfect alignment with the tack-passage in the throat plate at the raceway-end. Should it be necessary to adjust this, there is a small connection leading from the raceway to the shifter mechanism, called the raceway-shifter-ball-connection. The small check-nut on this should be loosened, and the ball-connection turned until perfect alignment is made; then the check-nut should be tightened, holding the adjustment firm.

The raceway-end is attached to the raceway bracket, and contains the mechanism for tack-separating. It may sometimes get jammed with a bad tack. To remove this, turn the machine by *hand* until the supporting-slide is in a backward position, then remove the binding screw on the front of the raceway-end holding it to the bracket. Remove the screw from the under side of the tie-plate, and slide out the raceway-end. The correct replacement of this is very important, as the rack-slide inside the raceway-end must be in its correct position. It should be replaced with the finger

gripping the rack-slide and the thumb gripping the raceway-end. This will bring the stop shoulders together. Then place into position, insert the binding screw, and replace the screw under the tie-plate.

The Driver Bar. Across the lower face of the tack-driving bar there is a line marked, and corresponding lines are marked across the driver-bar-swinging-guide. The line on the driver-bar should not be allowed to go below the corresponding lines on the swinging-guide. This may be ensured by the adjustment of the nut-washer and the check-nut at the top end of the bar.

The swinging-guide is really the slide bed for the up-and-down motion of the driver-bar, swinging it forward at the right moment for the angle drive of the tack.

The angle drive is a distinct advantage to the work, and the positioning of the shoe to the machine is all-important to get the correct drive, as the angle of the drive is increased during the process. The advantage secured by this is that the last for machine-sewn work having iron bottom plates, the forward drive of the machine tends further to tighten up and secure the upper by the final clinching of the tacks, in the same manner as a slightly-inward inclined tack does in the hand-lasting process.

The Tack-carrier and Adjustment. The function of the tack-carrier is to receive the tack through the medium of the separator, and carry it forward over the feather to its adjusted position for the driving apparatus of the machine.

It will be noticed that as the pincer takes its over-draw motion, there is a change in the action of the machine, i.e. the revolving of the cams brings other mechanism into play.

At this time the separator has taken a tack from the raceway, and dropped it through the raceway-end into

the pocket of the tack-carrier (fitted with fingers for the purpose of holding the tack in an upright position), which now moves forward over the feather holding the upper to its position of "stretch," until reaching the full extent of its travel. With the release of the pincer, the driving-bar descends, penetrates the tack-hole of the carrier, forces the tack through the fingers, and drives it home to the adjusted position. Then, with a final motion of the cams, the tack-carrier recedes to its former position ready to receive the next tack.

This forward and backward motion is obtained through the action of the supporting-slide, which receives its motion from the supporting-slide-cam on the main shaft of the machine.

The tack-carrier should be adjusted to take its travel and carry the tack to the required distance, but in some circumstances it may require re-adjustment to meet the requirement of tight-cut uppers.

To regulate the distance of the tack from the edge of the innersole, first remove the driving-spring-arm-link-pin (the pin between the top of the driving-bar and the spring-arm), then adjust the supporting-slide, so that it will travel the proper distance to drive the tack where required. This adjustment may be made by *raising* the cam-lever-fulcrum-stud (situated on the right-hand side of the machine) to increase, and by *lowering* it to decrease, the distance of travel.

Then align the tack-driver with the tack-hole in the carrier block, raising and lowering the driver-bar with the hand and at the same time adjusting the wedge at the front end of the supporting slide, until the driver is in perfect alignment.

The supporting-slide should be in its forward position at the time of alignment of the tack-driver and tack-hole.

Bind all loosened screws and check-nuts, and replace

the driving-spring-arm-link-pin before starting the machine.

The Shoe-rest is fitted to an adjustable holder which can be regulated in angle and depth in relation to the edge-gauge, this being determined by the depth of the tack-drive and the lowest striking point of the pincer.

The Overdraw Pull may be regulated by the over-draw-shaft-spring take-up (situated on the right-hand side of the machine towards the rear), and this may be used to increase or lessen the pull according to requirements.

The Updraw Pull is regulated by the updraw tension spring (situated at the top back of the machine). The amount of tension may be increased or lessened by the hand-nut at the top, and the amount of updraw may be increased by pulling forward the updraw adjustable wedge handle at the top of the machine. This increases the lift of the pincer without displacing the adjustment.

Some machines are now equipped with a positive updraw, giving a definite pull of $\frac{1}{16}$ in. or $\frac{1}{8}$ in., at the will of the operator, near the finish of the updraw movement.

These adjustments, if used as intended, and at the right time, will enable the operator to overcome the many difficulties in "Consol" lasting.

When the lasting is completed the shoe goes forward for levelling and feather clearing.

CHAPTER XVII

THE "REX" ROTARY POUNDING-UP MACHINE

LASTING can hardly be said to be completed until all the surplus material of the upper has been trimmed off and the

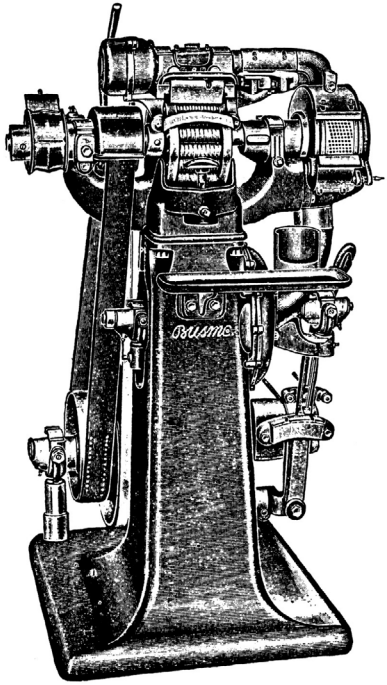

FIG. 50 "REX" ROTARY POUNDING-UP MACHINE

bottom levelled ready for sole-attaching, and the "Rex" Rotary Pounding-up Machine is undoubtedly ideal for this purpose. (See Fig. 50.)

It should be understood that this machine is not intended as a lasting machine, as it takes no part in the tensioning-up of the upper, playing only on the plastic nature of the material in levelling, moulding, and blocking to shape after lasting. Therefore, all the necessary lasting strains and tensions should be effectively carried out previously, leaving only the tapping-up and levelling for this machine to complete.

The machine is power driven, and the very high speed at which the various shafts run calls for regular and careful attention to the lubrication. For this reason it is fitted with a system of chain oiling. The oil wells or reservoirs are partly filled with oil, and the links of a loose chain running round the shafting pick up the oil when the machine is in motion, keeping the shafting well lubricated.

The Grater Wheel or Cutter Drum

The machine is fitted with various contrivances, the shoe first going to a "cutter" for the purpose of removing right down to the tack heads all surplus material from the toe-end. If the toe-pleating has been done properly it will assist this operation, and ensure a flat bottom. There is an adjustable serrated rest for the positioning of the shoe to the cutter. When this comes in contact with the innersole across the forepart, the toe of the shoe is gradually lowered down to the toe-rest, bringing the surplus material lightly in contact with the cutter wheel.

The drum is fitted with a dust-hood and exhaust pipe, which carries away all dust and surplus material cut off, by means of a fan connected with the machine shaft.

The Pounder Drum

This is fitted with the beater wheel, and is composed of spindles and loose rings. The spindles are grouped

to form a drum mounted, upon a shaft, each spindle holding fourteen or fifteen hard steel rings, on alternate rows. The end rings on the rows of fourteen are wider than the others, and thus each ring half-covers the one on the next spindle, preventing any cutting effects or damage to the upper.

The shoe should be presented at right-angles to the drum and worked round on the shoe-rest, being held firmly against the revolving rings.

On the rotation of the drum the loose rings tend to swing outward by centrifugal force, delivering a series of glancing blows as they come in contact with the shoe. Each blow is so slight that no damage can be caused to the upper, but the whole series of them literally roll the material level round and over the feather inwards.

The Beater Attachment or Blocking Hammer

This is used for beating-up and blocking the toes to shape, and consists of a vibrating jigger operated with an eccentric motion from the shaft.

The jigger beats up the sides of the toe above the feather with a series of rapid strokes; and to be properly blocked to shape the shoe should reach here before the toe-box is completely set. The operator positions the shoe to the hammer, instead of the hammer to the shoe, as in hand-lasting.

The length of the stroke can be adjusted by the regulating block. The heavier the work the longer the stroke required, as it causes the hammer to give a heavier blow.

The Blocking Wheel

This contrivance may be used for smoothing-out any irregularities and ironing up the toes and vamps. It is a smooth, polished, corrugated wheel used for faced

materials, such as patent and glace. It is heated by oil friction, being fitted with an oil felt pad for this purpose, and should be kept liberally treated with oil to prevent burning or damage to the materials during use.

The bottom is then filled in according to whatever method or material may be in vogue, and the shoe passes along for the temporary attachment of the bottom-stock.

The Attaching Machine

There are several types of this machine in use, the principles of operation being the same, but the mechanical contrivances varying in methods.

As the bottom-stock is attached in bulk, the length of the fastener must be sufficient to hold it firmly in position for sole-sewing, and yet provision must be made in the length of the fastener to suit all variations in the substance of the bottom-stock. To meet these requirements, one machine, the "Taper Tacker," is twin-headed, giving a different length of fastener for light or heavy stock. It cuts and tapers the fastener from a wire coil.

The wire-grip machine derives its name from the "wormed" or serrated wire used, the serration giving the fastener a grip in the material. This machine is fitted with a gauge which can be regulated to cut any length of fastener required.

The staple fastener cuts and fashions a staple from the length of wire, and gives a very secure fastening, as both shanks of the staple are driven through all substances of the bottom, the points being deflected and turned back into the innersole.

The great drawbacks in these machines are the fasteners and the method of attaching. The fasteners are driven in the sole channel, and the lengths of wire

often cause trouble in the sewing, such as broken needles and broken thread, resulting in lumps and knobs of thread, which leads to further trouble in the channel-laying, and often causes the lip of the channel to be broken off.

For this reason the wire-grip machine is sometimes fitted with a nozzle for attaching the sole on the surface, the fastener being sunk below the surface of the grain, but here, again, comes a difficulty in the finishing—the fastener may be covered on a black bottom, but is detrimental to a light finish.

The procedure in the method of attaching calls for some consideration. It should be remembered that the bottom-stock is moulded to shape, and to break the mould would be quite wrong, undoing the work previously done. Yet to attach the bottom-stock quite dry (especially coupled substances) adds to the difficulties of the operator, owing to the inward drive of the machine.

Wherever possible the bottom-stock should be in a *slightly* mellow condition—which may be procured by wetting a large bulk of it some hours previously—as this gives a better chance of obtaining a correct balance.

After positioning the sole, the shoe is presented to the machine mostly at an angle, in order to get a solid drive on the iron plate, and to get the fastener out of the line of sewing. If the toe-end is presented first, the drive of the fastener will often force the sole back out of position (especially if dry). A better position can be maintained by securing both sides of the toe first, and then the toe-end, followed by securing the joints.

The bottom-stock must not be too wet, and the mould must not be broken on account of the tendency of the sole to draw down where the fasteners are inserted, leaving the other parts cockled up and giving the appearance of a switchback—which causes great

distortion to the shoe in sewing, and adds to the difficulties in the channel-laying process.

The seat may be secured by the same machine.

The shoe can then be slipped and is ready for sole-sewing.

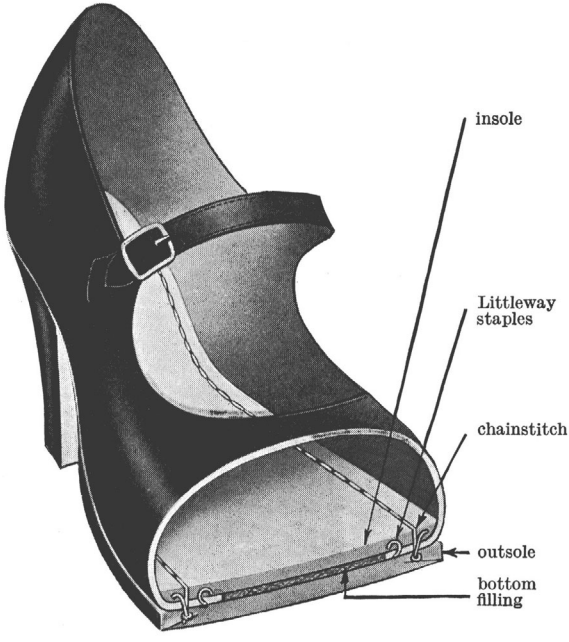

FIG. 51 LITTLEWAY PROCESS
(*By courtesy of the British Shoe Machinery Co., Ltd.*)

STAPLE-LASTING—A VARIATION OF THE MACHINE-SEWN PRINCIPLE

New methods of making are continually being evolved, especially in the lighter grades of footwear. These involve new systems of machinery, or the displacement of older machines by more modern ones, as in the "Littleway" process. (See Fig. 51.)

The staple-lasting machine used in this process is calculated to give a lightness and flexibility to the shoe and more comfort to the wearer than can be obtained in "Consol" lasting.

The principles of lasting are exactly the same as in the machine-sewn process, the difference being in the method of upper attachment only. The special feature of the process is that, instead of the usual tacks to secure the upper to the innersole, this machine uses a fine curved staple, which is driven through the upper and partly through the innersole. The curved shanks of the staple are turned upwards into the innersole without penetrating right through to the inner surface, by this means preventing the discomfort to the wearer which is often caused by tack points rising or rusting on the inside. The staples, which only partly penetrate the innersole, do not interfere with the full flexibility of the leather; hence, we get a less rigid shoe than formerly. Also, the fine staples used are not so likely to obstruct the passage of the needle in sole-sewing as the larger heads of the tacks.

The waist and sides are stapled on this machine, the shoe then going to the bed-laster for seat and toe clearance by the usual tack method.

After sole attachment, the bottom-stock may be finally secured by the B.U.S.M. sole-lockstitch machine, which is the true "Littleway" method, the ordinary Blake-sewn method, or the welded process of attachment.

CHAPTER XVIII

MACHINE LASTING–WELTED SYSTEM

THE different methods of attachment call for different methods in the preparation of the components, and the careful selection and preparation of the welted innersoles helps greatly towards the success of the machine-welted system. When we come to consider the weakening of the innersole caused by channelling, the strain of the welting machine, and the stress of walking, we are forced to the conclusion that the material for this purpose should be of the best quality.

In addition to the preparation of the welted innersole explained previously, there is the process known as

GEMMING, OR THE ECONOMY METHOD

This process necessitates the use of a special plant of machines, such as the channelling machine, toe-snipping machine, cementing machine, lip-setting machine, and the reinforcing machine.

The first operation is the channelling. This is performed in the same manner as for the solid innersole, with a feather-split and an inner-channel, except that in this case they are not cut quite so deep, as the innersole is selected lighter in substance, and the additional support of the canvas is relied on for added strength. For this reason the "holdfast" or between substance is much closer, about $\frac{1}{8}$ in. instead of the $\frac{5}{32}$ in. used for light work, the deficiency being made up by the added substance of canvas.

Next comes the toe-snipping. A small wedge-shaped

piece is snipped out of the lip of the feather-split at the front of the toe just large enough to enable it to be turned up without puckering.

Then the channelled portion of the innersole (from the feather to the edge of the inner-channel) is covered with a layer of solution, such as "Latex." After drying, both channels are opened and set by the lip-setting machine, being firmly pressed and adhered together to form one solid substance.

The whole of the flesh side of the innersole is next solutioned and again allowed to dry.

The canvas is then cut to the required shape and size, and bedded well down across the innersole and into the channel lips, the reinforcing machine trimming off all surplus canvas, and finally setting the channel.

A lighter innersole may be used in this process for the lighter grades of work, and the canvas prevents any stretching or spreading during the welt sewing.

Another method of preparing the innersole for this system is to cover the channelled portion with solution, preferably "Latex," then when dry open both channels on the double-lip-turning machine. This keeps the innersole clear of water stains, and it is claimed that "Latex" has a mellowing effect on the material. The two channel lips are pressed together to form a solid wall for the side-lasting machine and for the welt-sewing operation.

The stiffeners, side linings, and toe-box may be prepared as in the machine-sewn system.

The plant of machines used in this system would include the assembler, the pulling-over machine, the side-lasting machine, and the bed-laster; for the bottoming processes, the welt-sewing machine and accessory machines, bottom-filling, the sole-laying machine, the sole-rounding machine, the sole-stitching machine, and the levelling machine.

Assembling

The assembling of the upper may be carried out by the same method as in machine-sewn lasting, except that in this case the innersole must be securely positioned on the last as in the method for welted bench-lasting.

There are several reasons why the innersole must be firmly secured. In the first place, the innersole as a foundation to the shoe should reproduce the exact shape of the bottom of the last both in length and width, and this means the innersole must cover the whole bottom plane of the last. The lasting machines, especially the bed-laster, in forcing the upper into the feather-split, have a tendency to force the innersole inwards from the edge of the last, and for this reason the innersole should be perfectly firm and dry. Again, the welt-sewing machine thrusts inwards from the feather, drawing the welt and upper with it, and having the same tendency to reduce the width and length of the innersole; so the innersole fasteners must be as near to the edge as the channel and welt-sewing will permit. If the innersole is allowed to buckle inwards this gives a very bad effect when the shoe is slipped off. The upper draws in at these points, appears to be badly lasted, and the welt shows too wide, thus spoiling the whole outline of the feather.

Following the assembling and back-tacking comes the pulling-over.

The "Rex" Combination Pull-over Machine

The operator on this machine now cuts off the machine-sewn tack-pot by means of the separating lever, and brings into play the tack-pot containing the welted tacks. (This is, of course, for this machine only;

other machines, constructed for welted work only, need no alterations.) He then sets the tack-placing gauge for the tack position, i.e. the welted tacks should be placed in $\frac{3}{16}$ in. into the shoulder of the feather-split to help in the toe-lasting and welt-sewing operations. This requires the adjustment of the three tack-placing gauges, One attached to the front wiper and one on each of the side tack-blocks.

The placing-gauge is shaped to fit the feather as it comes in contact with the last, and as the expander arms close in carrying the drivers over the feather of the shoe, the placing gauge prevents the drivers closing in beyond the position of adjustment.

Owing to the many different materials used in uppers at the present time, the operation of machine pulling-over requires a great amount of skill, not so much in the actual positioning of the shoe or in the driving of the tacks, although these must be skilfully done, but in the correct tensioning of the pulls to suit each particular kind of leather and the many different designs of upper.

Failure of machine methods often occurs through lack of discrimination, such as failing to get the correct adjustments, and using the wrong tensions to suit materials or upper designs. If all work is lasted with the same strain it leads to many breakages and the distortion of uppers.

Every laster knows the vast difference between fabric and leather materials, and would never attempt to last them both with the same strain. He should discriminate a little further, and note the difference between such materials as patents, glace kid, box calf, buck-skin, and reptile leathers. The hand-laster acquires a “sense of touch,” and knows when he has placed a suitable strain on each of these materials to get the best results. The machine-operator should look

on this from the hand-laster's point of view, and regulate the machine pull accordingly.

Again, with the different designs of uppers, many of the present-day fashion shoes, such as the bar-shoe, court shoe, etc., are cut with low vamps and very little or no fastening at all at the instep. These designs, to be preserved, need very careful handling. An Oxford cut shoe, fully laced at the instep, will give a resistance to the pull of the machine, but the same pull used on the open-cut vamp style would result in distortion of the upper. For these reasons the operator should make full use of the *oil-check* to give a suitable tension.

At one time, with a large quantity of work of the same sort going through, the shoes were made and matched up afterwards, but the modern method is to send them through in pairs. Some materials with natural markings, such as lizards, are cut to match in pairs, and should start as pairs and finish as pairs, being matched up in each operation. The puller-over should therefore use the same tension on each, giving the same length of caps and vamps and making the shoes correspond with each other.

With a large quantity of work of the same sort going through, once the correct tensions are set on the machine, they should be maintained right through, ensuring a uniformity of tension in the bulk, and preserving the exact fitting properties of the last.

This shows the need of correct machine adjustment and the skill required in proportioning the strains. It does not apply to the pulling-over machine only, but to lasting machines of all descriptions. Assuming the pulling-over completed, the shoe follows to the

Staple Side-lasting Machine

This process is sometimes known as "jointing," the operation consisting of completing the "drafting" of

the shoe and lasting the sides and waist, to prepare the shoe for the bed-laster.

It was the advent of the side-lasting machine in conjunction with the pull-over machine that made the "all-machine" welted system possible. Prior to this, the "jointing" or side-lasting had to be done by hand, following the pull-over. The waist and sides of the forepart were lasted on the bench, then passed to the bed-laster for toe and seat clearing.

For an "all-machine system," this method left something to be desired, since even after the toe and seat were completed the shoe required a certain amount of bracing either by hand or machine before the lasting rivets could be removed ready for welt-sewing, as the bed-laster only secured the toe-end as far as the side of the cap. Staple side-lasting eliminates two operations, namely, bracing by hand, or stapling by machine (a machine designed to take the place of hand bracing), and tack drawing. This meant a considerable advantage all round and a speeding-up of the process.

The machine is fitted with a pincer in the same manner as the "Consol," and the operator manipulates the machine in a similar way. The pincer pulls the upper tightly to the last, but instead of driving tacks, staples are formed from a coil of thin wire, horizontally penetrating the upturned channel-lips and between substance of the innersole; the points of the staples are then deflected outward, and re-enter in the opposite direction, firmly securing the upper to the innersole.

This method means an improvement in the work, as there are no tacks to penetrate the last and no tack holes, except the pulling-over tacks, leaving the inner-sole much cleaner and smoother inside.

Types of this machine are also used for various systems of lasting, as machine-sewn methods and the cement or welded process of attachment.

Bed-laster

Types of this machine can also be used in any of the former methods of making, but undoubtedly it is particularly suited for wiping in the toes and seats of welted work. The machine may be operated by combined hand and treadle as described below or by combined hand and belt power. In the latter case, the tack filling clamping of the heel band, release of the heel band, and the return of the heel carriage are performed by belt power (see Fig. 52). It is able to deal equally well with the stoniest and lightest materials; in fact, a skilled operator can produce better results on heavy work than can be done by hand.

The modern machine is equipped with many gadgets, really being a mass of adjustments to cope with all styles and shapes of lasts of every description. It is constructed with two "heads," each dealing with the extreme ends of the shoe. These are called the toe-head and the heel-head, and the shoe is inverted and positioned between them. The heel-head is mounted on a carriage, allowing a movement or swing either to left or right of the central position.

The machine can be adjusted to take even the most twisted shape of last, making it quite as efficient on bespoke or extreme shapes as upon stock or standard shapes of last.

Last Shapes. (See Figs. 53, 54, 55)

By way of explanation and for the benefit of the beginner, it may be necessary to digress a little here. The term "twist" may be somewhat misleading to him. What is really meant is the amount the last deviates either to the right or left of a central line taken from the centre of the toe to the centre of the seat.

The Straight Form, or slipper-shape last, can be positioned centrally in the machine with both heads

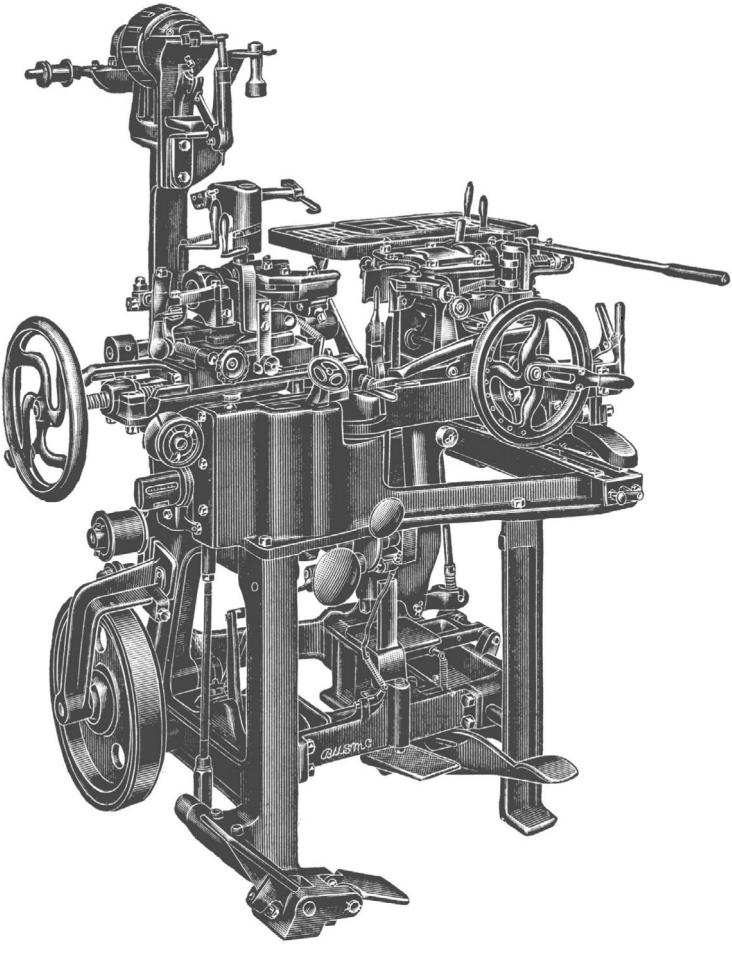

FIG. 52. NO. 7 BUSMC LASTING MACHINE

central, and needing no further adjustment for position, this being an easy shape to work to. (Fig. 53.)

The Rights and Lefts, or ordinary standard walking shape last, would need some adjustment of the machine in order to get a correct and level wiping action. (Fig. 54.)

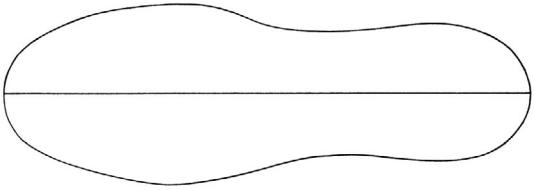

FIG. 53

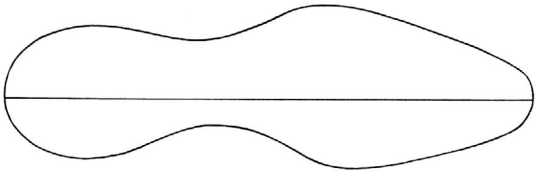

FIG. 54

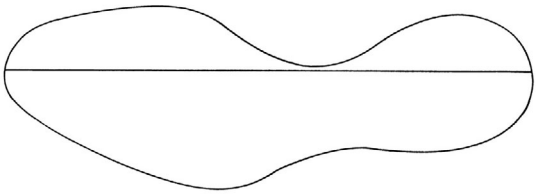

FIG. 55

The Twisted Form, or extreme shape last (Fig. 55) (made to suit so-called anatomical requirements), would need many further adjustments of the machine; hence the heel-carriage, enabling the operator to adjust the heel-head to any angle suitable for the last shape.

Before commencing, the operator should see that the toe-head of the machine is adjusted correctly. It

is raised and lowered by means of a connecting-rod and treadle, worked by the operator's foot, and should be adjusted so that the rear end of the treadle touches the floor when the toe-head is down.

The Process

When worked by hand and treadle, the operator places the shoe inverted on the jack post with the left hand, holding the toe central to the toe-head, and takes hold of the ratchet hand-wheel on the heel-head with his right hand, drawing the heel-head inwards and guiding the toe of the shoe on to the toe-rest. At the same time he presses down on the jack-post treadle with his foot, and this clamps the seat-end of the shoe in position for the heel-wipers.

Next, he presses smartly on the foot-power treadle, which raises the toe in position for wiping, and also drives the shaft for the tack-hopper filling the raceway and loose tacker. This treadle locks the shoe in the machine. The shoe is then clamped into position by means of the hold-down post treadle, which brings the clamp on to the innersole and firmly secures the shoe against the pressure of the wiper action. The toe-head is then raised to the level of the shoe and the wipers are brought inwards, binding on the toe of the last. The front tack is removed, and the toe-end of the vamp and cap is laid back over the wiper plates.

In some types of this machine a clamp works in conjunction with the wipers, holding the upper back while the wipers are forced into the feather from underneath. Alternatively, a tool called a "spreader" may be used for this purpose, holding the upper securely over the wipers while the toe-head is raised to position. The wipers are then brought forward by the wiper lever moving over the feather of the innersole, forcing

and moulding the upper evenly into the shoulder of the feather-split.

The machine is equipped with a loose tacker, which is loaded by the action of the machine and operated by a maul, and is for the securing of the seat.

There are no rivets used to secure the toe-end in this method. A specially-made wire is used instead. It is fastened off at the sides of the toe, practically connecting up with the staples used in the side-lasting, so that no further bracing is required.

The toe-head is then released and lowered back into position. A knee lever releases the hold-down clamp, and a smart pressure on the foot-power treadle releases the shoe from the machine and brings all the other parts back to their original position.

The mechanism of this machine is very intricate, and to be thoroughly understood, together with the working of the machine, each action must be taken separately.

Shoe Position

Correct positioning of the shoe in the machine is a very important point in operating, and has a great bearing on the result.

The *toe-end of the shoe* must be positioned *centrally* with the toe-head of the machine, leaving the swing of the heel-carriage to accommodate the seat-end.

The central toe-position can be obtained by adjusting the toe-head-swing until it is central on the toe-head. This adjustment is made with the toe-head-screw-hand-wheel, always using the swing of the heel-carriage, which is adjusted by the yoke locating screw handle. It allows the forepart of the last to enter the toe-head centrally, the swing of the heel-carriage taking care of any twist in the last, and ensures a clean and even sweep of the wipers on both sides of the toe.

The Heel-head and Adjustments

The machine is equipped with a flexible heel-band that automatically conforms to the seat shape of the last, compressing the seat of the upper and stiffener to shape. This, together with the wiping-over action of the heel-wipers, forms a perfect mould to the seat-end of the shoe.

In order to obtain a level and even wipe over the feather, both the heel-head and toe-head are fitted with a rocking mechanism, which allows the head to be tilted to either side to accommodate the rotundity in the bottom of the last.

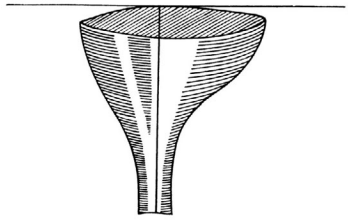

Fig. 56

If the bottom of the last is examined it will be found that this roundness is more pronounced in the seat than in the forepart (see Fig. 56), the convex curvature being introduced to form a "bed" for the foot in the shoe, and this mechanism tilts the whole head over to the angle required for a level wipe.

Either head may be adjusted in this direction by the rocking-head-screw-handle, needing readjustment for both right and left foot last. For this reason, the operator, when faced with a lot of work of the same description, will do all of one foot first and then the other, so saving time in readjustments.

Further adjustments for the wiping action of the machine are often necessary owing to the shape of the last.

Here, again, for the purpose of explanation it will be necessary to digress a little. All lasts are made with a certain amount of longitudinal curvature in the bottom, some more than others, the amount varying

according to the style or purpose of the footwear. If a last is placed, on a level surface with the joint in its correct position, it will be seen that the toe and seat ends stand clear of the ground line. (See Fig. 57.) These are called the "spring" and "pitch" of the last, the spring being the amount of toe elevation

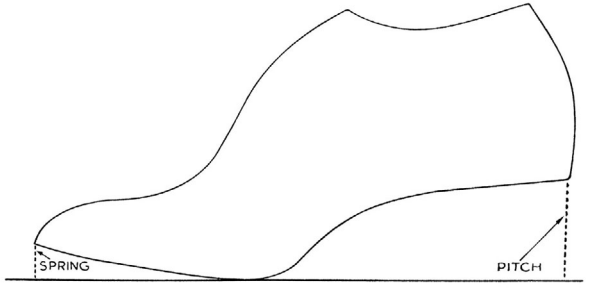

FIG. 57

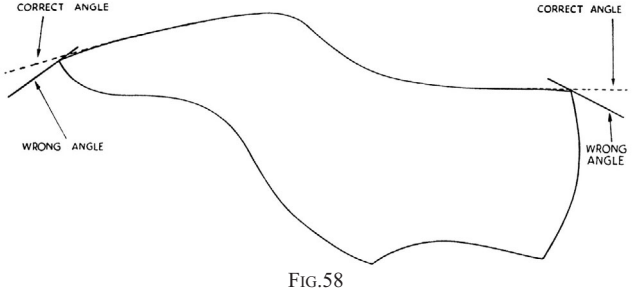

FIG.58

from the ground line to permit of easy progress in walking, and the pitch being the accommodation for the heel. The higher the heel the more longitudinal curvature in the last.

These variations in length curvature call for a suitable adjustment of the wiping action of the machine. (See Fig. 58.) For this reason both heads of the machine are equipped with elevating mechanism.

This adjustment can be made on either head or both by the elevating screw-handle (both heads are fitted the same), elevating or depressing the whole head to any level or angle required suitable to the spring and pitch of the last.

The Toe-head and Adjustments

The adjustments on this part of the machine make this head very mobile. In addition to the elevation and rocking mechanism, it is fitted with aside adjustment for twist, which is sometimes made necessary for a very twisted shape of toe, or for bad positioning of the shoe in the machine.

This adjustment is called the toe-head-swing, and is regulated by a small hand-wheel on the side near the wire reel. It allows both wiper plates to be brought in level with both sides of the toe, ensuring an even wipe and preventing any cutting effects on the upper which would occur where one wiper plate is forced in tighter than the other. It also prevents that askew motion where one side is wiped in and the other pushed out.

Wiper Action. (See Fig. 59)

The wipers both for the heel and toe are somewhat horseshoe in shape, and are made of two separate plates to allow for a closing-in motion.

The heel wipers need very little changing, and are made in three sizes only—men's, women's, and children's. They are capable of taking any last of their respective grades.

The toe wipers are made to shapes of toe only, and the more varied the trade or shapes of last used the more toe wipers will be required. The changing and fixing of these is a very simple matter, as the machine is fitted with a locking arrangement holding them firmly

in position and preventing their riding over the feather when being pulled in.

After the adjustments are made, the toe-head treadle is

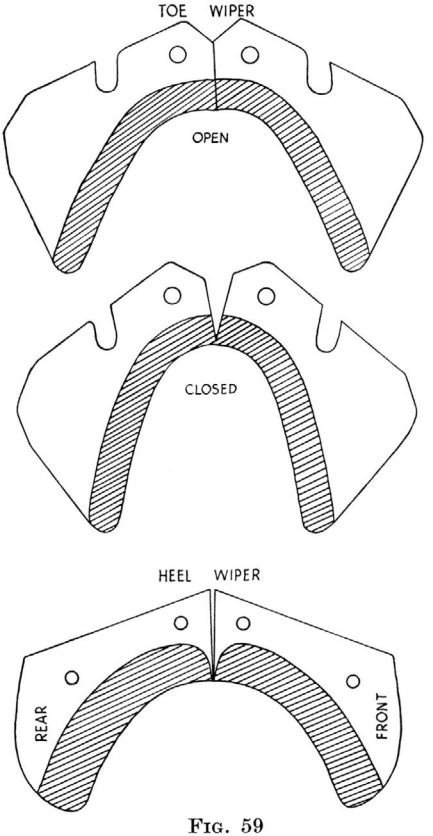

Fig. 59

depressed and the wipers are brought inwards in contact with the toe of the last. The toe-end of the upper is opened up and turned back over the wipers. A further depression on the treadle gives an upward or

perpendicular wipe, drawing all upper material tightly up with it. When the wipers are level with the feather, they are pulled inwards with the hand-lever, this time giving an horizontal wipe, forcing the material over the feather, and moulding it tightly into the shoulder of the channel. It will now be seen that the wipers occupy a smaller circumference than previously, the corners of the wipers having closed inwards. This closing-in action is imparted by the shape of the cams in the toe-head.

Securing the Toe

The machine is fitted with a wire reel on which is fastened a specially-wound coil of copper wire, which is used for the bracing and securing of the toe. The wire passes through a loop, and a cleaning device, consisting of a felt roll, which cleans the wire as it is pulled through, keeping it in good condition for use.

Prior to positioning the shoe in the machine, the operator passes the wire under the toe-head and hooks it in the wire-grip on the rear side of the head. The wire is then in position for use.

After the toe is wiped in, the operator fastens one end of the wire round the pull-over tack at one side of the toe, takes the other end of the wire in his pincer, pulling it tight under the wipers, and, just slightly raising the head, allows the wire to be drawn right into the shoulder. It is then fastened off on the opposite pull-over tack. Being a square-drawn wire, it holds the upper quite tight and prevents any slipping back or loss of tension, the tacks and wire remaining until the welt is sewn in.

Securing the Seat

For this purpose the machine is equipped with a loose hand-tacker and a tacker-loading mechanism

connecting with the tack-hopper. The latter is the reservoir for the tacks, and is operated by the foot-power treadle, working automatically with the operation of the machine. The tacker is hooked on to the end of the raceway, automatically filling each time the operator locks or unlocks the shoe in the machine, and by this means he always has a constant supply of tacks. The tacker is held in position for driving with one hand, and is operated by striking it with a maul with the other hand.

When this machine is used for machine-sewn work, it is usually equipped with two tack-hoppers and two tackers carrying two different length tacks for the varying substance of uppers.

Following this process, all surplus upper material is trimmed off level with the lip of the channel. The shoe is then ready for the

Welt-sewing Operation

Prior to the actual sewing, the welt has to be prepared, and this necessitates the use of several small accessory machines.

The welt may be prepared from a range of leather, the range being cut to give the length of welt required, which varies according to the size of the shoe.

A small hand-tool fitted with a knife is used to cut the range into welt strips, the knife being set to cut any width of welt required. The welt is then passed through a small levelling machine to reduce it to an even substance all through. It is then passed through another small machine for grooving and bevelling, being bevelled on the grain side and grooved on the flesh side. The groove forms a bed for the thread of the welt seam, and the bevel fits into the shoulder of the feather-split, allowing the welt to be squared out from the feather after sewing.

Another method used is known as coil welting. Lengths of material are cut to the width required, each length being skived at the ends, and the skives are solutioned and stuck together by evenly lapping one over the other, making one long coil. This is then levelled and grooved, and when the welt is sewn in it can be cut off just to the length without any waste.

There is one drawback in this method. A join of the welt may come at a point where the curvature of the last is acute, such as round the toe, and the stress of sewing and levelling the welt causes a weakness at this point.

Following the preparation the welt is sewn in, securing the welt and upper solidly to the innersole.

The shoe then goes to the inseam trimmer machine, which removes all the surplus material above the welt seam.

The welt-beater machine then taps the welt out level and square to the feather. For stout work, where the welt is unyielding, this machine is fitted with a knife attachment, and a few oblique cuts can be made round the toe to enable the welt to be squared out. For light work, the shoe follows to the welt-skiving machine, where the welt is reduced in the waist (to allow for bedding the sole and forming a bevelled waist).

Bottom-filling Machine

A compound filling is used in the next process, such as a fine ground cork and solution or pitch. This is better than a flat filling, owing to the unequal substance of filling required.

The bottom-filling machine runs the filling in, and it should be pressed down into all crevices of the bottom to keep it firm and solid. A “leveller” fitted on the machine is used to scrape off the surplus filling. To prevent over-filling and to maintain a flat bottom in

the sole, this scraping off should, be carefully done. Especially should the surface of the welt be kept clean, as most compound fillers are quick-drying, and any small particles of cork adhering to the welt become wedged between it and the sole when the latter is stitched on. This often causes unequal substance around the edge of the sole and makes it bad for the finishing, as the effect of the hot iron on the cork makes it impossible to get a good finish to the edge.

After filling comes the sole attachment or

Sole Laying

Prior to this process the sole and bottom of the shoe must be prepared for bevelled waist by machine, to the substance required to form the bevel. It is blocked to the last bottom shape, then solutioned ready for attachment. The bottom of the shoe is also solutioned, the solution being carried right out to the edges of the welt to ensure a perfect binding of the welt and sole together.

There are several types of machine used in this process, but the principle is the same in all—to get a perfect adhering of the sole to the bottom of the shoe.

The sole is balanced in position on the shoe and lightly pressed down from the centre outwards towards the edges, to exclude all air. The shoe is then placed in the machine.

The machine is fitted with a mould shaped to the bottom which comes in contact with the sole. Pressure is applied by a lever for a few seconds. This adheres the sole tightly to the shoe and moulds it to shape. The welt should be boned back to the level of the sole.

Other kinds of machines used for this process consist mostly of the pneumatic air-press type. The sole part of the shoe is brought in contact with an air cushion, and, with the shoe clamped in the machine, pressure is

applied. Probably 40 lb. or more pressure to the square inch is used, calculated to give an even pressure all over the bottom. The capacity of this machine is five pairs. The operator fills the machine with the number of pairs, then takes out the first shoe he put in. This leaves nine shoes under pressure and one out, and the time of working the machine in this way is calculated to give the necessary time under pressure for the adhering and moulding of the sole to shape, ready for the

Sole-rounding Machine

This is called the "Universal," or "Rough-rounder," and trims up both the sole and welt together. It can be regulated to round the edge to any width of welt required. The machine does not trim the edge of the sole to the definite edge for finishing, but removes all the unwanted surplus, leaving a sufficiency for the edge-trimming machine to work upon later; hence its name—the "rough-rounder."

The operator sets the machine for the width of welt required, and holds the shoe up to the machine with the sole away from him, tracing it around while the knife, with an in-and-out motion, trims the edge. At the same time another knife in the machine is brought in contact with the flat of the sole and cuts the stitching channel. The machine thus performs the two operations of rounding the sole and cutting the channel at the same time.

A small accessory machine, called the channel-opening machine, opens the channel by means of a rapidly-revolving "whirl" ready for the

Sole-stitching Machine

This permanently attaches the sole to the shoe.

The channel is then laid over and closed by a

revolving wheel acting on the sole in the same manner as the driver in the hand process.

After the bottom has been sleeked and levelled to shape, the shoe is slipped off the last, and the seat of the sole secured either by one of the sole-attaching machines or a loose nailer, the seat being roughly trimmed at the same time ready for heel attaching.

CHAPTER XIX

THE WELDED OR ADHERED PROCESS OF ATTACHMENT

THE "stuck-on" method was first used in the attachment of bottom-stock, the shoe being lasted in the ordinary way as for machine-sewn work, and then the sole cemented and welded to the bottom instead of being sewn.

There are many advantages claimed for this process. In the first place, the soles are not channelled and so two operations are not needed, namely, the sole-channelling and the channel-laying processes. This is also claimed as an advantage to the wear of the shoe, as there is no channel to fray out, or kick up, in wear.

Again, with the elimination of the thread seam, there are no needle perforations through the bottom of the shoe. This, together with the addition of the welding cement between the sole and the shoe, is a great aid in waterproofing the bottom.

Also there is no distortion of the shoe caused by sole-sewing as in machine-sewn, as the shoe remains constant on the last until the making is completed, allowing it to be slipped much cleaner, and obviating any damage that may be caused by the re-lasting of the shoe for channel-laying.

These and many other advantages were claimed, but there were also many drawbacks, and no doubt the pioneers of the process suffered many disappointments owing to faulty sole-laying, and unsuitable cements and sole-presses.

Since the inception of this process, many improvements have been made in the cements, methods, and

machines used. These improvements have made it possible to include many grades of footwear in this method of shoe construction, such as sandals, slippers, leather and felt, tennis shoes, dress, and many kinds of walking shoes.

It may be as well here to give a brief description of the process.

After the lasting is completed and the bottom filled in, the lasting allowance of the upper is abraded or made rough to form a key or holdfast for the cement. The flesh side of the sole is also roughened for the same purpose. Both the sole and the shoe bottom are then coated with cement, and, when ready, the sole is positioned and the shoe placed under pressure in the sole-laying press, which moulds the sole to the last bottom shape while the attachment is made.

In all welded methods, the preparation of the bottom-stock is a most important point. The innersole must be accurately shaped to the last to give a clear and definite feather for the abrading process. It must also be carefully moulded to the bottom curvature of the last.

The innersole should lay flat to the last at all parts. If allowed to bridge across the arch of the waist from the joint to the seat, the pressure of the sole-laying press often causes distortion in the waist of the shoe. To prevent this and to make the waist rigid, most light-weight innersoles are now reinforced through the waist and seat.

Lasting Methods

Such progress has been made in this process that there are now several methods of lasting in use.

First, the ordinary "Consol" machine method of lasting, the soles then being welded on.

In the second method, the shoe is pulled-over by machine, then goes to the staple side-laster, which

staples the waist and sides, and follows to the bed-laster for the wiping-in of the toe and seat.

This second method is possibly more in favour than the first method for this class of work, as it is claimed that the fine staples used in lasting offer less resistance to the cement than the tack heads of the "Consol" method. Also the staples do not penetrate the innersole in the same manner as the tacks, allowing more flexibility in the shoe.

Again, in order to effect a complete union between the sole and shoe, the bottom must be perfectly flat. For this reason, the operator on the bed-laster when wiping-in the toe cuts away all the underneath material, leaving only a bare margin of the toe-box to wipe over with the outside cap or vamp. The toe and also the seat are then secured with tacks as in the ordinary method. This reduction of material at the toe-end assists in getting the toe as flat as possible, whereas with the "Consol" method more difficulty is found in trimming and clearing away the pleats around the toe.

The third method is rather more complicated and takes a longer time than either of the preceding methods, and this undoubtedly adds to the cost of production. There have been many attempts in the past to produce a tackless shoe, and the idea of this method is to eliminate as far as possible in the completed shoe all tacks and staples that are used as fasteners in the ordinary machine methods of lasting. It necessitates a special plant of machines.

The Process

Following the assembling, the upper is pulled over by machine with the heads of the draft tacks standing up (similar to the welted process) to be pulled out later. A special tank or cementing machine is now used. This is fitted with a nozzle and valve, and compressed

air forces the cement out when the valve is released. A thin layer or ribbon of cement is laid between the lining and the upper along the waist and sides of the forepart, and again between the upper and the innersole surface.

The shoe then goes to the *tack* side-lasting machine, the operator lasting the waist and sides of the forepart with longer tacks than are usually used. These are left standing up, anchoring the upper in position while the cement is still wet.

The shoe then follows to the bed-laster, where the toe and seat are wiped-in. The seat is then secured with tacks.

In toe lasting, following the first wipe-over, the wipers are partly released, the toe-end opened up, and the underneath substance trimmed away. A layer of cement is then applied, and the toe is again wiped over and secured with tacks in the same manner as the sides. Or a metal plate is sometimes used, which, being pierced with holes, is held in position with large-headed tacks, retaining the toe-end of the upper in position until such time as the cement sets and dries. The plates are then removed and returned to the bed-laster to be used over again. The side tacks are also removed, and the shoe passes along to the next operation.

The bottom-stock of this make of shoe may be attached by the cement process, or sewn by either the lockstitch machine or the ordinary Blake-sewn method.

The merits claimed for this method of making are that only the heel seat of the completed shoe carries any metal, and that such a shoe compares favourably with turnshoes for lightness and flexibility.

A fourth method—an all-cement process—is used for a light class of slipper goods, but the lasting process claims no special qualifications. The upper is adhered to the innersole with cement, and the sole, either felt or light leather, is attached by the same means.

In all welded methods the preparation for sole attachment is most important, and great attention must be paid to this part of the process.

Following the lasting, the bottom of the shoe must be *perfectly* levelled. The adhering of the sole calls for a firm and even surface, and the operator on the pounding-up machine should leave no ridges or humps on the bottom plane of the last. All surplus material must be pounded flat or trimmed away.

The feather-line of the shoe must be carefully and accurately defined as a guide for the abrading process.

The bottom-filling and shanks which are cemented in, should be of such a nature as will help in the adhering of the cement. The forepart must be flat and the waist shaped if necessary, but the surface must be level and the whole cavity of the bottom must be filled in. Any unfilled cavity will probably be reproduced when the sole is welded on.

The Abrading Process

The lasted-over margin of the upper is now abraded or roughened-up right out to the feather-line, and if the feather has been well defined it will greatly assist in this operation. The abrasion must not be carried beyond the feather, or damaged uppers will result. To prevent this a metal template can be used, and a mark traced round as a guide for the abrading.

Only the surface of the material should be worn down just enough to allow the cement to soak in and form a holdfast. If the upper is abraded too thin, when the sole is welded on it causes a lifting of the upper at that point, and consequently a weakness to that part.

Sole Preparation

In the first place, the sole must fit, leaving a bare sufficiency of edge for finishing purposes. Then the

sole must be fleshed, that is, in order to give a firm holdfast for the cement, all backing, dirt, and loose material must be removed from the flesh side. The sole should then be moulded to the contour of the bottom of the last.

For the purpose of cementing and adhering, the soles must be in a perfectly dry condition, and the flesh side thoroughly roughed-up. The machine that is sometimes used for this purpose consists of a circular stiff wirebrush, which raises a sort of nap on the solid flesh fibres of the sole, giving the cement a good holdfast. This would be impossible where the sole is damp or where the backing or loose fibres remained.

The roughening must be carried out on every part of the sole that comes in contact with the bottom of the shoe. The roughened side of the sole is then covered with a layer of cement carried out to the edge of the sole. The bottom of the shoe is also covered with cement, extending out all round to the extreme feather line, so as to form a perfect bond between sole and shoe around the edge.

These are now laid on one side until the cement is dry.

There are other machines used for this purpose. One—the "Perfecta"—combines both the roughening and cementing in one operation. Briefly explained, this machine is fitted with a short row of prickers or awls and a cement tank, the nozzle of which follows closely to the action of the awls. The sole is placed in position and the machine set in motion. The prickers penetrate lightly into the flesh side of the sole, then as they emerge a thin jet of cement exudes from the nozzle into the punctures. The prickers again descend in the same place and force the cement into the holes. This action is repeated all round the sole until the operation is completed.

Sole Laying

There are several types of sole-press in use for this purpose, some constructed, on a water-bed system, others on air inflation methods, but the principles are the same—to get a tight adhering of the sole to the shoe bottom by conforming the sole with equal pressure to the curvature of the last.

In the first-named type, the sole-press is fitted with bladders filled with water, which form a bed for the sole. These bladders are made fairly firm and stiff, yet with sufficient flexibility to conform under pressure to the varying curvatures of the different-shaped lasts, bringing equal pressure to bear on both the concave and convex curves of the bottom.

The air sole-press is constructed in a different manner, being fitted with valves and an air compressor, which inflates the pads or bladders forming the sole bed after the shoe is placed in the machine. The pads remain inflated during the whole time the shoe is in the machine, and are deflated when the shoe is removed.

All sole-presses are constructed to take several pairs of shoes (varying from four to twenty pairs or more), and are arranged on the time principle required for the adhering and drying of the cement. The dry cement on the sole and the bottom of the shoe is given a coat of solvent, which is a softening liquid used to bring the adhesive into a tacky condition. The sole is positioned, the shoe is placed in the press, and the pressure applied. Then the machine is moved round to the next section for another shoe, and so on until all the sections of the press are filled up. The first shoe that was inserted is now round to the operator ready for removal, the time taken being calculated to be sufficient for the complete adherence of the sole according to the nature of the cement used and the kind of sole being attached.

One great objection in the past to this method of

sole attachment was the roundness in the bottom caused by the sole-press, but the improvements made on some of these now cause the preliminary pressure to come first in the centre of the sole, keeping that part of the sole perfectly flat while the later pressure of the pad closes up the edge.

Conclusion

The demand for a light grade of footwear has steadily increased year by year. This may be due to our milder climatic conditions, the better road construction of later years, and greater facilities of transport, entailing less walking. Moreover, great endeavours have been made to produce a tackless form of shoe other than the hand-sewn, combining lightness, flexibility, and comfort with less cost. We must recognize that the welded system of making comes near to this ideal.

We must also recognize that this system has come to stay—it has passed its preliminary tests and great improvements are constantly being made—so that the possibilities of the near future are that the welded system will supersede some of the present-day machine methods of shoe-making in the same way that these methods superseded older methods in the past.

SECTION VIII

THE FITTING UP OF LASTS

BY
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PREFACE

"A well-fitted last should conform to the contour of the sole of the foot, and reproduce artistically the fundamental protuberances and hollows, and where prominent the ridge on the inside of the last should be gracefully continued to the toe, and the toes of the last should be thick enough in the right place to allow of the placing of the toes of the foot in the proper position. Lumps and dents should find no place in a well-fitted last; everything should be gracefully rounded and correctly positioned.

"An ideal shaped last should be of the right shape adaptable to the purpose of the particular boot to be made therefrom, and made snug enough to confine the foot without any uneasy experience to the wearer. It should allow of an easy entrance to be made to the boot. . . . No injurious pressure should be in the boot made from the last, and no wrinkles of loose leather at any part. It should be graceful and easy, and combine a skill and knowledge that is obtained by a long, studious experience." *

So wrote Mr. F. Y. Golding over thirty years ago, and no better inspiration to the student could be offered. Again, "the fitting *up* of lasts requires much care and knowledge, if a good fitting shoe is required."

Last fitting consists of the successful application of

* *The Manufacture of Boots and Shoes.*

properly prepared fittings to the lasts that have been carefully selected for the purpose.

The last must not only be true in *measurement,* but also in the *shape* suitable for the foot, that is, the "draft" or border outline of the foot and last must agree. Form is really the great secret of comfort; and that we have discovered only after scores of years of practical experience.

GEORGE SABBAGE.

SECTION VIII

THE FITTING UP OF LASTS

CHAPTER I

THE VARIOUS TOOLS USED

A DESCRIPTION of the various tools used is given for the guidance of the beginner.

THE KNIVES

For ordinary skiving purposes a shoemaker's knife with a $\frac{3}{4}$ in. width of blade is required, as well as a Swedish pattern knife. These may be added to for special purposes.

The knives should be treated with care, especially when sharpening, so as not to spoil the temper by excessive rubbing on the fine emery cloth.

It is best for learners at first to take just one stroke to the right and then take the knife off the emery and give one stroke to the left, instead of a continuous backward and forward rubbing, which makes the blade hot and tends to remove the tempering of the steel. If it is too heavily rubbed the edge becomes brittle and quickly loses its sharpness.

Realize that steel is softer than emery (which has nearly the hardness of a diamond), and it will be understood why the knife becomes brittle when over-rubbed.

The Strop

This is usually a piece of wood about 15 in. long and 2 in. wide. One side is covered with leather and the other face is covered with emery cloth.

Four-in-one-strop. A useful strop can be made of a piece of 2 in. quartering, i.e. all four sides are 2 in. wide. The length is about 16 in. On one side fasten by paste a strip of emery, putting leather on the second side. Attach a piece of zinc (for skiving purposes) on the third side. The fourth side is used for cutting the fittings or as a paste board.

Skiving Slab

A piece of marble of about $\frac{3}{4}$ in. substance by 12 in. square or a piece of thick plate glass should be obtained. Either of these makes an excellent skiving surface.

A skiving board made from a piece of lime wood 18 in. by 6 in. and 1 in. thick can also be used with advantage. Cover one side with zinc for skiving. The other side is used for cutting on, and one end may be reserved for pasting the fittings before attaching to the last.

Size-stick

The size-stick consists of a piece of hard wood—usually boxwood—suitably shaped, and about 15 in. to 18 in. in length. At one end is *fixed* an upright, forming the beginning of the stick. A similar upright is made to *slide* on the stick, which may thus be adjusted to the object to be measured, giving the shortest length through the body encompassed from back to front. Size-sticks that have a screw or spring, enabling the movable upright to be fixed when required, are among the best to select. The fixed and movable uprights are marked with divisions of inches for measuring the heights of heels and the spring of lasts.

The English shoe sizes marked on the upper face between the uprights are $\frac{1}{3}$ in., the notation commencing at $4\frac{1}{3}$ in. from the fixed, upright and marked as size 1.

To test a size-stick, take a steel rule marked in inches and see that 12 in. is the true measurement indicated on the stick for the size 11's men's; that 10 in. is a 5's size ; and 6 in. is the children's 6's.

Size-sticks and tapes should always be checked before taking into use, as there are some on the market incorrectly marked. If inches are marked on the under-face they should be made from the same zero as the inside margin of the fixed upright.

Rasps, Etc.

A last-maker's French rasp, 12 in. By 1 $\frac{1}{4}$ in. is desirable to rasp the rough wood quickly. A half-round wood rasp 16 in. by 3 in. is also useful for reshaping lasts that require any reduction.

Single and double shoe tapes should be included in the tool list.

A spokeshave is useful for cutting out the sides of lasts for court shoes.

A last-maker's bench and knife are by no means to be despised as part of the equipment (see Section II).

Fittings

The best leather to use for fitting up lasts is level shoulders that have been vegetable tanned. The worst leather to use is waxed calf or anything containing grease, which soils the linings, and, if *turnshoes* are to be made, also soils the outsides.

Fittings must be very carefully prepared *before* fixing to the lasts. The leather after being wetted through should be allowed to get nearly dry, so as to prevent any shrinkage beyond the edge of the last

after the fittings are fixed. The leather is what one would call just "mellow" on the dry side.

Where lasts require permanent alterations by additions, this can be obtained by building up the portion of the last requiring increase by using plastic wood. Thin applications are desirable if any great thickness is wanted, allowing for drying between the successive layers. After drying, the superimposed increase can be shaped to requirements by the use of the knife or file.

Skiving

Skive the flesh side of the leather so as to keep the fittings smooth on the face and thus prevent undue friction when the uppers are lasted.

A "pull" skive taken towards the body of the worker can be used for the larger and longer fittings, as this will enable a longer sweep to be taken.

For the smaller fittings the "push" skive is the best to adopt, as the little finishes that are needed can be given to the fittings easily. A fitting must be so skived that when placed in position on the last there are no ridges or lumps between the fitting and the last. A test after the fitting is made to the last is to place the apron over the fitting and see if any irregularities are present. If so, they must be removed, by taking the fitting from the last, and re-skiving on the flesh side.

If no irregularities are observed, the grain side of the fitting can then be polished to increase its smoothness. This is done by rubbing the grain with the handle of a tool or bone.

CHAPTER II

SABBAGE'S SECTIONIZER FOR THE LOCATION AND DIMENSIONS OF FITTINGS ON LASTS

THIS Sectionizer is used for fixing the *location* of fittings for lasts from 2's to 11's men's, and. gives the *sizes* of the patterns for the various fittings. It is built up by taking the *foot's* length and dividing it into eleven. It is then applied to the last by adding one-eleventh of the length of the *foot* at the toe-end for the extra length of the last beyond the length of the foot.

The usual allowance made in the trade for men's is three shoe sizes, i.e. 1 in., and for women's lasts two and half sizes, beyond the length of the foot. Yet a woman's 7's is the same length as a man's 7's.

We advocate the theory that the length added to the last should be gradual all through the scale, and, as already stated, make the length of the last increase over the foot by one-eleventh of the foot's length. Compare this with the trade allowance. When a man's foot is measured by the size-stick and registers "8's" (i.e. 11 in.), we add three shoe sizes, and the last is made size 11's (i.e. 12 in.). Thus one-eleventh of the foot's length has been added, and from this we get our 12 in. sectionizer. (See Fig. 3.)

If we take half of 12 in. we get size 6's infants', which is just 6 in., and is suitable for a *foot* measuring $5\frac{1}{2}$ in.; one-eleventh of $5\frac{1}{2}$ in. is $\frac{1}{2}$ in., the usual trade allowance used for that size. We always maintain that if we err at all it should be on the long side.

The "sectionizer" method guides us for adults by giving the greatest extension for the largest length of foot. For instance, if the foot measures size 10's in

the size-stick, the shoe should measure size $13\frac{1}{16}$. Another advantage possessed by the "twelfth" sectionizer for lasts is that when producing the sole area of a last we have fixed points for an ordinary foot that correspond with the elevenths of the foot, and therefore have more guide points for the different parts of the foot. We have also an approximate measurement of the longitudinal position of the various bones of the foot, and this should guide us in the construction of sole shapes and in taking the measurement of the foot. As the extra length allowance is all in the front part of the last over that of the foot, the various divisions counting from the back of the heel of the foot and last retain the same number, only on the foot they are elevenths but on the last they are twelfths—a difference of $\frac{1}{132}$nd of an inch, which may be considered negligible.

When measuring, certain prominences of the foot should be located. The position for taking the joint is recognized as the junction of the second phalanx of the large toe with the first metatarsal; the joint is actually where the articulation of the two bones takes place. It is best to take the measure straight across, as if taken on the slant or oblique, different results would be obtained by different measurers, unless the obliqueness was indicated. It is advisable to take a second measure one "eleventh" farther back on the foot, i.e. seven-elevenths from the heel. This gives the outside joint position and the rise of the lower instep—a position that the Americans term the waist measure.

Fig. 1 shows two scales, one for size 2's and the other for size 11's. Each scale is divided into twelve equal parts, giving divisions that can be marked on the lasts 2's and 11's as a guide in determining the location and dimensions of the various fittings about to be described.

Fig. 2 is a chart showing how the intermediate sizes

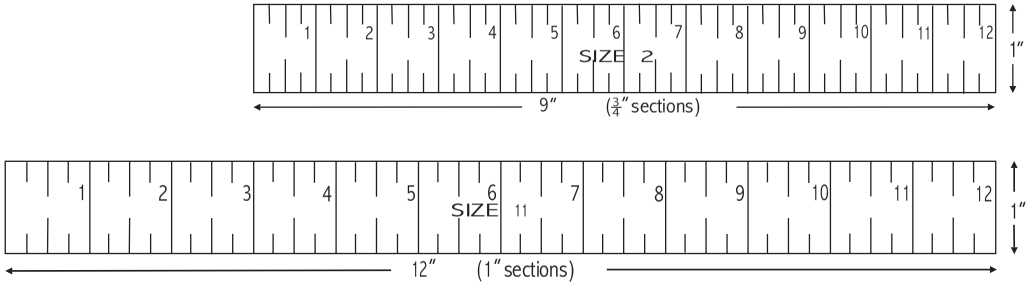

FIG.1 SCALES FOR SABBAGE'S SECTIONIZER

Used for marking on bottom or sides of the last the relative positions from Zero to Section 12

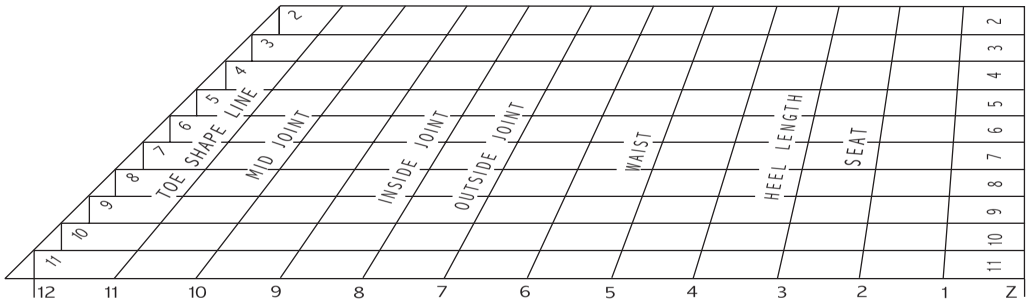

FIG. 2. POSITIONS FOR EACH SIZE OF TOE SHAPE LINE, JOINTS, WAIST, HEEL-LINE, AND SEAT

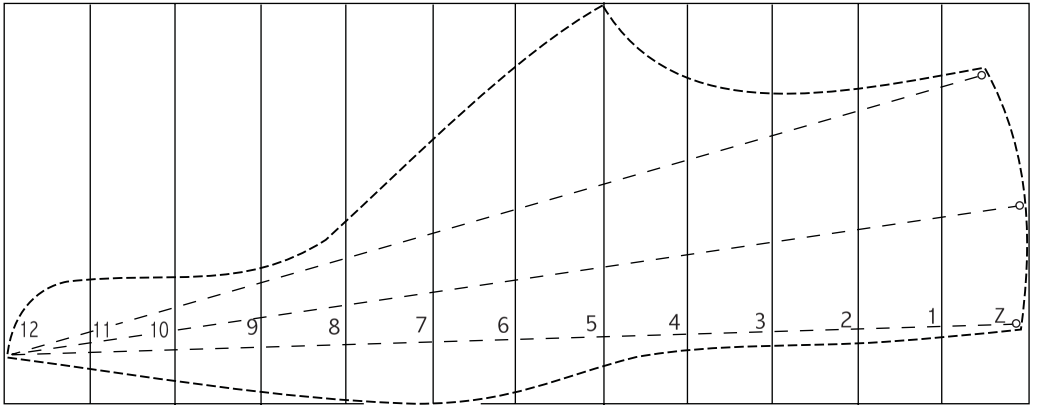

FIG. 3 ELEVATION OF LAST (SIZE 11's) DIVIDED ACCORDING TO SABBAGE'S SECTIONIZER

Profile of 11's last, showing amount of curve for the waist and also the method of producing an excellent back shape for a fairly good height heel. It should measure the same from bottom edge of the toe to the three points marked *O*

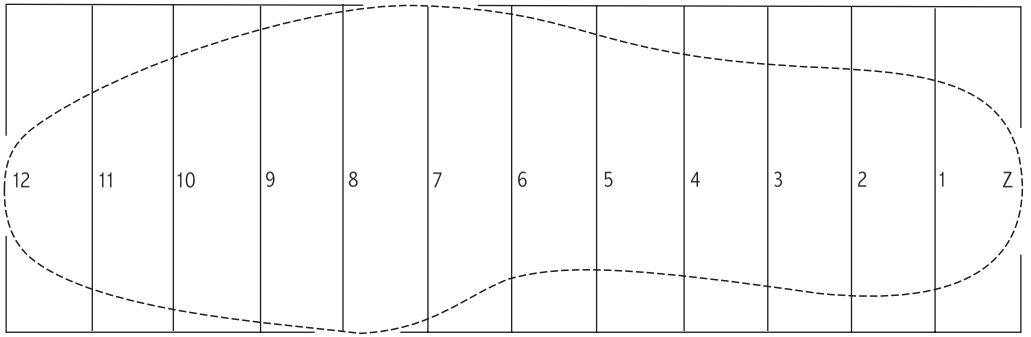

FIG. 4 SOLE OF LAST (SIZE 11's), DIVIDED ACCORDING TO SABBAGE'S SECTIONIZER
Sole shape divided into 12ths from Z to 12

from 2's to 11's are obtained, and the names of the positions hereinafter mentioned in the description of the fittings.

To obtain this chart, draw lines parallel to the base and at equal distances from each other. The 12 in. scale of Fig. 1 is marked on the lower or base line, and the 9 in. scale on the top line. By connecting similar positions on each scale, the intermediate sizes are obtained.

Fig. 3 shows how the divisions are applied to the section or profile of a size 11's last, and this can be used for determining the location of the various fittings to be added to the last. For lasts differing in length from the 11's, the divisions shown in Fig. 2 can be used for the appropriate size of last.

Fig. 4 shows the sole of the last divided as in Fig. 3.

The lengths of the divisions for the other sizes of lasts can also be obtained from the following table—

Size	Length in Inches	One-twelfth Division
2	9"	$\frac{3}{4}$"
3	$9\frac{1}{3}$"	$\frac{7}{8}$"
4	$9\frac{2}{3}$"	$\frac{29}{36}$"
5	10"	$\frac{5}{6}$"
6	$10\frac{1}{3}$"	$\frac{31}{36}$"
7	$10\frac{2}{3}$"	$\frac{8}{9}$"
8	11"	$\frac{11}{12}$"
9	$11\frac{1}{3}$"	$\frac{17}{18}$"
10	$11\frac{2}{3}$"	$\frac{35}{36}$"
11	12"	1"

An increase of $\frac{1}{36}$" per size

CHAPTER III

FITTINGS USED, MAKING AND AFFIXING

THE various skives used in making fittings are composed of three fundamental types, and it is advised that the following be made by the beginner before attempting those about to be described.

Fig. 5 shows the form of skive that is most generally used. It

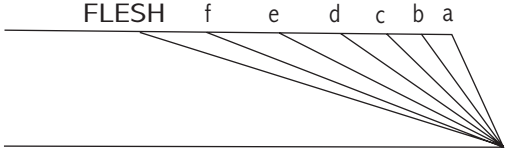

Fig 5

is taken perfectly straight from the distance required on the flesh side, as *a, b, c, d.,* etc., to the grain or face of the leather. After skiving some sample pieces of varying distances, *a, b, c, d,* take the mellowed

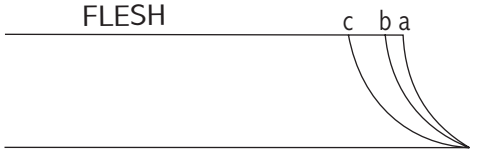

Fig 6

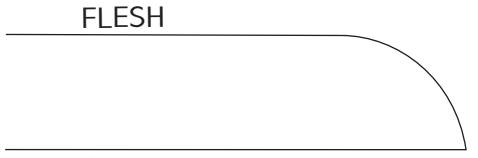

Fig 7

skived, leather, place the flesh downwards on a flat surface, and smooth the grain down. If the piece is then cut across, the shape formed by this skive can be examined and compared, so that it will be seen how to skive for a particular shape.

The same applies to Figs. 6 and 7.

Outside Joint Fitting

This fitting is a useful one and may be made either short or long. The former can be of three divisions, while the latter is made five divisions in length. (See Fig. 3.)

In Fig. 8 is shown the short outside joint fitting. Fig. 9 shows the full outside joint fitting, and Fig. 9A the pattern for the leather large enough to making a pair of fittings. After skiving, the pair is divided, as shown. This ensures that both fittings are alike.

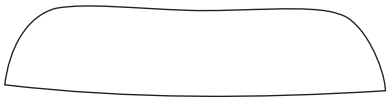

Fig. 8. Short Outside Joint Fitting 6 to 10 Divisions

Such a fitting needs a *long skive* at each end, and a gradual

Fig. 9. Full Outside Joint Fitting

skive along the top, so as to blend nicely on to the wooden last. This prevents the edge being felt through the thinnest fabric shoe, and leaves the inside linings quite smooth when the last is withdrawn. There must not be any trimming-up after it is fixed to the last. The grain must always be left on the fittings, and only the flesh side of the leather skived. The flesh

side can be so skived that only the grain is left at the feather edge of the fitting, so as to blend smoothly to the last. The reason that skiving is done on the flesh side is that the grain side of the leather is stronger, cleaner, and more durable. Dust does not cling to it, which is a most important point when turned shoes are made from fitted lasts. Moreover, because the flesh side is weak it might tear away from the tacks when

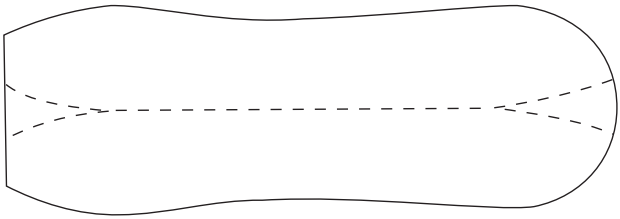

FIG. 9A. LEATHER CUT LARGE ENOUGH FOR PAIR OF FITTINGS, AND, AFTER SKIVING, DIVIDED SO THAT BOTH ARE ALIKE

securing the fitting, if the leather were skived on the grain.

To keep lasts and fittings clean, it is a good plan to keep the lasts boxed up. Old shoe boxes answer the purpose, because customers' extra fittings used for various kinds of footwear can be kept in the same box. Put figures outside the box to denote the registered number and the letter of the rack to which they belong.

A very good clean adhesive is necessary. Stick the fitting on the last to come just below its feather edge, so that in case of shrinkage, it can be rasped level with the edge of the last. This ensures that the edge of the insole is smooth. Hold the fitting in position at the toe-end and put in about three tingles, keeping them rather close to the feather, as otherwise the fitting may spread out when the insole is blocked to the last. Pull the fitting tightly so that its top thin edge clings

closely to the top edge of the last. Do not make large holes in the last by using wooden pegs to fix the fitting.

The best tingles of all are French tingles of $\frac{5}{16}$ in. (or $\frac{3}{8}$ in. for thick fittings) in length. These are the same tingles that are sometimes used for lasting-up sew-round work. They are very fine, and do not mark the satin of the outsides or even the delicate linings. Some other kinds of tacks leave the marks of their heads behind. When French tingles are used this does not happen, and the fitting is easy to remove if required, without being torn. The advantage of this outside joint fitting is described later.

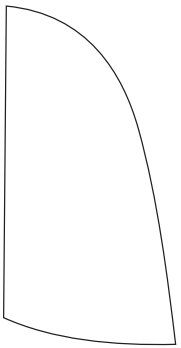

FIG. 10

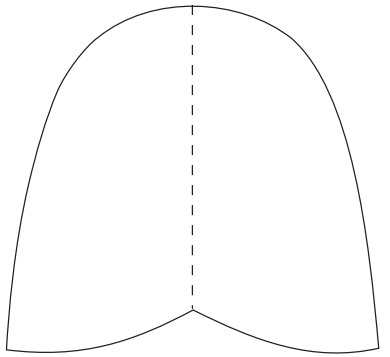

FIG. 11. COMBINED PAIR OF OUTSIDE SEAT PIECES

OUTSIDE SEAT PIECE

This is made three divisions long, as shown in Fig. 10, so as to come to the heel-line. (Division 3, Fig. 3.) It is used for a customer who needs a wider seated last. It makes a less twisted form, and often prevents running over at the heel. Fig. 11 shows a pair of the

same fittings cut and skived in one piece to ensure true size and substance before dividing lengthwise.

Outside Waist Piece

This is egg shape, as shown in Fig. 12.

Vegetable tanned shoulders are the ideal leather for fittings, but, for economy's sake, shanks or middles of bellies answer well for the waist piece fittings. Such fittings are soft and

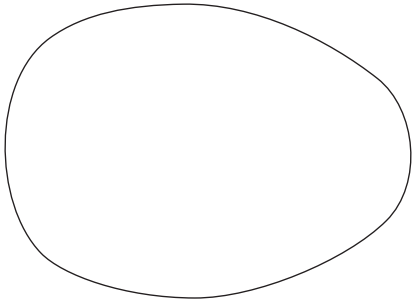

Fig. 12. Size 11's Shoe Waist Piece for Oxfords

stretchy. They bend easily over the last and conform to the shape of the waist, and can be fixed with paste only. They are just held in place by a few tacks, which can be withdrawn when dry, thus obviating the risk of marking the uppers.

Toe Pin

This is a very useful fitting, but it needs the utmost care in preparation and fixing. A toe pin cut from shoulder leather answers for the majority of cases, but for a toe pin that is going to have a lot of wear, select leather from a 16 lb. butt rounding, as this is the best for durability—in fact, if well sleeked and hammered it is as hard as some wood, and butt leather fittings can be worked on for years.

When fixing around the toe, use plenty of tingles

and keep them close to the feather edge of the last so as to keep the toe always of the same shape. After several pairs of wet insoles have been blocked, the toe pin, if not correctly fitted, may spread and thus the toe becomes wider.

Fig. 13 is the combined pattern for a pair of toe pins in one piece. When butt leather is used to make a "hard-setting" toe pin it must be wetted more than a shoulder leather toe pin,

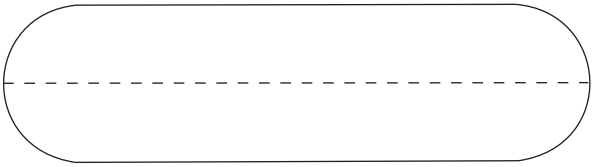

FIG. 13. PAIR OF TOE PINS IN ONE PIECE

since the water takes longer to penetrate and make it mellow. It also takes longer to dry; therefore do not rasp the bottom edge level until it is dry and adheres closely to the last. Being close and fine on the flesh side, it needs more moulding to fit to the last. The skilful part is the skiving, especially at the top edge underneath the puff where all the pipes appear. It takes a lot of coaxing to get this clear, and so this fitting is a test of skill. The point to remember is that it must be perfectly smooth on the top edge, so that the puff is clear of any ridges. Do not skive any off when once it is on the last, but *draft* it until clear; this can be done with mellow leather.

For turnshoe fittings use a nice clean leather that can be stuck on the last with a good adhesive, without leaving any tingles in the fitting when it is dry. Four tingles fix the toe pin sufficient for turnshoes. It is mellow, and therefore clings to the last. We call this leather "lining hide"—it is really what is used for riding-boot linings. It will do without tacks because

since the sole is rounded true *before* making, it fits the last shape and holds the edges of the fitting true. Austrian Glaze is the best adhesive for this purpose.

Inside Joint Fitting

This is the next fitting of importance. It is used to make a bolder tread, when the foot is fully developed at this point.

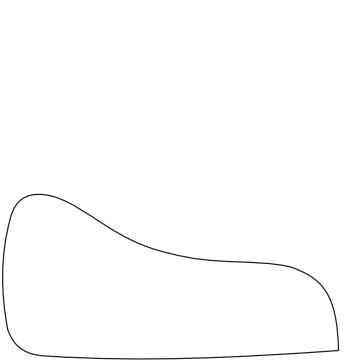

Fig. 14. Size 7's Inside Joint

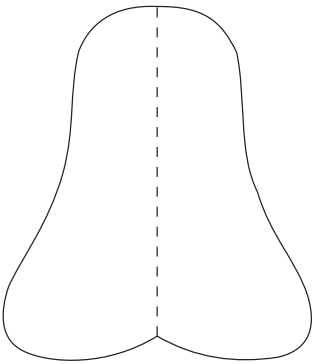

Fig. 15. Inside Joint Piece Pair in One Piece
Divided after skiving

(See Fig. 14.) Fig. 15 shows a pair in one piece, which is divided after skiving.

Full Heel Pin

This is cut to reach to the heel-line (Division 3 in Fig. 3), and turns over the top of the last. (Fig. 16.) The length of the turn-over is one division, its width being to the last.

Semi-heel Pin

This is cut to reach to the seat-line (Division 2 in Fig. 3). This fitting is for a foot that needs the last

lengthened at the back, so as not to increase the width of the seat. (See Fig. 17.)

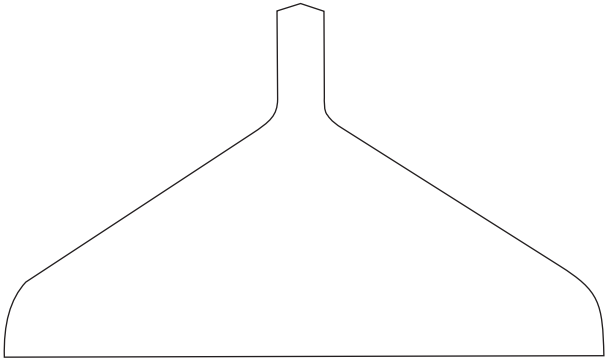

FIG. 16. FULL HEEL PIN SIZE 7
To reach to heel-line Division 3. Turn over top one division ; width according to last.

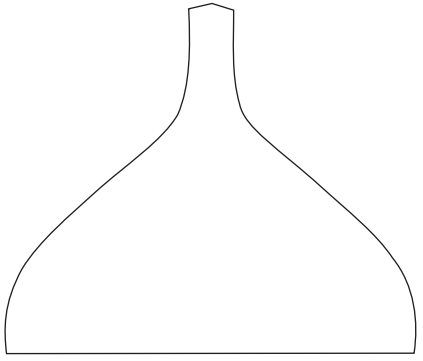

FIG. 17. SHORT HEEL PIN OPENED OUT
Called semi-pin. Does not increase heel width

SHOVERS

These are made from different thicknesses of leather, and reach from the toe of the last to the comb. Their

object is to increase the measurement of the top section of the last over the entire area of its application. Fig. 18 shows a pattern for the right foot. Notice the curve on the outside of the instep so as to clear the shoe quarters. It, is made the same width as the toe of the last. At the joint position it must be made wide enough to come from joint to joint when on the last.

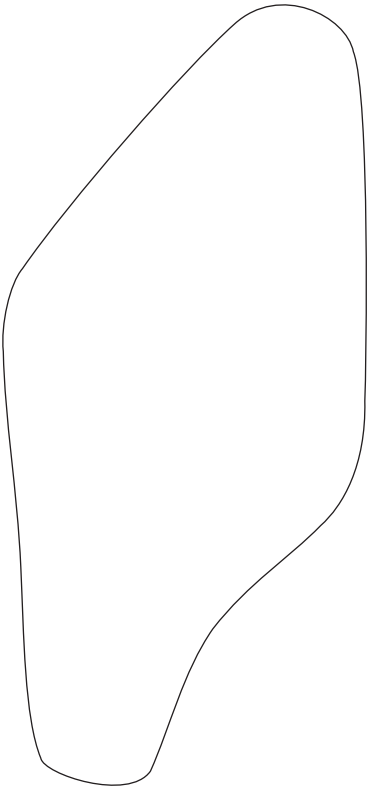

FIG. 18

JOINT LEATHER

This fitting is used to make the last larger over the toes and the joints, and covers from Division 12 to Division 7 in Fig. 3. The pattern is shown in Fig. 19.

FULL INSTEP PIECE

This fitting increases the instep and the long-heel measurement of the last, and is made to the size of Divisions 4 to 7 in Fig. 3. The shape is shown in Fig. 20.

NARROW INSTEP PIECE

This is used to give room for the narrow bar button shoes which at times press upon the instep, and when

the uppers are cut from stretching sorts of leather the bars contract when the last is withdrawn. The pattern

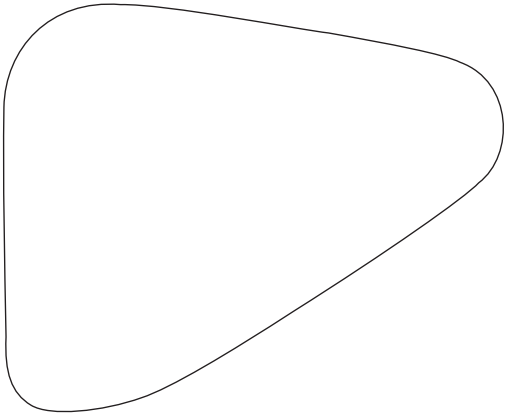

FIG. 19. JOINT LEATHER

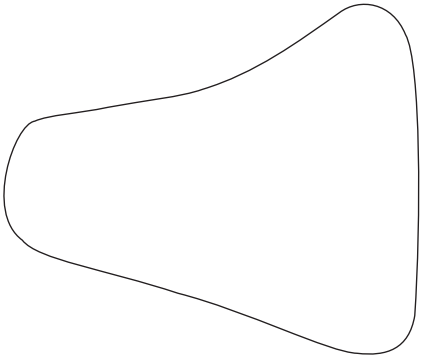

FIG. 20. FULL INSTEP PIECE

is shown in Fig. 21, and is made to cover Divisions 5 to 7 in Fig. 3.

Tab Piece for Derby

This is a fitting used to prevent pressure on the lower instep of the foot and where the corners of the lappets or tabs are situated. There is always extra stitching where the tab is stitched to the tongue. This fitting is shown in Fig. 22.

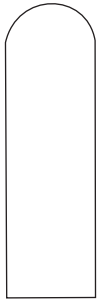

Fig. 21. Narrow Instep Piece
Size 7 for narrow bar

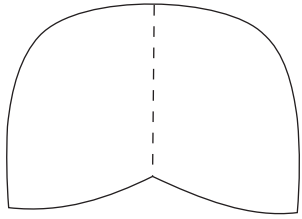

Fig. 22. Folded Tab Piece

Tread Piece

This fitting extends transversely across the tread of the last. It is made to come from Division 10 to Division 7 (Fig. 3) on the inside joint, and from Division 9 to Division 6 (Fig. 3) on the outside. The outside waist is left full substance at the contact point of the last so as to increase the amount of toe spring, the substance being determined according to the spring required for the higher heel. The curve of the waist is automatically increased for the higher heel, so the fitting must be skived nicely each end, and brought gradually down into the waist. The anterior end is skived very nicely to blend into the range of the forepart of the last. The forepart must not have as much convexity as a last for a lower heel.

This is a fitting where we reverse the rule of always having the *grain* side of the leather outwards. One reason is that when the flat wide piece is placed on a curved surface it may want touching up with the rasp after it is stuck on the last, and being at the *bottom* of the last it cannot soil the linings. Another reason is that as the grain is left on the fitting and only pasted to the last, the fitting can be easily removed when a lower heel shoe is demanded.

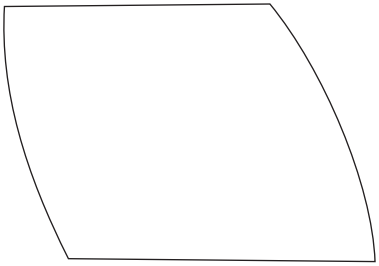

FIG. 23. TREAD PIECE FROM DIVISIONS 10 TO 7 INSIDE TREAD AND 9TO 6 OUTSIDE TREAD
Used to increase spring for higher heel or sunken ball

A modified form of this pattern can be used for a customer who has a very prominent ball across the tread. This fitting on a smaller scale is better for an enlarged joint cavity than the old shaped "walnut" piece which formed a kind of saucer for the ball to rub against.

The pattern is shown in Fig. 23.

BOOT PIECE

This is a piece of leather cut to fill in the concavity of the inside instep and. the back part, which has probably been cut away from the customer's last to make it suitable for strap or other shoes. The loss is replaced by filling in the side of the last from the back to the comb and inside instep. Make the fitting about 1 in. up from the bottom edge of the last for a lace boot, but for a button boot sometimes both sides have to be treated. (See Fig. 24.)

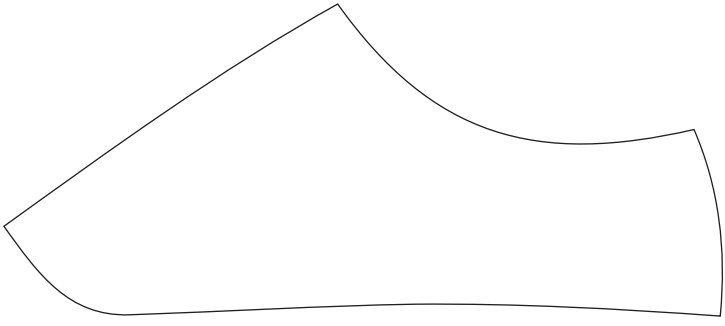

FIG. 24. BOOT PIECE TO FILL SIDE OF LAST

WAIST PIECE

This is placed transversely from Division 7 to Division 2 (Fig. 4), and carried up the sides of the last a little to make the

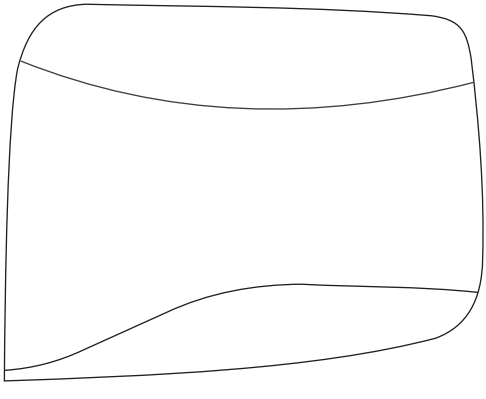

FIG. 25

latter suitable for a tennis shoe or a slipper without heels, by filling up the curvature under the waist. (See Fig. 25.)

Extension Toe Pin

Although this is one of the smallest fittings made, its main object is the improvement in appearance of the last to make what some call a "smarter" toe. It certainly makes a better-looking toe when added to a stumpy forepart last.

This is apparent when we note that it merely lengthens the last and maintains the original form at the mid-joint line. (Division 10, Fig. 4.) The dimensions of a pattern for a medium-shaped toe can be obtained by cutting a square half the width of the last at the tread. For example, for size 11's, with $3\frac{1}{2}$ in. tread, the pattern would be $1\frac{3}{4}$ in.; for size 7's pattern tread of 3 in. the pattern would be $1\frac{1}{2}$ in.; for size 2's last, with $2\frac{1}{2}$ in. tread, the pattern would be $1\frac{1}{4}$ in. These are approximate figures, and must be altered for wide or narrow toes. The square is for a pair of toe pins. When divided as shown, it gives two fittings identical in shape and slightly over the size required, to allow for trimming off at the bottom edge when fixed on the last and quite dry. (See Fig. 26.)

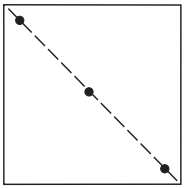

Fig. 26. Extension Toe Pin

The extension toe pin should be skived *thin* on the flesh side at all points and sides, all the sides being true in every respect. A circle drawn in the centre, with radius one-quarter of the diagonals, covers the portion to be left at full substance. Note again that the outside is skived carefully to the edges, and particularly to the corners of the square.

Fix this fitting so that it lies centrally with the toe. extending equally on each side from the centre of the toe. Having made holes in the centre and at the ends of the diagonal line, place the pattern on the prepared leather and then dissect. When divided the

pair of toe pins is obtained. Then place the two bottom edges together so that the skiving of both is alike. If this is not so, place them on the slab, the edges meeting, and skive again until both are true. Fix them on the last with the apex in the centre and the bottom edge just below the end of the last. Don't drive the tacks home until the position is made quite true.

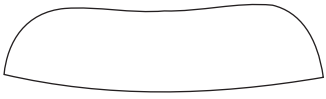

FIG. 27

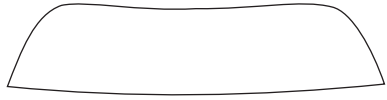

FIG. 28

SIDE TOE PIECE

When this fits on the inside toe from Division 12 to Division 9 (Fig. 3), it makes the inside straighter in form—that is, more twisted or a modified "Meyer" form. (See Fig. 27.) A side toe piece for the outside toe is cut for Division 12 to Division 8 (Fig. 3), and makes a less twisted form, i.e. a modified "Camper " form. (See Fig. 28.)

CHAPTER IV

SELECTING LASTS TO MEASURE AND PROFILE REQUIREMENTS

In this Section we are assuming that the last-fitter has taken the measurements of the foot and made a draft or border outline, and noted the profile of the foot. *Always* remember that the first thing to do after taking these outlines is to take the length of the foot in the size-stick so as to compare it with the length as given on the draft. It sometimes happens that customers are talking so much during the draft-taking that the size-stick is overlooked. The best plan for the last-fitter is to save his remarks until the end of measuring, so that the measurer can look at the foot and note any irregularities, such as hammer toes, flattened or curved arched waist, high or flat instep, or thin at the sides of the heel, etc.

All deformities in the foot can be located from the back by placing the size-stick at the back of the heel and sliding the second upright forward until it rests on the deformity. (See also Section II and Section XVI.)

After taking the draft and measure, a last is selected that will be the most suitable for the foot in all its salient features, and by laying the last upon the draft we are able to see what alterations are required in the last to make it adaptable for the foot. If the measurements have been taken from the foot by means of the principles involved in the sectionizer referred to in Chapter II, then we can the more easily adapt them to the last. The last can be marked into the divisions

recommended, and we therefore have the twelfths to guide us where to mark the positions for the fittings required.

In essential features the last should follow the border outline of the foot. (See Section II, page 216 *et seq.)*

CHAPTER V

RELATION OF FOOTWEAR TO THE HUMAN FOOT

FOOTWEAR should be in true relation to the human foot, both in contour and in the position of the toes of the last in relation to the seat.

It is not *only* a *short* shoe that is the cause of an enlarged joint. The joint action of the opposing muscles should be considered with their variety of movement and alteration in shape. The great toe moves *outwards* by the power of the abductor pollicis muscle, and when the heel is raised the great toe moves inwards (towards the centre of the foot) by the action of the opposing muscle, adductor pollicis. A border outline with the foot flat and then one with the foot raised will show the difference, but it will also show that when "the smaller toes are flexed in *action,* the joints of small toes present a series of uplifted prominences while gripping the ground,"* and the action of the muscle abductor minimi digiti has spread the small toes *outwards* from the centre of the foot. This must be considered in constructing the sole shape at the mid-joint line. (Fig. 29A.) "The preservation of these functions should be the consideration of the producers of boots or shoes."* Last-fitters can produce footwear in true relation to human feet, whether at rest or in action.

The reader should refer to Section XIII and learn the arrangement of the foot and the position of the parts that influence the external "form," so as to be in a position to allow for the foot both in repose and during

* *The Manufacture of Boots and Shoes,* 1902.

its use, and to allow for the changes of "form" that take place during its various movements.

Form or shape is emphasized as the most important item in last-fitting, because form is determined by the bony prominences, although the softer parts, either muscular or tendinous, also assist in determining the shape. The last must follow the shape of the foot, and measurements alone are not sufficient if the shapes are not consistent. However, the bones should furnish the position from which to take measurements because of their stability and easy location.

The first thing in selecting the most suitable *form* of last is to find out for certain the shape required, by making marks on, and within, the draft.

A draft or border outline taken with the customer *sitting,* i.e. weight *off* and in a position of repose, is to be preferred. The first procedure is to take the draft and measure *across* at Division 2 (Fig. 3) the seat width. Assume that it is $2\frac{1}{2}$ in. Then mark off a point (say a dot in the centre) at $1\frac{1}{4}$ in. As the seat of the last is to be only $2\frac{1}{4}$ in., mark a dot $\frac{1}{8}$ in. *inside* the draft each side, from *A* and *B* in Fig. 29.

The second lot of dots are to be placed *on* the outline (not *within* it, as the last requires the full width here) straight across at about Division 10 (Fig. 3), where we find it measures $2\frac{1}{4}$ in., that is, the same *width* as the seat of the *last.* This would be about the region of the mid-joint (Fig. 2), but it may be necessary to go forward a little more to get exactly the $2\frac{1}{4}$ in. required. Then place a dot each side *on* the draft, *not* inside it (as the foot will elongate and spread out to this width when the weight is on), and mark a dot in the centre $1\frac{1}{8}$ in. There have now been obtained six points of bearing for a rectangle. (See Fig. 29.)

For undistorted feet or toes that have not been pressed out of the proper line of action, the centre line

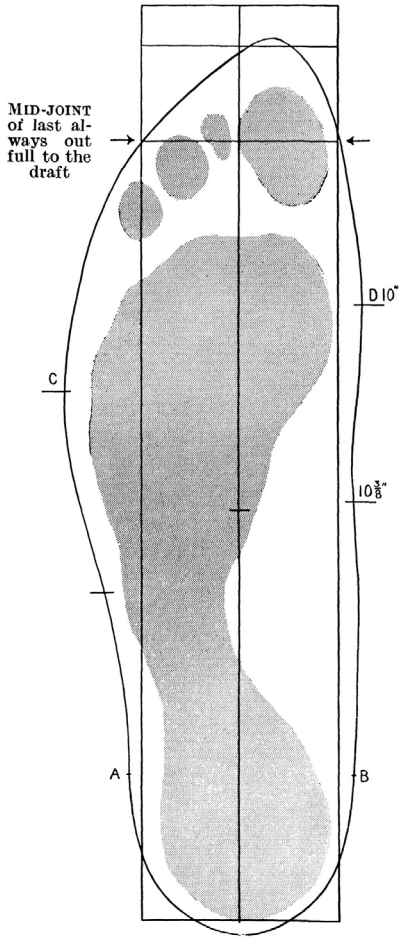

FIG. 29 IMPRESSION AND DRAFT

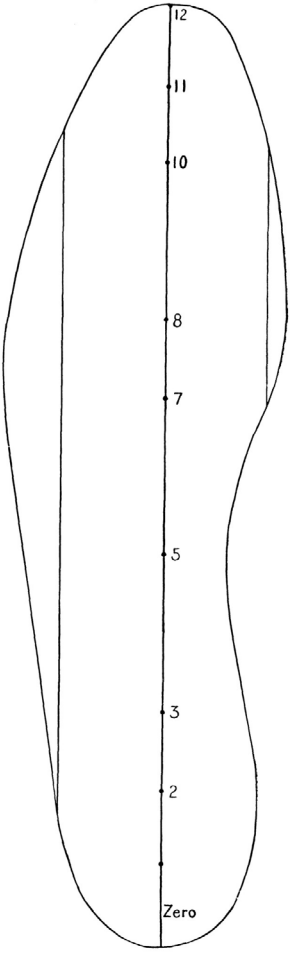

FIG. 29a. SOLE SHAPED FOR FIG. 29

of the rectangle should pass through the second toe in the direction of the line of muscular action. This rectangle shows at a glance the type of last needed, for the foot. (See Fig. 29A).

The "improved sole shape" results from "a system of sole shape construction based upon practical principles." "The tread width is situated on either side of the centre line of a rectangle in the proportion of four-ninths of the entire width of tread for the inside joint, and five-ninths for the outside joint."*

This makes a nice-looking shape for well-proportioned feet. (See Fig. 30.)

We now refer to the border line for the amount to be deducted from the draft at the width of the tread, because it is seldom that the *last* is made to the full width of the draft (except for people who want a *loose* shoe). A last of full width and to the correct measure would be very thin and tend to cut the foot at the vamp seam of the shoe—unless made with a very short vamp or low opening.

* *The Manufacture of Boots and Shoes*, 1902.

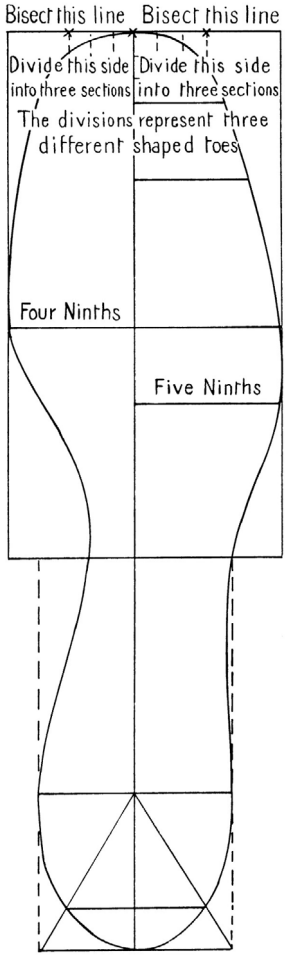

FIG. 30. IMPROVED SOLE SHAPE

Therefore we put a dot *inside* the draft at the inside joint position about Division 8 (Fig. 3), making it $\frac{1}{8}$ in. from the border line, as the foot is thick and strong and will not give much under pressure, and even if it *is* pressed it pushes the little toes over more to the outside of the boot. In a line with this first dot and on the outside, make a dot $\frac{1}{4}$ in. *inside* the border outline. This should be at the outside corresponding with Division 8 (Fig. 3). At a point corresponding with Division 7 (Fig. 3) make a dot $\frac{3}{8}$ in. *inside the border towards the soft part of the foot.* This pressure on the soft part of the foot does not mean at the bony part of the tread but just behind it.

In cases where it is thought that it would be an improvement to combine two forms to get a better-looking shoe, this can be done with safety if one makes sure that the draft being worked to does not cramp the toe-ends at the "mid-joint," that is, about Division 10 (Fig. 3). We find that this line in some feet is only a division and a half from the toe-end (12). However, wherever it is, bring it in the area of the rectangle, except at one point, that is, at Division 10 (Fig. 3), where it should be a full $\frac{1}{8}$ in. (for ordinary height of heel) *outside* the rectangle so as to allow of the toes in action spreading to the outside. This is allowed for in constructing the shape of the toe. (See Fig. 29.)

In a heavier customer the tread and seat would spread more, especially the seat, which is very concave and spreads when on a fiat surface. Therefore a greater deduction from the seat and tread width can be made for this class of foot. In fact, if the seat of the last is made very concave it will look narrower and be less likely to run over. This spread of the seat is very deceptive when the draft is taken standing with the weight on. The waist always appears to be flatter when without a heel, and generally the outline is longer

and a greater reduction has to be made in constructing the rectangle. The "weight on" border outline taken with the customer standing on the measure book or draft sheet sometimes varies in the same customer, since he is apt to exert more pressure than is needed, to enable us to get the correct border and plan. However, it is just a matter of taking less deduction from the "weight off" draft than the "weight on" draft. In the opinion of the Author "weight off" is the better method. In the first place we get the true outline of the foot in repose and no undue pressure anywhere when the customer is seated. Secondly, if we take three separate border outlines of the customer they will be alike, and it is easier to note the inside waist and mark it. Finally, in taking the girth measure to the indication lines on the draft, it is easy to slip the measure under the foot at the points required.

Fig. 31 shows two of a set of rectangles of nine different widths from 2's to 11's, but all $12\frac{1}{4}$ in. long, each with a central line. The reason they are all $12\frac{1}{4}$ in. long is because one often gets a long foot with a narrow seat or "mid-joint" line, or a short foot with a wide seat, for instance, a size 4's shoe with a $2\frac{3}{8}$ in. seat; then all one has to do is to choose the $2\frac{3}{8}$ in. width rectangle, and place it on the draft at the points marked. By marking the rectangle over the draft the toe line can be fixed as well as the seat. Also an indication of what form of last is needed can be obtained by measuring from the centre line to the inside joint (which is $\frac{1}{8}$ in. *within* the border line, and $\frac{1}{4}$ in. within the draft at the outside joint). This constitutes the width which the last should be, straight across the tread. Assume the tread required is 3 in. Then measure from the centre line to the inside joint point, and it will be found to be four-ninths of the measure. That will leave the other five-ninths for the outside. For easy calculation this

RECTANGLE TO PLACE ON BORDER LINES, TO PROVE WHAT FORM OF LAST IS MOST SUITABLE, BY THE EXCESS OF TREAD BEYOND RECTANGLE AT INSIDE AND OUTSIDE JOINT

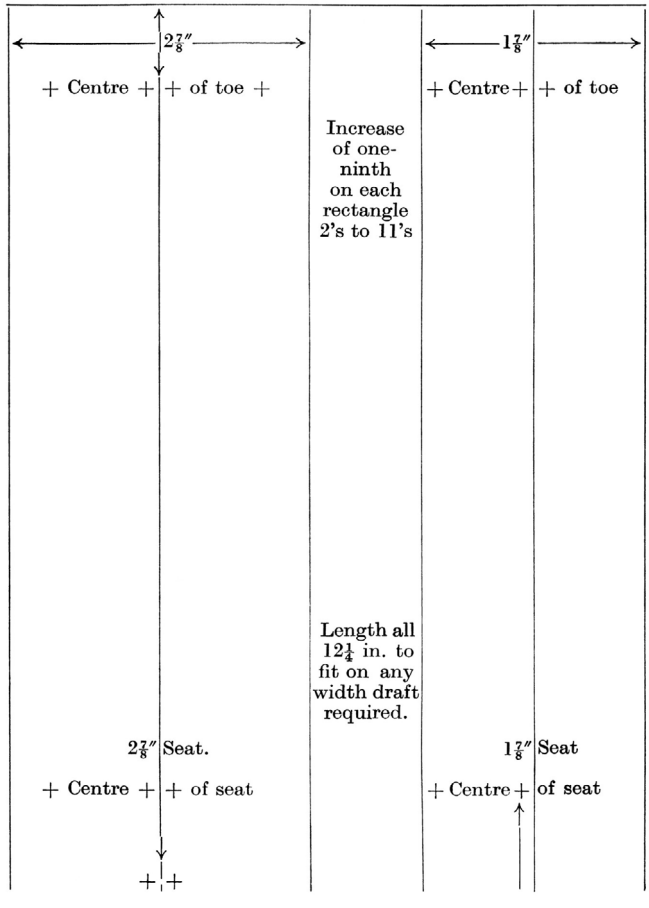

FIG. 31

would be four shoe sizes to the inside, and the width of five shoe sizes from the centre to the outside. Thus this foot needs the "improved form shape," i.e. the four- to five-ninth proportion of the tread. (See Fig. 30.)

In the improved method, as shown in Fig. 30, the proportion used from the centre of the rectangle to the inside joint is four-ninths of the whole width of the tread, the remaining five-ninths being put to the credit of the outside joint. *After* the deductions from the draft previously explained have been marked off by dots, the last is tried on the draft, and it should fall on these points. If the shoe is to have a heel, an average of $\frac{1}{8}$ in. outside the draft is added if taken with the weight off. This is put outside the draft about Division 10 (Fig. 3). It is important to add this for comfort, but it is often *overlooked* in fitting up lasts. Some fitters think they give room by adding a fitting at the wide part of the tread only. This really allows the tread to spread and the mid-joint gets more pressure by striking the outside toe, at Division 10. Only $\frac{1}{8}$ in. beyond the draft is needed.

The last must fall *on* these points, and the toe come out at the centre of the rectangle. If the last is narrow at any point, then add a fitting there, and an extension toe if needed. Remember that we are not producing a sole area for stock work, but for this special foot. Therefore we must not simply trust to judgment in placing the last on the draft, but work to a fixed principle that can be carried out by each and every fitter. Once this plan becomes familiar, it is simple and saves a lot of time, and more uniform results are obtained than by guess-work or independent judgment. As fitters up of bespoke lasts we give what has been proved to be the best plan of fitting up a last for special feet and making a shoe that will be comfortable, keep its shape in wear, and be more durable.

Examples of the Testing of Tread Proportions by the Seat Width

A rectangle will do for any shape required. Make the same deductions and allowances on the draft as before, place the seat rectangle on the draft, and mark it off as described before.

The "Meyer" shape is shown to be required by *all* the excess of the tread width over the seat width that is placed to the outside of the rectangle so as to form the outside joint and leave the large toe nearly straight. Therefore, if the draft shows the excess to be all on the outside, the Meyer form is needed though very few customers like it, as it sometimes cramps the mid-joint at the outside. What is called a modified Meyer suits some feet, and this will be found out by the rectangular lines.

The next plan is called the "Camper." This is just the opposite to the Meyer, i.e. the excess of the tread width over the seat width is equally divided and placed on each side of the rectangle. The seat width tester will again prove whether this shape is wanted to fit the draft, as the dots will be an equal distance each side of the rectangle. This shape fits into the draft of a foot with a bunion. Therefore it is *not* suitable for healthy, good-shaped feet, as the large toe would be in the wrong position. (See Figs. 32, 33, and 34.)

Fitting Lasts to Drafts (Border Outline) and Impressions

In a great many cases the draft or border outline is taken with the weight on, i.e., the customer stands with his full weight on the measuring sheet, giving the full spread of the tread with the seat flattened out. This method shows the length of extension of the foot, and can be compared with the size-stick length taken with the weight off, i.e. with the customer

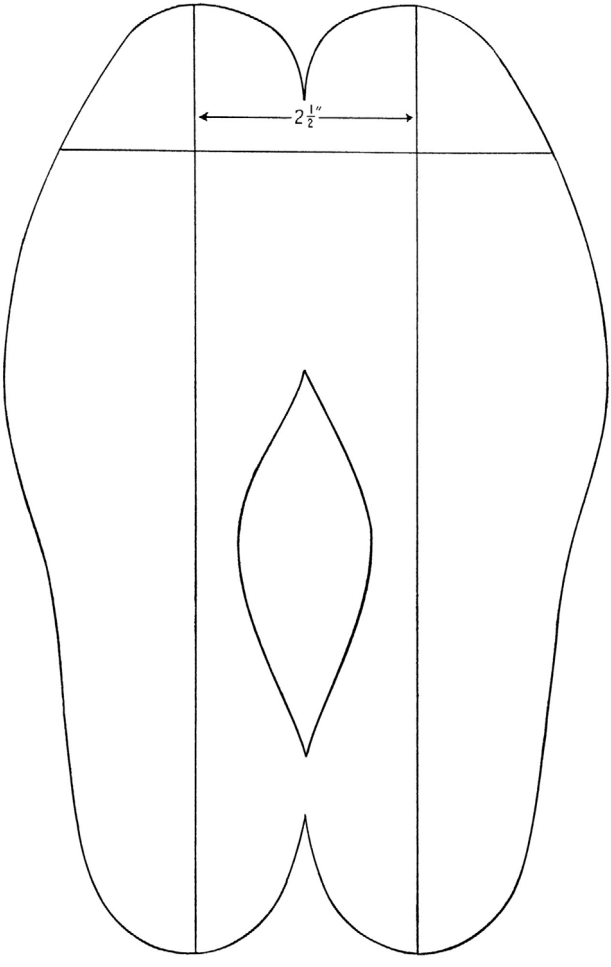

FIG. 32. MEYER 7'S

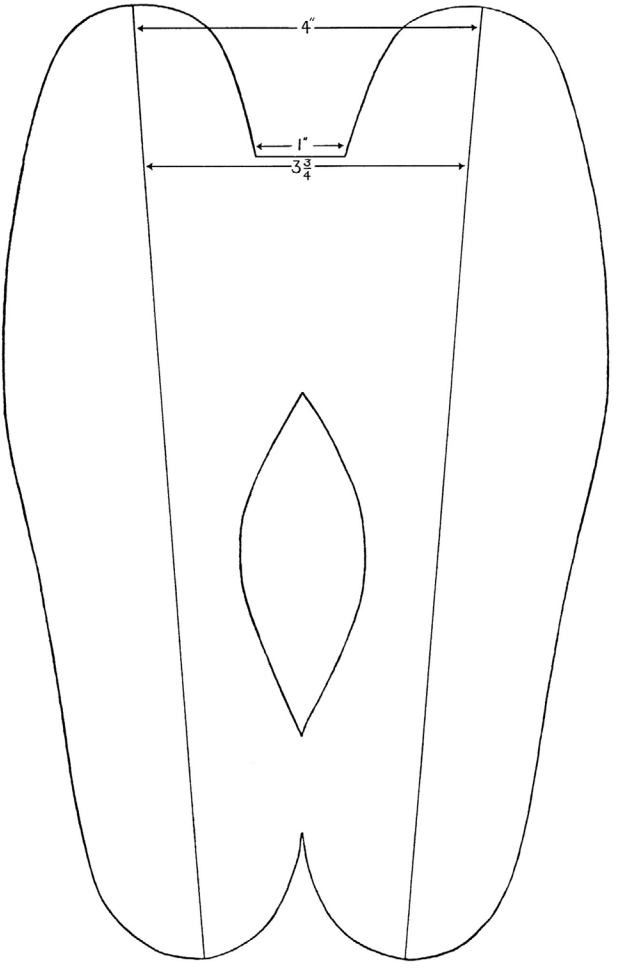

FIG. 33. CAMPER 7'S

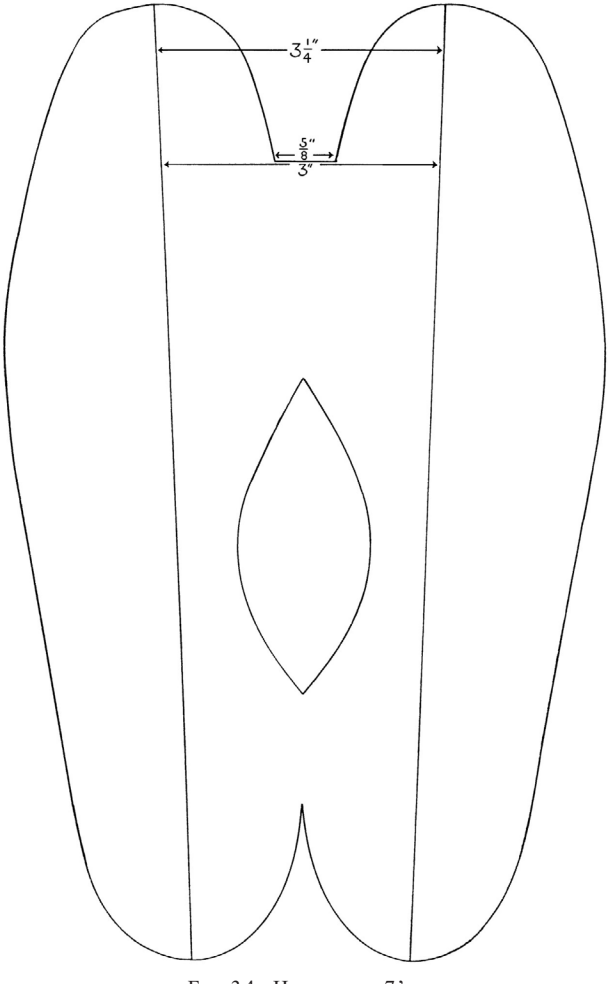

FIG. 34. HANNIBAL 7'S

sitting down. If an impression is also taken with the draft, it will show how much arched the foot is on the inside waist. The impression will also show the transverse arch across the tread. The ball (or roundness) of the seat and the tread will show on the impression by a dark patch, the greatest pressure being made on the plantar portion.

CHAPTER VI

LOCATION OF MEASUREMENTS OF FOOT AND LAST

In previous chapters we have touched upon the form, profile, length, and the border outline. It must be impressed upon the last fitter that form is more important than the actual girth measurements. A $\frac{1}{8}$ in. inaccuracy can be remedied after the shoe is made, but it is difficult to alter the form of the shoe when made, and it is therefore likely to be uncomfortable until it is "broken in"—and by then it may be "broken out," because of the undue strain placed upon the material and the workmanship.

This used to happen when all the fittings were piled on the top of the last instead of placing some to the width. The incorrect shape may be due to the toe not being in true relationship with the seat, thus causing it to run over at the heel or the tread. Sometimes a small "slit" used to be found in the upper leather because the sole was too narrow at the inside joint, and the continual pressure of the upper over the edge of the hard sole caused a fracture. Sometimes the workman was accused of "cutting" the upper. But with further provision against error in last fitting, this fracture has not occurred in bespoke shoes for many years. Therefore the location of the measurements of the foot to the last must be correct at the tread, seat, and mid-joint to ensure the "form" of the last being right.

As far as we can gather, the oldest method of taking girth measurements was to use a narrow strip of brown paper 18 in.. by 1 in. wide, tapered at the *bottom* edge.

This end was, however, *not* used. Measurements were taken from the vertical or square zero end called the top edge. With the square end in the left hand, the top edge was placed around the joint and a small nick torn in the top edge to indicate the girth. The instep was taken about midway the length of the foot, and a similar nick torn. The next measurement taken was termed the heel measure, about $1\frac{1}{2}$ in. above the instep position at about the centre of the curve of the throat, and another nick was made.

The next move was to turn the bottom edge to the top, and measure around the ankle (about $1\frac{1}{2}$ in. above the ankle joints), another nick being gently torn. The rest of the leg measures must all be taken on this bottom edge. The object of tearing a *small* nick was that in a smart foot the joint and ankle measurements were often the same and the paper might tear in half.

Where this method is still in use, copy into the order book these measurements in inches in case of loss. It is easier to measure the lasts in inches than with a paper strip.

One of the first actions of the last fitter should be to guess the weight and age of the customer and note if he has a bony or fleshy foot. Some feet are more compressible than others. The next point to find out is what the customer wants, i.e. his idea of a fit. One plan is to examine the shoe being worn and inquire if he likes that depth of vamp or other details. But the best way of obtaining the customer's opinion of close or normal fit, when taking the measure in the usual way, that is, at the ordinary tape tension, is to draw it $\frac{3}{8}$ in. tighter, and the customer will soon shout "Not tight, please."

Another method of measuring and location is to have two tapes fastened together at right angles. (See Section II, Vol. I, page 217, Fig. 21.)

The difficulty of applying the measurements to the last can be overcome by placing the size-stick at the back of the last and adjusting the movable upright to the length of the *foot.* Mark on the front of the last where the movable upright touches it. This position on the last gives the place where the girth was taken—no matter how many sizes have been added to the front of the last. If the foot is a 3's and the last is a 6's and 3's have been measured from the seat end of the last, this is the position to measure from when using the location tape.

The difference between drafts with "weight on" and "weight off" is simply that when deductions are made from the border line for the tread and the seat, less is taken in the case of the draft with the weight off than in that of the outline with the weight on.

CHAPTER VII

THE DIFFERENCE MADE BETWEEN THE FITTED LAST AND THE FOOT FOR DIFFERENT SORTS OF FOOTWEAR

MEN'S DRESS SHOE

ALTHOUGH a dress shoe *may* refer to a smart shoe used for *day* wear, the term is normally applied to an *evening* dress shoe. The type used for day wear is usually made of patent leather and cut as an Oxford shoe, but without a toe cap. It is made with a bevel sole or a very light square edge. As a rule it is worn over very thin or silk hose.

Therefore, in fitting up the last there are four points to be considered that affect the fit of the dimensions and the shape of the last, viz. (1) patent leather; (2) no cap; (3) light sole; (4) substance of sock worn. It seems almost needless to point out the influence that thin and thick hose have on the fit of the shoe. In the same way that thicker stockings are allowed for in golf shoes, so we allow for thin socks in evening shoes.

1. The leather used for the outsides is the most important factor to be considered, especially when dealing with the old style of patent calf, which was not "elastic." The measure of the last should be smaller for patent than for a waxed calf shoe. The calf leather is more yielding, and can be lasted tighter to the last, and as it retains more contracting reserve than does patent leather, it gives more when taken from the last. Good patent calf leather is close in the grain, firm though pliable, and has very little stretch. It bends with the grain and is not brittle, hence the last must be smaller or the shoe will be bound to crease and

eventually crack. The patent sides used largely to-day have different properties from patent calf.

The foregoing cannot be said to apply to all patent leather now in use, because the "patent colt" has a lot of stretch left in it and contracts after the last is withdrawn. The linings of drill, therefore, form creases, and if the wearer uses thin socks the creases cut the foot. To obviate this, russet linings of a similar nature to the colt are used.

2. When there is "no cap," a more receding toe can be made and not so much thickness is needed as where there is a cap and a stiff toe. The latter type when used for dancing causes the toe-end to drop in.

3. The thin sole used for a dress shoe means "flexibility," and we thus know that the last can be made with a flatter bottom or with less toe spring, as the large toe has the power to clear the fold after the foot is flexed. The thin sole gives it the neat "pump" appearance that so many people like in an "evening dress shoe."

Evening Dress Shoe

An evening dress shoe is used for dancing, etc. It is made of thin patent leather, and is worn over a silk sock. In the olden days it had scarcely any puff, which was a very comfortable style. Nowadays it has a good puff, the same as is put in "pumps." The demand is for very little toe spring or a rather "dead" forepart.

Now taking all these points into consideration the conclusion we arrive at is that a greater reduction can be made from the original measurement than for a strong boot or shoe. Also with a softer puff the shoe can be worn a little shorter and be made with a receding toe, after the style of a pump last. In fact, a pump last is often used for dress shoes to make them cling to the sock, and the thicker sole used (double) will carry the

higher heel. Since the sides of the last are thinner for the court shoe, the quarters cling to the sides of the heel, if the instep is in the right position.

In these days of motoring, a *semi-dress shoe* a little more substantial than an evening dress shoe is required for day and evening wear. The semi-dress shoe is made of patent leather (or even enamel hide) and is quite plain, with a straight cap having two rows of stitching at the edge and *no* punching. This shoe answers very well for general wear, and although not really a shoe for dancing, it is often so used.

For shoes with patent *straight* caps, make sure that the last does not recede too much at the outside edge at the corner of the cap, and that it is a "non-twisted" shape. The heat of the feet affects the patent, and the extra pressure on a twisted shape causes a little open work or breaking out near the cap. As a precaution insert a good side lining that is carried well under the puff.

From the foregoing it will be seen that it is necessary to make a patent dress shoe a very neat fit, and yet quite comfortable in case the feet swell, as they are apt to do in an enamelled leather shoe. Moreover, it must be free from wrinkles that would be liable to crack when the wearer comes out of a warm dance room into cold frosty air.

Many consider that a good British glace kid is more comfortable, and more durable, for a dress shoe than patent, and after being cleaned a few times it is very bright and does not show lines or cracks at the creases during wear. As it is flexible it can be made as close a fit as a semi-dress shoe with a cap.

As the semi-dress shoe is made with a toe cap and firm puff it is advisable to put a $\frac{1}{8}$ in. joint leather on the last right down to the end of the toe, as the toe recedes too much for wear with cashmere hose. Use an

Oxford shoe last that has a proper instep measure instead of the thin sided court shoe last which was suitable for an evening dress shoe.

For firm box calf leather, put a thin seam piece at the edge of the vamp and tongue and wherever there is less flexibility, as this prevents it cutting into the foot a little, and throwing creases below the tight position.

Golf Shoe

This is now a very wide term. Originally it meant a fully brogued shoe with a wing laid on the vamp. The wing was about 3 in. deep in the front, according to the size of the shoe. It was carried round the sides of the foot and made about 1 in. deep, with a thistle design on the toe. There was a brogued counter around the back of the shoe. A lap-over fringed tongue was used to prevent the heather or stubble cutting the laces or pulling them undone. This shoe was made in brown grain hide in preference to smooth brown calf, which easily shows any scratch marks.

The first thing to notice is what thickness of stocking is to be worn, as some thick ones increase the girth $\frac{1}{4}$ in. Measure over the sock if possible. If it is not convenient to do so, add $\frac{1}{4}$ in. shover. (Fig. 18.) This is a fitting from the toe to the comb, and is cut from $\frac{1}{8}$ in. substance shoulder. When spread over the last it makes $\frac{1}{4}$ in. increase in the girth all over. The next point is that the thickness of the sock at the toe and the heel makes the foot measure longer. It is risky to add a heel pin and alter the point of contact of the tread. Usually the addition of a toe pin to come down to Division 9 (Fig. 3) on each side will give the needed room for the large toe, which does not incline so much towards the centre of the foot when the shoe is made with a low heel. The sole is $\frac{1}{2}$ in. thick at the tread. This raises the toe

up, and so makes the heel *feel* lower. The toe being raised is an advantage when going over rough ground.

Wherever there is extra stitching in a shoe there is less flexibility. This shoe, as stated, has a wing about 1 in. deep at the sides, just running along the knuckles of the toes and so likely to press on the toes, unless the last is thick enough at that part. To prevent this, add a *ridge* or *knuckle piece,* cut to the size of the pattern shown in Fig. 35. Half the fitting is put on the top edge of the last vertically instead of receding, and the other half is put to hang over to the "feather"edge of the last. In making this shoe it is wiser to make a "stunt" feather in the insole as then the wing sits better.

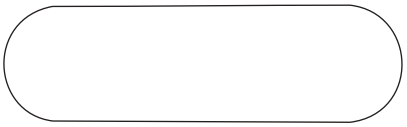

FIG. 35. KNUCKLE OR RIDGE PIECE

Sometimes a thin outside joint fitting is useful, cut from Division 11 to Division 8 (Fig. 3), because when driving off, the foot is sometimes raised. The outside quarter of the upper should be cut low enough to come below the outside "ankle," as it is very painful for the ankle to press upon the edge of a thick shoe quarter.

When taking the measure of the foot, measure the height of the ankle from the base.

As already stated, the term "golf shoe" is now a very wide one, and this is particularly true as far as the design of the upper is concerned, a great variety of styles prevailing. The Derby cut of shoe is favoured by Americans, but, unlike the usual Derby, the shoe is made without any cap or wing. One advantage of this is that at the mid-joint line (Division 10, Fig. 2) there is not so much pressure, because there is less stitching and therefore more flexibility. Another

advantage is that a bellows tongue can be let in under the tab to keep out the wet and dust. Take notice here of the term *tab,* as the Derby shoe is cut quarter-over the vamp and the tab, forming two lappets about $1\frac{1}{4}$ in. wide, i.e. $2\frac{1}{2}$ in. across the total width, with three rows of stitching. This makes for less flexibility on the foot from the joint upwards. To prevent pressure at these points a $\frac{1}{8}$ in. substance fitting made to the shape of the pattern (Fig. 36) is used. To make this pattern so that it will be three divisions wide by two divisions deep when opened out, first fold a piece of paper, and for the length mark along the folded edge the width of two divisions of the last as shown in Fig. 3, and from the folded edge mark off one division and a half for the width. Make a rectangle with these widths, i.e. two divisions deep and one and a hall divisions wide. (For divisions see Fig. 2.)

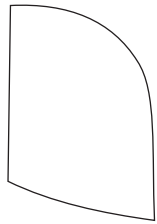

FIG. 36. PIECE FOR DERBY OR PADDOCK

From the folded edge make a round sweep, then open out, and the result will be as in Fig. 22. Place it on the last at the position the lappets of the upper touch on the last. After the leather is cut out to this pattern, skive it thinly in the front right down to the grain. The other part that comes where the stitching is situated can be skived with a narrow skive.

As this fitting comes to the top edge of the tab it will allow for any contraction that may take place when the last is withdrawn. Another reason why this fitting is desirable is that if the shoe should be tight at this position, the foot is likely to push the vamp forward and so form creases.

Men who believe in real comfort and very little pressure from the extra stitching decide in favour of a

plain Oxford, shoe design of upper, with the usual sole and heel, but a few have shoes without caps.

Ghillie shoes are used for smartest wear. This style of shoe is made with three or four straps that are left wide apart on the last when making. The laces form the fancy crossing. If this shoe is made with a wing it needs a last with the ridge piece and the thin seam piece attached and fitted according to the stockings to be worn. The shoe waist piece (Fig. 12) should be fitted at the root of the fifth metatarsal. (See Divisions 5 and 6 in Fig. 3.)

Derby Designs

Let us now consider one of the designs of open-tab boots, called the Derby, Paddock, or open-tab or lappets with bellows tongue, that are much in vogue.

In fitting up a last for this class of boot or shoe, extra comfort will be ensured and the appearance will be enhanced by the use of the tab piece fitting (Fig. 22), and the shoe waist piece (Fig. 12). The thickest part of the latter is at the part of the last just where the seam of the wing of the vamp occurs, that is, at the root of the fifth metatarsal (and when this is prominent the pressure on it is uncomfortable, until the boot is "broken in"). Therefore, the last must not be too narrow in the waist for a Derby boot.

There is another lot of stitching and stiffness to be considered at the seam of the quarter to the vamp. This rigidity occurs at 'the rise of the instep, and it is best to give a little extra room both for freedom of entrance and the extra comfort of the wearer.

Seam Piece

The stitching and binding on a patent court shoe sometimes cut the foot unless a seam piece is put on the last at the thickness above the inside joint.

Ski-ing Boot

To fit up for a ski-ing boot bear in mind that very thick hose is worn, a pair on each foot, and some of the amateurs wear thick goat-hair socks in addition. All this must be allowed for, and anything from $\frac{3}{4}$ in. Over the measure is required. There must be perfect freedom of the toes for doing the big jumps, and there must be no pressure on the end of the large toe; therefore the end of the last is made nearly vertical and over an inch thick. Some idea of the amount required can be obtained by putting two worsted socks right over an ordinary last and then measuring the difference. The socks also widen the seat as well as increasing the length and thickening the toe.

If ski boots are made to order, the customer will give the thickness of socks worn by him when ski-ing. The last selected is what is termed a "thick dead last" with very little pitch, as the heel is very low and broad—not simply dead square all round, but actually curving outwards at the top-piece.

Like the skating boot, ski boots should be made to give strong support to the inside arch of the foot and not rub in the heel. Another factor that must be borne in mind in fitting up the last is the thickness of the upper leather.

The last must not be bevelled under at the feather, as the best style of making for the ski boot is the handsewn "veldtschoen," which is certainly better than the welted boot (unless it is made with quite a stunt feather). The forepart being sewn all the way round (the same as a sewn seat) and with no welt, the upper is not trimmed off, but is beaten or turned up and forms the welt. This forms a kind of spouting or gutter all round that prevents the snow that may have accumulated on the "welt" from entering the seam.

The design of upper used for the ski boot was made

familiar to us during the Great War by the imitation Norwegian boots worn by officers, though these were not altogether as suitable for trench work as for ski-ing. In fact, some wearers said that at the inlet the centre dropped and formed a kind of "saucer," allowing the water to enter the boot if it had not a good flat seam. To obviate this, some had a seam made in the centre of the end of the toe—a bad imitation. Some of the lower-priced shoes, instead of having an "inlet," had a "lapped-on piece," but that would not have answered for ski-ing, because putting the foot into the framework of the skis would have lifted the "lap on" and it would have come undone at the end and been an "inlet" for damp. This is one reason why toe caps are not used for ski boots.

Skating Boot

The description we are giving of the skating boot does not refer to boots for *roller* skating.

In these days of real ice skating rinks, there is a great demand for special boots, and this has led to a great many orders from experts and instructors.

The first question the measurer should ask the customer is what sort of hose is likely to be worn, and the answer may very well be to the effect that thin ones will be used for the rinks at home, and thick ones for, say, Switzerland. In these circumstances, the problem is to make the boots correct for both substances of stockings. Since an ordinary thick stocking increases the measurement $\frac{1}{4}$ in., we must increase the last $\frac{1}{4}$ in. by using a $\frac{1}{8}$ in. substance "shover" which spreads all over the upper surface of the last from the top of the toe to the comb. This fitting increases the girth of the last $\frac{1}{4}$ in. at the joint and instep—large enough for the thick stocking, but too large for the thin stocking.

To make the boot fit when thin hose is worn, we *decrease,* the girth *inside* the boot by choosing a $\frac{1}{8}$ in. substance bark-tanned shoulder and cutting out a pair of insoles to the size of the lasts. We then block them to the lasts, and round them up true to the shape of the lasts. After drying, they are inserted in the boots and thus *decrease* the inside of the boots by $\frac{1}{4}$ in. making them suitable for thin stockings.

For this kind of boot take a snug lower instep measurement between the joint and the instep proper. Take the long-heel measurement from the same spot as the instep around the extreme base of the heel, as this is a part that needs to fit snugly around the foot to keep it back and from riding up and down. Some may say it is possible to fit close around the throat or heel proper, but to have pressure on the throat is not comfortable, because the foot is thickened at this part. The shape of the back of the last and the thinness at the sides provide the best grip for the heel and a snug fit behind the inside joint under the arch at the first instep. Do not have too much curvature in the last at the outside waist as the heel is low.

The rigid sole plate of the skate plays an important part in the fit of the boot. As the toes cannot be flexed freedom is required on the knuckles and at the end of the large toe, since customers will not have a long boot to hinder them mounting on the toe-end. An important point is the pitch of the skate, that is, what height of heel the skate is made to carry. Some makes are designed for a $\frac{3}{4}$ in. heel, and the forepart of the last must be fiat enough to fit the plate. Other skates are made for an inch heel, and if a boot is made with a $\frac{3}{4}$ in. heel such a skate fixed to it would double the boot. If possible, reference should be made to the skate and the heel built to fit the sole and heel plate.

The heel must be quite straight and the pitch true. The seats should be sewn and stitched to prevent the boot breaking away at the seat with the strain. When they are hand-sewn, good plump insoles and soles thick enough to carry the plate screws should be used. The tongue of the boot should be lined with $\frac{1}{4}$ in. felt.

Tennis Shoe

When fitting up for lawn tennis shoes, we have to make a last suitable for a shoe *without* a heel—although it may be made with a "wedge" or spring heel, as long as the sole is kept flat enough to prevent indentations being made in the lawn. This means that the last must be made practically without any pitch and with only the slightest curve in the waist. A soft rubber sole would press down if a curved waist were made, the quarters would "gape," and the shoe would not "clip in the heel" to the extent that it should do for a game where there is so much running about.

It is better to keep lasts suitable for this kind of shoe than to alter the lasts that are kept for ordinary boots and shoes. A last for a tennis shoe should have a long forepart with spring, but without pitch, and should possess more back shape. In the case of men's lasts, it is easy to alter them, and this applies also to ladies' $1\frac{1}{4}$ in. military heel lasts. To alter such lasts a waist piece is put on. Cut a pattern that extends from the outside joint to the seat, making it five divisions of Fig. 3. The width should come 1 in. above the "feather "or the outer edge of the outside waist. It should extend across the waist until it reaches about $1\frac{3}{8}$ in. up the inner arch of the last. Then cut the $\frac{1}{8}$ in. Substance leather to this pattern and skive it all round, making a very gradual skive near the tread. Before fitting it on the last, put a thin piece in the curve of the outside waist, and place the waist fitting over it. It will then

be found that the $\frac{5}{16}$ in. curve has been reduced to $\frac{1}{8}$ in. This will allow for a $\frac{1}{2}$ in. or a $\frac{3}{8}$ in. heel. But measure the instep *before* putting on this fitting, and again *after* putting on the fitting. Whatever difference there is, the shoe must be left open that amount when making.

If called upon to fit up for a tennis shoe with a heel, called a croquet shoe, the pitch of the last need not be altered if the heel is to be the same height as for walking shoes.

Slippers and Court Shoe "Pumps"

The same fitting in the waist as that used for tennis shoes is required for a slipper without heels, or even for a top-piece heel, so as to prevent the weight of the foot pressing down the quarters of the slipper. The same sort of fitting in a smaller degree is required for the court shoe "pump" taking a $\frac{5}{8}$ in. heel.

We are here speaking of fitting up bespoke lasts of a special shape which are kept for each customer, and which have to be used for all their orders. It is better, however, to select lasts that can be fitted up to customers' special measurements. For instance, a "pump" last should be thin at the sides of the quarters and full at the seam of the vamp, so as to clip at the heel but yet not cut the foot at the vamp seam. It is often possible, however, to convert men's lasts for these different kinds of footwear, for the simple reason that they do not vary much in the height of heels and "form." In the case of ladies' bespoke lasts it often happens that they have different heights of heels, making it necessary to alter the pitch to suit the different kinds of shoe. The pitch affects the amount of curve provided *under* the waist. Test this by placing the last upside down in the size-stick and make sure that the most curved part of the waist is one-fourth of

the height of the heel that is to be made, that is to say, a 2 in. heel should have a $\frac{1}{2}$ in. curve.

The Louis XV "range" of heel length is often $\frac{1}{2}$ in. or more longer than a military heel, and must be allowed for to prevent the heel standing on the *breast.*

The amount of curve given for the waist should be applied with caution when fitting up lasts for ladies' court shoes. Make it a rule to bring the point of contact at the tread more gradually under the waist. If the foot has a prominent root of the fifth metatarsal, this must be allowed for to prevent the foot pressing the quarters out—which will occur even when the sides of the lasts are made thin, if the foundation is not correct. There is not a leg portion to the shoe as in a boot to brace up the foot or to prevent the foot going forward. The shape at the back is important and a fraction more should be taken off at the top than for an ordinary shoe. If an ordinary length of heel is wanted on a Louis XV last that has been made for a long heel, then the last can be made suitable.

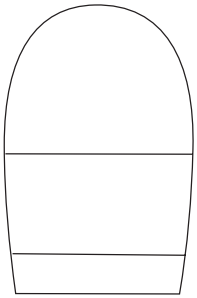

FIG. 37. HEEL COCK FOR S.R. WITH LOUIS XV CURVE

FITTING UP OF LAST AT SEATS FOR VARIOUS CONDITIONS

To convert a Louis XV last and make it suitable for a straight-breasted wood heel of the same height but with a shorter seat range, put a piece of leather under the curve where the breast of the heel touches the last so as to make it pitch true; otherwise, when the shoe comes from the maker it would stand on the back of the heel, but off the ground at the breast. Assume that the last is suitable for an ordinary heel, and that

we do not want to cut away the last underneath to make a curve. We can put what is called a "heel cock" (see Fig. 37) on the seat at the back. Make this two divisions long (refer to Fig. 3) and skive it thin at the front edge, but leave it the full substance at the back, until it carries the Louis XV heel. As a rule, it is best to stick the "heel cock" in the shoe when it is made. Be careful when fitting that it does not stick out too far at the back.

CHAPTER VIII

THE EFFECTS OF ADDED FITTINGS TO THE SHAPE AND MEASUREMENT OF LASTS

FIRST we will take the half-size full heel pin, with a substance of leather of $\frac{1}{8}$ in. (Division 0 to Division 3 in Fig. 3.) Just think what it does. This increases the width of the seat on both sides, and also increases the length of the last posteriorly, i.e. $\frac{1}{6}$ in. Longer. Moreover, it increases the heel girth if in a boot, and makes the long-heel measure larger.

In *some* cases the real error to guard against is that it alters the "line of contact" of the tread. If the shoe is too large at the long heel, the foot goes forward to find its proper bearing, and leaves the back part of the shoe, so that the foot is apt to ride up and down at the back, i.e. slip at the heel. Again, the *wide* part of the foot is pushed to the narrower part of the shoe, and may thus cause creases in the forepart if the last was correct in girth before the heel pin was added. Finally, if the waist is too long, a longitudinal crease will form behind the inside joint when the weight presses on the upper instead of resting on the sole, or it will cause pressure on the vamp seam and most likely cause the toe to turn up. As an illustration of this, one sometimes finds that a person with a thick, fat foot buys a long shoe because her proper length shoe is not wide enough, with the result that the waist is too long, the foot presses the waist down, and the toe turns up. In addition, the large toe is so far away from the end of the shoe that it has not the power to bring the end of the shoe down. The lesson to learn from this is to make sure that the "line of contact" for the

tread is correct and only to use a heel pin if the waist is wanted longer.

If the seat is not to be any wider, then make a semi-heel pin, that is, one that does not come right round to the heel-line but only round to the seat-line.

A $\frac{1}{8}$ in. substance heel pin is useful to put on a customer's usual last when it is used for making a shooting boot. If a thick shooting stocking or sock is to be worn, the substance of the stocking increases the length posteriorly as well as the front part.

When a toe pin is used for lengthening the forepart, select from leather $\frac{1}{6}$ in. substance for a $\frac{1}{2}$ size elongation. (For a $\frac{3}{4}$ size toe pin, use a leather substance of $\frac{1}{4}$ in.)

If the last is of the correct girth and width and all the customer wants is extra length, then what is needed is simply a toe pin. It may be that the foot requires a little more room inside and outside Divisions 9 and 10. (Fig. 3.) In this case make a toe pin from Division 10 at the inside toe and carry it round to Division 9 on the outside. This not only gives length but makes a less twisted shape, and there is not so much risk of being wrong as in lengthening Division 0 with a heel pin.

To test the position of the ball of the inside joint to see if the length of the waist is correct, place the "sectionizer" on the draft, and Division 8 should fall at the inside joint for the normal foot. Then place the sectionizer on the last, and it should fall at No. 8 if the waist is the right length. In any case, the last should be made correct for the draft.

Waist Fittings

Although waist fittings do not materially alter the *shape* of the last, the instep *measurement* is increased, which means that the instep must be made smaller if it was correct to begin with; otherwise the boot or

Oxford shoe must be left open when making. If, however, it is a narrow bar button shoe, it does not need making smaller, as a narrow bar *button* shoe fits tighter on the instep. The reason is that a narrow bar contracts a little when the last is removed, and the customer does not notice the pressure of a wide piece of material as much as a narrow piece—a piece of string cuts more than a wide piece of tape at the same tension. Moreover, the bar is usually placed about the top of the cuneiform or scaphoid bone, say at Division $6\frac{1}{2}$ of the last, so as to grip under the arch of the foot at the hollowest part.

We have said that the waist fitting does not materially alter the shape of the last, but it improves the fit of the boot or shoe, and there is less strain on the stitching of the vamp wing seam. At the present time some lasts are made with a little fullness on the outside waist; whether it is *enough* is left to the last fitter's judgment, and if he has a good border outline to work to for the boot on order he should be able to test this point. In some cases, what is often called a "little bone" on the outside waist causes the prominence. This prominent part is really the root of the fifth metatarsal bone, and is not usually visible in fat feet, although, of course, the bone is still there. It exerts a little pressure at Divisions 4 and 5 (Fig. 3), and therefore the thin outside waist piece is useful in helping to obtain a clip in the quarters of the shoe.

In the thin bony type of foot, the root of the fifth metatarsal can be *seen* and felt, and the waist piece must be nicely skived at Division 6, the full substance maintained at Divisions 4 and 5, and made thin at Division 3, not to increase the joint measure. In some cases of *very* thin feet where the toes appear to have been very much twisted and the root of the metatarsal sticks out so much that it presses out the

stiffener and. makes the quarters gape, a small piece of leather is added to the ordinary waist piece at Division 5.

The pattern of the waist piece given is narrow and thin at Division 3 end, because it must not increase the width of the seat, and where it is turned underneath the waist it must not upset the pitch of the heel, i.e. not go beyond Division 3. It will be noticed that the anterior end of this fitting is widest where it reaches to Division 7. This is because half the width of the fitting is to go under the waist at Division 7 at the outside joint to make the point of contact a little farther back, and with a little less curve in the waist. The gradual line prevents the weight of the foot pressing the shoe down.

This fitting slightly alters the curve profile of the waist. The alteration at the bottom portion of the last is where the boot or shoe becomes very much altered in shape after wear, if the waist is made too narrow or too much curved. (This can be seen when the shoe is sent back to be repaired.) The strange part is that people with flat-waisted feet often say that they can never get shoes arched enough or the instep high enough. That is generally because the seat and the waist are too narrow, and therefore the foot does not go right down into the shoe, and the instep does not therefore lace close enough. The best thing to do in cases like this is to make the waist flatter on the outside, and then it will fit up closer on the inside waist when the foot is down. When people say "Always too large in the heel," it is often that the seat is too narrow or twisted. Therefore this is a case of the fitting added altering the measurement, but not the shape or the contour of the last in the forepart.

Another waist fitting that does affect the *measurement* of the instep chiefly and also alters the *shape* of the

profile of the last, is the waist piece used for tennis shoes without heels, or with only a wedge heel. The waist piece goes right across the waist from Division 2 to Division 7 (Fig. 3), and is placed about one division up the outside waist of the last and thus increases the instep measurement. This has to be reduced on the last or the shoe be left unlaced by the amount required when making. In this case the pattern used for the upper must be cut accordingly. If the customer's own bespoke last is used it must not be cut away on the instep.

This same waist fitting is used for a slipper with a top-piece heel or a set-up seat. Otherwise the waist would break down when the weight of the foot carrying the weight of the body is brought down on the slipper.

A gent's court shoe (or pump) with a $\frac{5}{8}$ in. heel requires a modified form of this fitting as a waist piece, with the last made thinner at the sides so as to make the quarters clip in and not slip at the heel.

"Ridge" Piece (Fig. 35)

This is a fitting that does not alter the contour of the last and does not make much increase in the measurement. To make a pair in one piece, fold a piece of paper and make a rectangle four divisions in length and one division in width from the folded edge. This gives the shape and dimensions for one fitting, and when opened out for a pair. Skive the leather made to this shape all round. Each end must be pointed and skived the width of one division, and graduated neatly so as to be free from lumps or bumps of any sort that would show through the uppers of thin material at such a prominent part of the last.

On some feet the "knuckles" of the small toes stand up. This may be due to the shoe being too much twisted and cramping the toes up. In this cramped

position the muscles cannot function properly. The large toe is mainly for progression, and the small toes are for prehension or grip. Thus the "knuckles" stick up a little as the tips of the toes dip down. The flexing muscles cause the grip, and the extension muscles bring the toes back to their proper position, provided the contour of the last will allow it, and the edge of the last at the toes is not too thin or receding instead of nearly vertical. If the last is too receding, the ridge piece is useful when placed at Division 11 along the top edge of the last to Division 7, so that it partly hangs over and is partly on the top, making the edge nearly vertical. This allows for the thickness of the "knuckles" so as to give space for the flexing muscles to function. It should be noticed that unused muscles that are cramped eventually lose their power. If the extension muscles of the small toes do lose their power, then the toes do not flatten out and the "knuckles" become permanent.

This completes the description of the fittings for the outside of the last. The inside fittings follow.

Inside Joint

Let us take a "straight form" type of foot with a bold inside joint and a thick and round knuckle at the junction of the first metatarsal and the large toe, sometimes found in men, for example, in male dancers and heavy-weight footballers, but more frequently in women. In the case of ladies we find it in the large-boned feet and also where high heels are worn. This is partly accounted for by the fact that for every $\frac{1}{2}$ in. the foot is raised, the large toe-end travels towards the centre of the foot $\frac{1}{9}$ in., that is, in the case of a $1\frac{1}{2}$ in.heel, the toe-end goes inward $\frac{3}{9}$ in. Or $\frac{1}{3}$ in. The high Louis XV heel lasts are consequently made with a "straighter form" than those for a shoe without a heel.

The last must therefore not be too twisted on the outside at the mid-joint line at Division 10. (Fig. 2.)

The inside joint fitting is one that *does* alter the shape, the measurement, and the width of the tread. It also makes a roundness or thickness at the "round" head of the first metatarsal where it fits into the "cup" of the posterior end of the bone of the first phalanx, or large toe as it is usually called. The ball-and-socket formation of this joint (see Section XIII) is a splendid arrangement, which allows perfect freedom and support in progression or turning round. This long-suffering member of the bone family is very liable to be misplaced by "foot-clothiers." In some cases the side at Division 10 is pressed towards the centre of the foot, because the last is cut away too much at the mid-joint section. This also occurs if the shoe is fitted too short, so as not to allow of the elongation that should take place in walking. As a result the toe turns inwards because it cannot lengthen out, and thus forms a prominence on the side. A prominence is sometimes formed on top of this joint when the toe is pressed back at the end.

In both these cases an inside joint fitting is needed that will very much alter the shape and the measurement, and this will be described later when dealing with *enlarged* inside joints. The inside joint fitting which is now being described is for a type of foot with a bold inside joint (not enlarged).

When fittings are made fully long a more gradual outline is obtained, because of the gradual skive provided. As the inside joint is four divisions from Division 12, we must make the thickest and highest part of the fitting at that point, and graduate it up to the mid-joint (Division 10, Fig. 3), where the foot is not to be turned inwards, but the finish must be at Division 11 if the toe is not to be made wider.

The posterior end of the fitting must come gradually behind the inside joint Division 8, to allow for a graduated skive, yet not increase the lower instep measurement much, unless the foot requires it. The position of this fitting is one division from Division 12 to Division 7.

SHOVER

A "shover" is well known to experts, but to novices the name does not convey the original meaning. In past times lasts were made without sawn-down blocks, and with the instep measurement very small. Uppers were just pulled over at the toes, and then this fitting was pushed down or "shoved in," hence the term "shover." Sometimes two or three "shovers" were used if a larger fitting shoe was required, and perhaps this accounts for the origin of fittings being numbered as one fitting, two fitting, and so on.

The "shover" is a very useful fitting for block lasts when it is wished to increase the measurement of the upper part of the shoe from the toe to the instep and the comb, for example, when thick material or thick hose has to be provided for.

A light piece of shoulder of $\frac{1}{8}$ in. substance just makes the $\frac{1}{4}$ in. increase required all the way down the last. For a thinner shover $\frac{1}{16}$ in. substance makes $\frac{1}{8}$ in. increase.

Sometimes when fitting up the last chosen it may need a permanent shover to make the last up to the measurement required if it is to be kept for the special use of one customer only. This is a general rule in bespoke shops.

Stock shovers should be available in sets of all sizes, and marked with consecutive numbers so as to be registered in the order book.

To make sure that all the $\frac{1}{4}$ in. shovers are the same in substance, each pair of shovers could be put through a splitting machine adjusted to give $\frac{1}{8}$ in. before being fitted and skived.

The shover is made narrower at the outside instep, to allow the outside quarter to lie close into the last and the foot. It should be skived level all round, except at the end of the comb. If blocked to the last when the leather is mellow, it will then retain the shape, that is, the last retains the same profile, but there is an increase in the measurement.

Joint Leather

There are a great many feet that require joint leathers, but not an instep piece, i.e. there is a small rise from the joint to the instep. It is quite common for feet to measure the same on the instep as at the joint. In this case it often happens that the increase is needed in the uppers, and not in the side joint fittings. When a joint leather is needed, cut a pattern of six divisions in length for the outside of the foot and five divisions for the inside. Skive this fitting evenly all round, especially at the puff (Division 1, Fig. 3), making a wider skive to prevent the toe looking clumsy. Also make a long one-division skive at Division 5 to keep the measurement small at the waist. The increase is really needed at Division 8, i.e. at the vamp seam and along the knuckles of the toes—according to measure. Therefore the effect of the added fitting of a joint leather is to increase the measure by $\frac{1}{4}$ in. at the joint if $\frac{1}{8}$ in. substance leather is used, but it does not alter the form of the last.

Joint Leather and Waist

Sometimes in a foot of this type that needs a joint leather, the instep looks flatter because of the thickness of the joint. Although it is $\frac{5}{8}$ in. larger in measurement than the joint, the profile is of a low instep, but the outside waist is full at the root of the fifth metatarsal. If such is the case, then the outside waist piece is useful

if shoes are wanted. It is placed not beyond Division 3, so as not to interfere with the pitch of the heel, and should reach to Division 7 on the side of the last, and part be taken underneath so as to bring the tread location farther back. This makes for a better fit of the quarters, and where the outside ankle is prominent and situated low down, the quarters should be cut low enough to clear the ankle.

Instep Piece

We now come to another useful fitting, i.e. the full instep piece. Like the shover, it reaches to the top of the comb, and laps over the instep more to the inside than the outside, so as to give more room to the scaphoid and inner cuneiform bone—a rather sensitive part of the foot. It begins at $4\frac{1}{4}$ divisions from the toe, so that it does not increase the joint measure. Skive it at the anterior end, and skive gradually each side. Keep it the full substance at the comb and make a level gradual rise on to the instep to the top for a full instep. In this case, the foot is of a different type from that for which we have just made the joint leather, i.e. A foot with a small joint measure or a bony instep and a curved waisted, slim, symmetrically shaped foot with arched instep and small joint. "Short heel" is an apt description for it. In the case of this fitting we have added to the measurement and increased the profile, but not altered the form of the sole shape.

A further fitting is for a narrow bar shoe, to allow for the contraction and the narrow bar cutting the instep. This should be placed at the comb. Its length should be $3\frac{1}{2}$ divisions and its breadth 1 division. It should be skived all round the edge at the width of the division. Skive at the anterior end so as to make a gradual rise. The comb or posterior end should be the full substance.

CHAPTER XI

PROPORTIONAL SIZES OF THE FITTINGS– THEIR POSITION ON LASTS AND THE BONES OR THE JOINTS THEY COVER

COUPLING each fitting to the name of the bone to which it is nearest will be found to be a good "memory" aid, as it will enable students readily to call to mind the position and the name of each bone of the foot and the proportional size of the fitting according to the length of the foot in "elevenths," or according to the length of the last, which should be one-eleventh longer than the normal foot. The reason for making fittings' dimensions in twelfths is, as already stated, because fittings are made to the lasts.

As an example, suppose we call the heel pin "os calcis pin." We know by practice that the heel-line is three-twelfths the length of the last. We make the complete or full heel pin three-twelfths plus the amount required to go round the back of the last. This increases the length at the posterior bone and also increases the width of the seat. The semi-heel pin only reaches the seat-line, i.e. only two-twelfths plus round the back. This does not increase the width of the seat. The three-twelfths in length is a reminder that the height of the fitting is three-twelfths, being one-quarter the length of the last plus the required turnover at the top of the last, which prevents the fitting becoming loose at the top of the back of the last, and does away with the need of tacks at the back. Tacks might tear the linings when the uppers are pulled up and down, or if fabric shoes are being made inside out, they might be marked. If the heel pin or "os calcis pin" is drafted

properly, tacks are also unnecessary at the bottom of the lasts that might spoil the uppers when a damp stiffener is in.

As another illustration, take the paddock or tab piece, which would be called the "metatarsal" fitting. This tells us that the position is at the junction or articulation of the phalanx of the large toe, and reaches to the instep in height at six-twelfths from the toe. Taking the joints at four-twelfths from the toe, the length of the fitting is thus fixed as two-twelfths, and the spread or width of the fitting as three-twelfths when opened out, reckoning the widths of the lappets to be five-twenty-fourths, and one-twenty-fourth for the skive, as ease has to be given for the metatarsals. This gives us the proportional size, the position on the last, and the bones which the fitting covers.

The instep piece for bar shoes might be called the "cuneiform" piece, as it extends from where the last-named fitting finished, i.e. six-twelfths to eight-twelfths, plus the skive at the end and at the top. It goes above the scaphoid to the astragalus. Thus we get a fitting two-twelfths plus one-twenty-fourth in length and width, and placed at eleven-twenty-fourths from the toe up to the comb with a tendency of the fitting towards the inner cuneiform to the extent of three-twenty-fourths inside and one-twenty-fourth outside.This helps us to remember that we go from the toe-end of the phalanges to the metatarsals and cuneiforms, and then to the scaphoid and the astragalus. We have thus covered the inner side of the foot longitudinally, in position and proportion.

Another important fitting is the outside waist. This might be called the "cuboid" fitting, but it is really a little more than that, as it covers the cuboid and the articulation of the posterior end of the fifth metatarsal (called the root of the fifth metatarsal). Now to get the

proportional size of this fitting and the position on the lasts, let us refer back to the "os calcis pin" position that finished at the heel-line, i.e. three-twelfths from the back. We find that if we go forward another one-twelfth we reach the junction of os calcis and the cuboid. Another one-twelfth forward will bring us to the articulating point of the fifth metatarsal with the cuboid, and as it is this prominence we want to locate, the fitting can be constructed from these data. The position posteriorly will be three-twelfths (or at the heel-line), and the anterior end will be seven-twelfths from the back. Thus the fitting is four-twelfths in length, and by making it "egg shape," about five-twenty-fourths in front and three-twenty-fourths at the back, according to the style of the shoe. It can then be placed on the last so as not to interfere with the pitch of the heel, and yet with the wide part brought under to make the outside tread farther back.

The proportional size as applied to the toe pin, which can be described as a fitting to lengthen the forepart of the last, can be determined in the following way. As the forepart of the last is an oblique line from the inside joint to the outside joint, so the toe pin should be fixed on the last obliquely to keep the same proportion as originally, that is, the toe pin on the inside should be at two-twelfths from the end, and three- twelfths from the end on the outside. Thus the toe pin is five-twelfths plus the width of the toe. This helps us to remember the forepart position.

The extension toe pin is, of course, of equal length each side, and is for providing length only, which is described on page 208. (See Fig. 26.)

To produce sets of fitting patterns, it is essential to cut a model first. The greatest aid in the production of a good model is to sectionize the last in twelfths, as in Figs. 3 and 4, and to make the dimensions of the

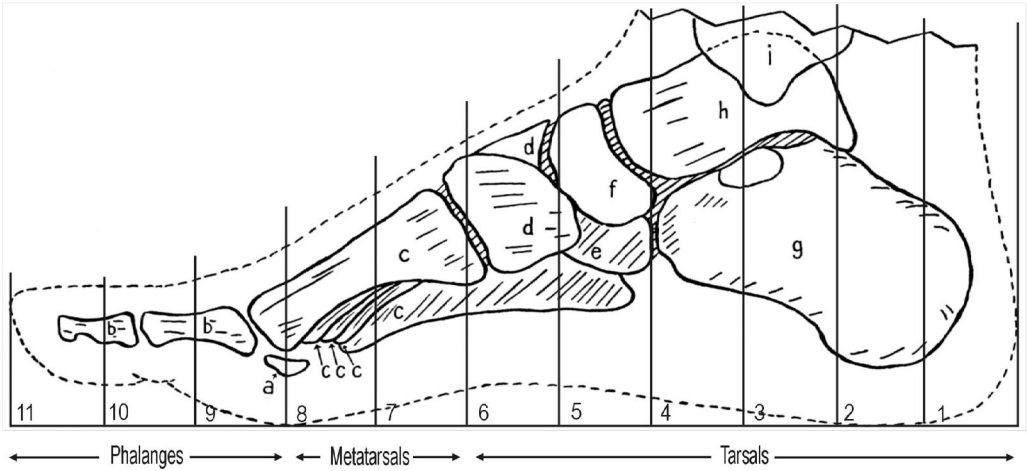

FIG. 38. RELATIVE POSITIONS OF THE BONES OF THE FOOT AS VIEWED FROM THE INSIDE OF THE RIGHT FOOT

(*a*) Sesamoid Bones (2)
(*b*) Phalanges (14)
(*c*) Metatarsals (5)
(*d*) Cuniform (3)
(*e*) Cuboid
(*f*) Scaphoid
(*g*) Os calcis
(*h*) Astragalus
(*i*) Tibia

fitting as a divisional proportion of the last. At the same time the location of the position on the last is

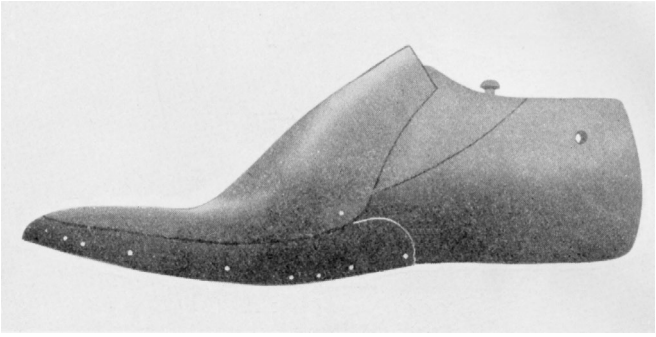

FIG. 39. LADIES' LEFT FOOT LAST FITTED UP
Outside View

FIG. 39*a*. LADIES LEFT FOOT LAST FITTED UP
Bottom View

determined, and this can be registered on the pattern to enable it to be fixed in the same place every time.

We now know the reason why each fitting is added to the last, and also the bone location of the foot. (Fig. 38 shows the articulation of each joint.) To retain as near as possible the same proportional

appearance of fittings for each of the different sizes we can make use of Fig. 2, which gives the lengths of a

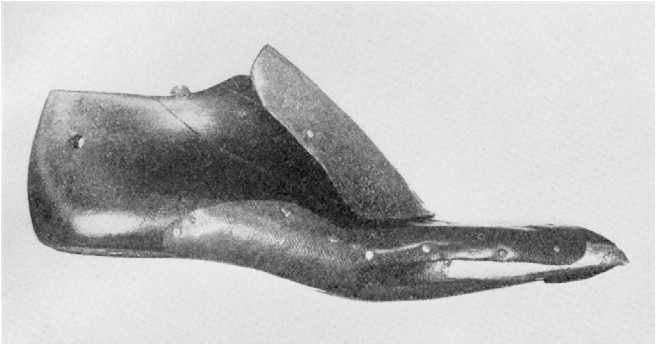

FIG. 40. OUTSIDE VIEW OF LADIES' RIGHT FOOT LAST WITH FITTINGS

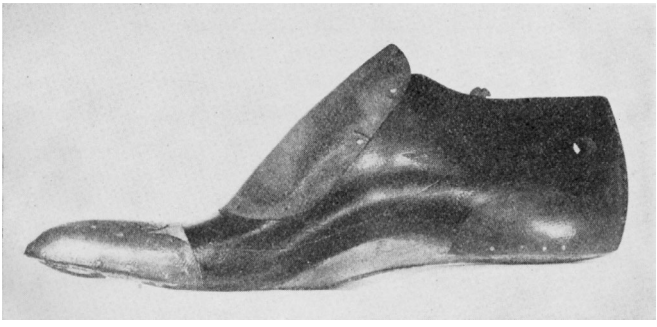

FIG.40*a*. INSIDE VIEW OF THE RIGHT LAST

division for each size of last required. If a fitting is, say, four divisions long on size 11's, it will be 4 in.; if for size 2's, it will be 3 in., and so on.

By making a model of a fitting for size 11's and for size 2's and laying them one over the other, we can

produce the other sizes required by dividing the spaces between into as any equal parts as we require sizes. In other words, we can use the comparative system of grading explained in Section I, Vol. 1.

In Fig. 39 is shown a photograph taken from the left foot of

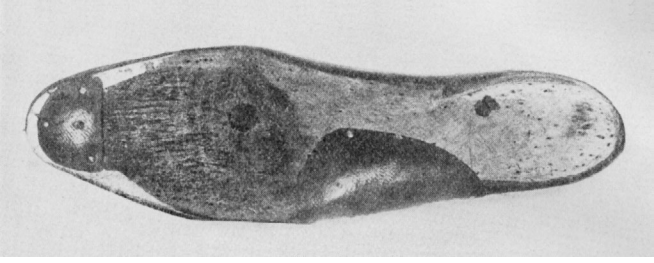

FIG. 40*b*. BOTTOM VIEW OF THE LAST SHOWN IN FIG. 40

a size 5's ladies' last, and Fig. 39*a* shows a toe pin, inside and outside joint piece, and heel cock.

This last has a shover, toe pin, full outside joint fitting and inside joint piece which have been affixed by the author to show how measurement can be increased without spoiling the shape. It will also show how, if the skiving is correctly done on the flesh side, the fitting blends into the contour of the last.

In Fig. 40 is shown the outside view of the right foot last fitted with a long instep piece, underneath toe piece for stiff large toe, nail piece) heel cock piece, and ridge piece. In the inside view of the last, Fig. 40*a*, are shown the ball piece, the heel pin, heel cock, and a nail piece on the top of the toe to allow for a thicker toe. The bottom view of the last, Fig. 40*b*, shows the outside waist fitting and the fitting for providing for ball piece, nail piece, and heel pin.

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