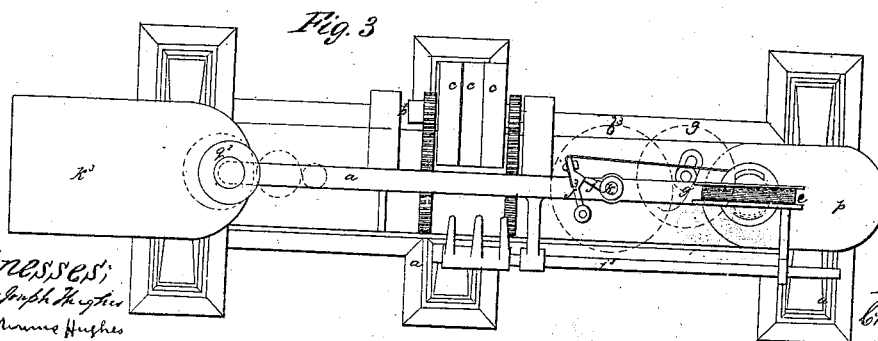
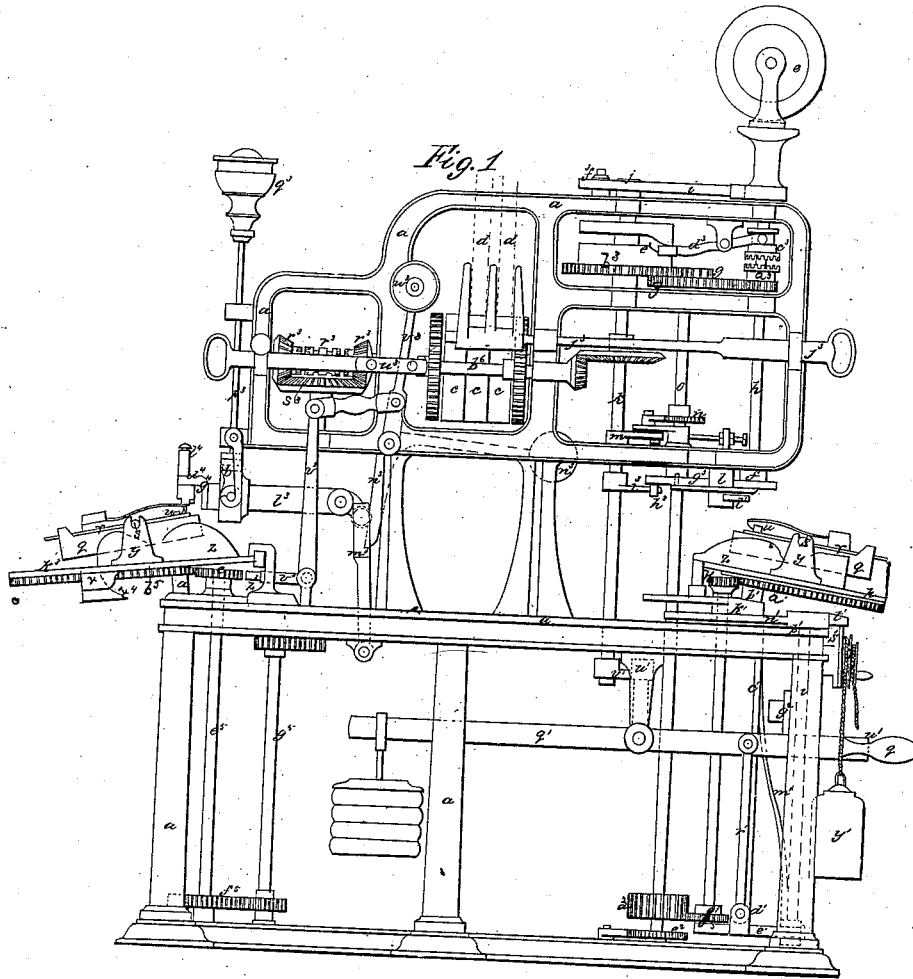


Southall & Heay, Making Shoe Soles,

N^o 52,802.

Patented Feb. 20, 1866.



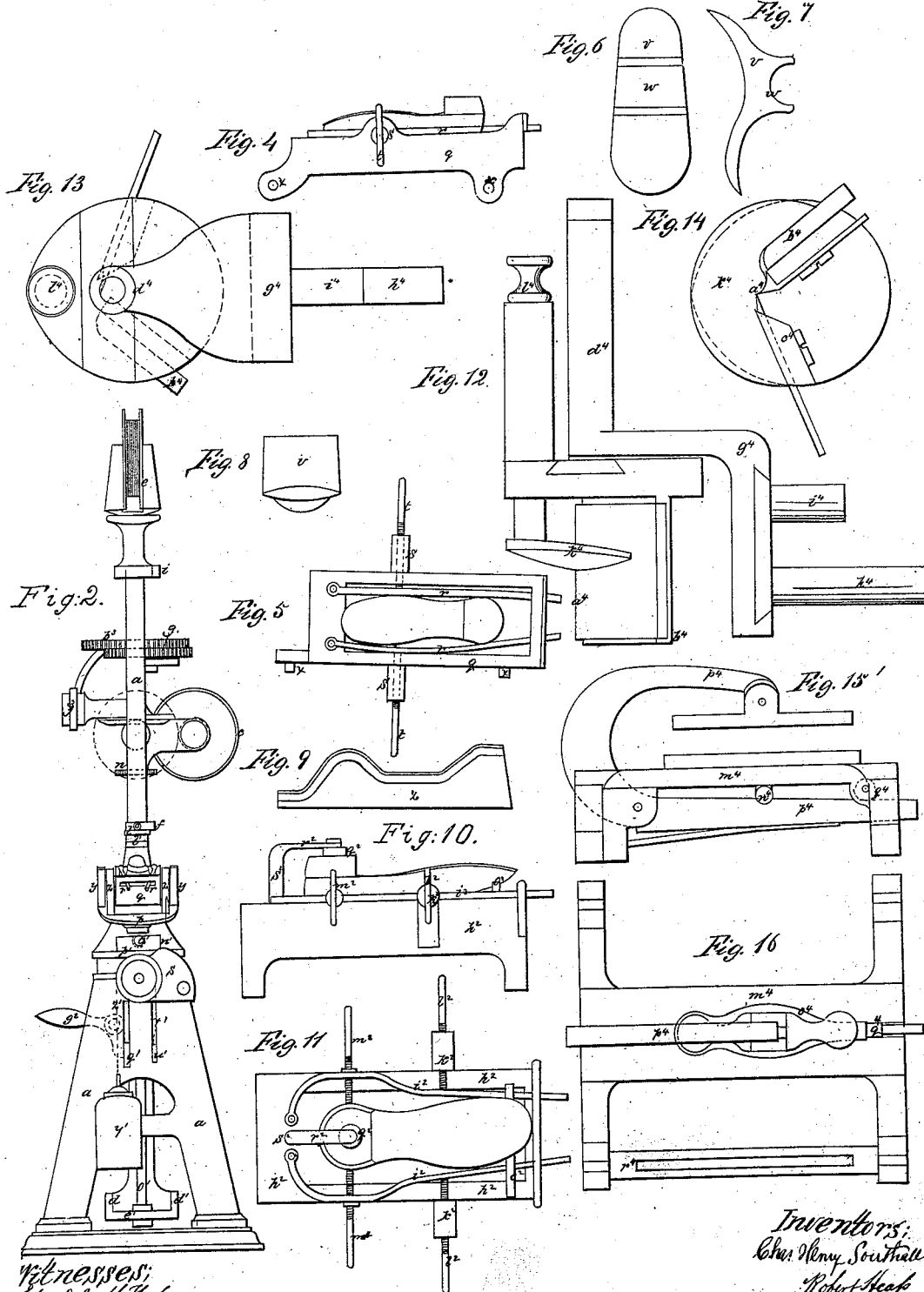
Witnesses:
Edward Joseph Hughes
William Hughes

Inventors:
Charles Southall
Robert Heay

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William H. Hughes

Inventors:
Chas. Henry Southall
Robert Heap

UNITED STATES PATENT OFFICE.

CHARLES HENRY SOUTHALL AND ROBERT HEAP, OF STALEYBRIDGE, ENGLAND.

IMPROVED MACHINE FOR MAKING BOOTS AND SHOES.

Specification forming part of Letters Patent No. 52,802, dated February 20, 1866.

To all whom it may concern:

Be it known that we, CHARLES HENRY SOUTHALL and ROBERT HEAP, of Staleybridge, in the county of Lancaster and Kingdom of England, have invented new and useful improvements in self-acting machinery or apparatus, worked by steam or other power, for cutting and shaping the soles and heels of boots and shoes and screwing them onto the uppers or coverings, and also in vises for holding the same and tools for paring, blacking, and glazing or otherwise ornamenting the edges of the soles and heels; and we do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

This invention relates to that description of boots and shoes in which the soles are fixed to the uppers or coverings by screws; and it consists in cutting the soles, making the screws, fixing the soles, and finishing their edges by means of self-acting machinery, so that a large number of boots or shoes can be made in a short time without employing skilled labor, and only requiring the ordinary wooden last without any plating, the several operations being performed either in one machine, or one machine employed for cutting the soles, another for screwing the soles and heels onto the uppers or coverings, and another for paring and finishing. As the screws are required to be of a greater length for the heels of the boot or shoe than for the soles, we begin by screwing on the soles at one of the sides, close to the heel part, and continue onward round the toe and the other side until we arrive again at the heel part, and this operation is performed for as many boots and shoes as required, after which the heels are screwed on, and then the soles and heels are pared and polished in the same machine or a similar one.

The manner in which our invention is to be performed will be clearly understood by referring to the figures and letters on the accompanying three sheets of drawings, in which—

Figure 1 is a side elevation of our improved self-acting machinery for cutting and shaping the soles and heels of boots and shoes and screwing them onto the uppers or coverings, and afterward paring and finishing their edges, all of which operations are performed in one ma-

chine. Fig. 2 is an end elevation, and Fig. 3 a plan of part of the same; and Figs. 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17 are detached views of various parts of our improvements.

In Figs. 1, 2, and 3, which are drawn to a scale of one and a half inch to the foot, *a* represents the frame-work of the machine, *b* the driving-shaft, *c* the driving and loose pulleys, and *d* the driving-straps. The screws for fastening the soles and heels to the uppers or coverings are made from a coil of wire placed on the drum *e* at the top of the machine, and afterward screwed by cutters or dies in the holder *f*, and forced into the sole of the boot or shoe without any hole having been previously made, the length of the screws being regulated by means of change-wheels *g*. When the screw has penetrated the intended distance the hollow spindle *h* containing the wire is made to stop by a check strap or brake, *i*, worked by a cam or lever, *j*, fixed to the top of the vertical shaft *k*, which is turned by means of bevel wheels and gearing from the driving-shaft *b*, while a pair of self-acting shears, *l*, cuts the screw and allows the boot to be moved by another cam, *m*, on the shaft *k*, working a ratchet-wheel, *n*, on the shaft *o* one tooth or more, as desired, which ratchet-wheel, by means of intermediate gearing, gives motion to the table *p*, on which the boot is placed.

In making boots or shoes with our machine the first and principal thing is the holding of the boot firmly. For this purpose we use two peculiar vises, one for the sole part and the other for the heel part. The vise for holding the boot or shoe when the sole part has been screwed on is shown in Figs. 1, 2, 4, and 5, the two figures, 4 and 5, being drawn to a scale of three inches to the foot. The said vise consists of an oblong iron box or frame, *q*, with square ends, and made rather longer than the largest-sized boot and rather wider than the broadest and about two inches deep. Parallel with the sides of this box are two levers, *r*, formed of round smooth rods, one end of each of which works on a fulcrum fixed to one end of the box, and the opposite ends of the said levers work in a slot in the other end of the box for the purpose of keeping them steady. At or about the center of each side of the box there is an axis or trunnion, *s*, which

enables the box to swivel up and down when in work, and through these axes are placed the screws *t*, which are in contact with and press up the aforesaid levers. At one end of the box there is a bed, *u*, for receiving the toe of the boot or shoe, and on the aforesaid levers there are clips *v*, made of brass or any other suitable material, between which the boot is placed, which clips have bosses with entire holes or have half-bosses with semicircular cavities. These latter clips are of various sizes, and different views of one drawn about full size are shown in Figs. 6, 7, and 8. That part of the clip which is in contact with the smooth levers *r* is curved in two directions, as at *w*, so that it may have a universal action and allow the nose of the said clip to bed freely against the boot, and the bed *u* is so placed that the toe is central with the center of the stud, on which the table and rack revolve. At the sides of the box are placed small rollers *x*, for purposes hereinafter described. The boot being held in this vise securely, the vise is then placed with its axes resting on two bearings or brackets, *y*, Figs. 1 and 2, fixed on the table *p*, which table is oblong in shape with circular ends, and with a slot down the middle sufficiently long to accommodate the largest-sized boot. This slot is beveled on the under side and rests on a corresponding beveled slide, in the center of which is placed a boss bored as in an ordinary wheel. On the top of the slide *p*, and screwed fast to the slide, there are plates *z*, Figs. 1, 2, and 9, having in them curved or cam-shaped grooves, in which the before-mentioned rollers *x* at the sides of the vise or box work, whereby the boot is made to rise and fall to suit its different curves, and thereby present a proper surface to the screws, shears, and finishing-tools. An enlarged view of one of the grooved plates is shown in Fig. 9; but the plates and grooves are of different dimensions, adapted to boots and shoes of different sizes and shapes, and both plates on the table may have the same form of grooves and have all the four rollers *x* working in them, or one plate at one side may have a groove adapted for men's boots and shoes, and the other plate a groove for women's boots and shoes, and then two of the rollers *x* would work in the groove of the plate in use and the other rollers would have to be removed. Underneath the table *p* is fixed a rack, *a'*, Fig. 1, round at one end and straight at the sides, but only the length of the largest-sized boot and the breadth of an average-sized one, and by being so arranged it is suitable for all sizes and sorts of boots or shoes. To suit the irregularities of the edges of the soles the table *p* is made to move to and fro by the center of the slide being placed on a stud, *b'*, which is central with the toe of the boot or shoe and fixed on the top of a pedestal-shaft, *c'*, about three or four feet long, the bottom of which is screwed in a cross-bar with turned ends, which ends work in two brackets, *d'*, placed on a bottom plate, *e'*. On this plate also is placed

a stud which carries a toothed wheel, *f'*, connected to the shaft *g'*, carrying at the top a pinion, *h'*, which gears into and drives the aforesaid rack *a'* for giving motion to the table. The wheel and rack are kept in gear by means of a casting, *k'*, keyed on the pedestal-shaft and bored the proper distance from it to allow the shaft *g'* to pass through. The pedestal-shaft *c'* and shaft *g'* are therefore always allied with each other and move to and fro according to the curves of the edge of a boot-sole, the sole itself forming its own cam or guide. There is a fixed guide, *l'*, Fig. 1, placed immediately underneath the shears, against which the edge of the boot-sole works, and to keep the edge of the sole to this guide a strong spring, *m'*, in Figs. 1 and 2 acts against the back of the pedestal-shaft *c'*.

The table-pedestal and its appendages just described require to move up and down to suit the inequalities of the boot-sole, and this has to be effected with great ease. To effect this the plate *e'* and the plate *n'* are fixed to a shaft, *o'*, about four feet long, or longer if convenient, for the longer the shaft the easier the motion. The plate *e* is keyed as near the bottom as possible, and carries the pedestal and the whole of the weight of the table and its appendages, and rests on the foot-plate of the machine when not in work. The other plate, *n'*, is keyed on the top and contains merely a slot for guiding the pedestal and keeping it always in the center. The frame at *p'* and foot-plate are bored to make bearings for this shaft *o'*, and with the bearings being so far apart it moves up and down with the greatest ease. A weighted lever, *q'*, is connected by a rod, *r'*, to the bottom plate, *e'*, for the purpose of raising the boot against the nose of the shears, against which it beds, and a proper weight being employed at the weight end, the boot always maintains its proper position. The weighted lever, however, is not sufficient to resist the force of the screw while penetrating the boot-sole, and consequently a wedge or cam-shaped hammer, *s'*, is used, which works under a toothed roller, *t'*, placed on a stud fixed to the top plate, *n'*, or any other suitable place. This hammer is worked by a lever, *u'*, put in motion by a cam, *v'*, on the vertical shaft *k*. The hammer has two grooved pulleys, in which are fixed chains working in opposite directions. One chain, *x'*, is attached to the lever *u'* and draws away the pressure from the boot to enable it to move, and a weight, *y'*, is attached to the other chain, *z'*, so that when the cam *v'*, which works the lever *u'*, liberates it the weight *y'* suddenly brings the pressure of the hammer again against the toothed roller *t'*, and thereby squeezes the part of the boot-sole together while the screw penetrates. The wheel *f'*, on the bottom plate, *e'*, is driven by a deep wheel, *a'*, with one half of a catch-box cast on the top and working loose on the vertical shaft *o*, the other half of the catch-box sliding on a feather or key fixed to the said vertical shaft *o*. This deep wheel *a'* en-

ables the wheel f' to rise and fall with the table without getting out of gear; or an ordinary wheel may be employed instead of the deep wheel, and rise up and down on the plate and be constantly in gear with the other wheel. This deep wheel receives motion from the ratchet-wheel n on the shaft o , and can be moved one, two, or more teeth, as desired, there being at the bottom of the shaft a catch or holding wheel, e^2 . The ratchet-wheel n is worked by a lever, f^2 , with catch and spring, and driven by the cam m on the vertical shaft k .

In our machine, therefore, the boot is first held fast in the vise, which is then placed in the machine. A catch, g^2 , which holds down the weighted lever q' and also the table and appendages, is then drawn on one side, and allows the table and appendages to rise and place the boot against the nose of the shears, as shown by the dotted lines, against which the hammer forces it tightly. The screw is then made and penetrates the boot-sole. When it has gone the desired length the hollow spindle h , which carries the wire, is made to stop suddenly and the shears cut the screw, and then the pressure of the hammer is taken away by the cam v' , and the boot moves the distance for the next screw, after which the cam v' ceases to act on the lever u' and the pressure is again renewed, and so on until the sole part of the boot is finished. These operations are performed for any number of boots or shoes, after which the heels have to be screwed onto the uppers or coverings. For this purpose we place the boot or shoe in the vise. (Shown in Figs. 10 and 11, which are drawn to a scale of three inches to the foot.) This vise consists of an oblong box, h^2 , the interior of which is longer and wider than the largest-sized boot. At the sides of the box there are two levers, i^2 , working on fulcrums at one end of the box and guided at their other ends in a slot at the other end of the box. At or about the center of the sides of the box there are axes or trunnions k' , having screwed holes, through which are passed the screws l^2 , the ends of which are in contact with the aforesaid levers i^2 . Each of these levers has a screwed hole, through which is passed the screw m^2 , which has a partly-spherical end fitted to a cavity in the holder, so as to form a ball-joint and enable the holder to swivel to any position. On the levers there is a cross-bar, o^2 , which is employed for supporting the front part of the boot or shoe, which bar is capable of being shifted as required and afterward held fast by a set-screw. On the levers there are clips similar to those shown in Figs. 6, 7, and 8.

In order that the screws may be placed at a uniform distance from the edge and the finishing operations performed in an efficient manner, it is necessary that the boot or shoe should be so held in the vise that the center of the heel should be central, or in a line with the center of the rack or stud which

carries the rack and table. To insure this condition we employ a gage which can be moved up and down according to the size of the boot or shoe, but which is always maintained central with the center of the aforesaid rack or stud. This gage consists of a circular plate, q^2 , attached to a bar, r^2 , which is fixed to or is formed with the circular or other rod s^2 . This rod is fitted to a vertical hole at the end of the box and held fast at the required height by the screw, there being, when the rod is round, a slot formed in it for the end of the screw to enter in order to maintain the gage always in a central position. Thus when a boot or shoe has to be held in this vise it is placed in the box and the fore part supported on the cross-bar o^2 and the clips p^2 placed on the levers, after which the holders n^2 are brought in contact with the sides of the boot or shoe below the heel, the wooden last being in the inside. The screws m^2 of the holders n^2 are now turned more or less until the heel is central with the gage, and then the holders and clips are screwed tight up by the aforesaid screws m^2 and the central screws, l^2 . All the motions are actuated by the cams and wheels on the vertical shaft k .

The shaft h , on the top of which is the drum e for holding the coil of wire, and each revolution of which causes a thread of the screw to be cut, is made to revolve by means of the wheel a^3 , which gears into one of the change-wheels g , two of which can be changed to regulate the length of the screw, and one of the change-wheels is geared into the large wheel b^3 on the vertical shaft k . The shaft h is furnished with a catch-box, e^3 , which is lifted out of gear when the stop takes place to enable the shears to cut and the boot to move. A lever, d^3 , is used to liberate the catch-box, and is worked by a cam, e^3 , fixed on the large wheel b^3 on the vertical shaft k . A smooth pulley is fixed on the shaft h , round which is placed the check-strap or brake i , which is drawn tight by the cam or lever j working a lever, f^3 , to which the end of the check-strap i is affixed, and which instantly stops the shaft h .

The shears l are made with a stud and roller on the end of each arm, which rollers work in slots in the plate g^3 , which may be circular or of any other shape. These slots are made so that when the plate is turned in one direction the shears close and cut the screw. A stud and roller, h^3 , is likewise fixed on this plate, against which a cam, i^3 , on the vertical shaft k strikes and causes it to turn as far as it is desired, the shears being again opened by the passage of the succeeding screw. The vertical shaft k therefore, when the driving-strap is shifted onto the fast pulley by the strap fork-rod and handle j^3 , is the means by which all the motions are worked, and every time this shaft revolves a screw is forced into the boot-sole and the boot moves the distance it is intended to place each screw from the other.

When the screwing is completed the vise containing the boot is removed to another portion of the machine, where a table, k^3 , similar to the table p , already described, but larger, is placed to receive it for the purpose of finishing the edges. There is, however, a difference in the motion of the tables, inasmuch as the one used for the screwing moves at intervals, whereas the motion of the finishing-table is required to move to and fro; neither is it required to move up and down, and therefore works on a fixed center, a^5 .

To the under side of the table is fixed a rack, b^5 , similar to the one before described, gearing into a toothed wheel, c^5 , fixed to the shaft e^5 , which carries at the bottom the spur-wheel f^5 , communicating by gearing with the shaft g^5 .

The tools have to-and-fro motion sidewise imparted to them, according to the shape of the heel and sole, by a lever, l^3 , jointed to a fulcrum on the movable arm or lever m^3 , the end of the lever l^3 being bored to receive the various tools, and the lever m^3 being kept up to its work by the lever and weight n^3 . This lever l^3 is also jointed, as at o^3 , to the slide p^3 , which can be held up by a catch, and thereby hold up the lever when it is not in work, as shown by the full lines. When the catch is turned back the slide is lowered, and with it the lever, as shown by the dotted lines, and the slide and lever are free to move up and down and follow the various curves of the boot-sole when the tool is placed therein, for in connection with the tool there is a guard which rests upon the boot-sole, and is kept there by a spring or by the weight q^3 connected to the slide, and is guided by the boot-sole accordingly. This lever therefore resembles, more than anything else, the human arm, the elbow being the movable fulcrum and the hand the end for holding the tool, and when the fulcrum of the lever l^3 is raised in the lever m^3 so as to place the lever l^3 in an angular position the heels can be pared and polished to an angle corresponding with the height to which the fulcrum is raised. The band which drives the screwing portion can also be used for driving the finishing-tools, or they may be driven by two separate straps, as shown in the drawings.

It is not convenient to finish the fore part of the boot and heel at the same time, on account of the extra thickness of the heel. To overcome this difficulty, therefore, the tools are made to traverse the edge of the boot-sole from one corner of the heel to the other, and then return. This is effected by means of two bevel-wheels, r^3 , with half of a catch-box cast on each, running loose on the driving-shaft, and gearing into and on each side of a larger beveled wheel, s^3 , fixed to the vertical shaft g^5 , which gives, by means of the intermediate gearing and shaft, e^3 , motion to the table k^3 . Between the two catch-boxes is placed a boss, t^3 , to which is cast the other halves of each catch-box, which boss slides backward and

forward on a key secured on the second shaft, b^6 , so that when it is in gear with one it is out of gear with the other, and vice versa. The middle of this boss is grooved, and a fork fastened to a sliding bar, w^3 , rests in the groove and works the said piece. This bar is made self-acting by means of a series of levers, v^3 , one of which is provided with a weight, w^3 , and is worked by adjustable cams x^3 and x^4 bolted to the table, so that they can be made to suit either a large or small boot or shoe, which cams, coming in contact with the bowl z^3 on the lowest of the series of levers v^3 , cause the levers to rebound to and fro at the proper time, thereby first putting one catch-box into gear and then the other.

To stop the machine a catch-lever is used, which enters a notch in the sliding bar w^3 and holds the catch-boxes equidistant from each other and out of gear with the bevel-wheels.

The tools for cutting the edges of the sole of the boot or shoe are shown in Figs. 1, 12, 13, and 14, Figs. 12, 13, and 14 being about full size. The said tools are made of brass or any other suitable material, with steel cutters, and are arranged somewhat similar to a joiner's plane, but are made to swivel universally to suit the various curves of the boot-sole. The principle of this plane or cutter is this: There is the cutting-edge a^4 , Fig. 14, and two grinding-surfaces, b^4 and c^4 . The cutting-edge, and also one or other of the grinding-surfaces, according to the position of the cutting-edge, whether on the side or toe or heel of the boot or shoe, must be kept to the edge of the part to be cut.

To enable this tool to work properly, we prefer that the cutting-edge a^4 should be placed exactly in the center of the stud which carries the said cutting-edge and surfaces, or it may be placed between the said cutting-edge and one of the grinding-surfaces, or in any other convenient position, which stud works in the center of the boss d^4 ; and the weighted lever n^3 , Fig. 1, is brought to bear against the arm-lever l^3 , in which the tool is placed, and forces the cutting-edge and one of the surfaces against the boot-sole, which, coming equally against each, compels the cutter to keep at its proper angle.

The boss d^4 forms part of a cranked holder, g^4 , with a stud, h^4 , opposite the cutting-edge, which stud fits in a hole bored in the afore-said arm-lever l^3 , and it is thereby enabled to follow and bed into the various curves of a boot-sole, the stud h^4 being prevented from turning completely over by means of a pin or key, i^4 , Figs. 12 and 13.

The guard k^4 of the tool rides on the boot-sole, and is made broad and of a proper shape, so that it may be easily worked by the same. It is also made adjustable by the screw and nut h^4 , so that it can be raised and lowered to suit any thickness of sole or heel.

The tools for blacking and glazing are jointed to a cranked holder having a stud fitting the

arm-lever l^2 , and work up and down and to and fro in the same manner as the cutting and paring tools.

For cutting the soles previously to their being placed on the boot or shoe we remove the vise from the table k^3 and place upon the said table another table having centers n^4 , Figs. 15 and 16, which figures are drawn to a scale of one-fourth. On this table is placed the part of the hide to be cut, and above which there is a templet, o^4 , held fast by screws or by the lever p^4 , which is pressed down by the cam q^4 . This templet forms the guide for the tool which cuts the leather beyond the templet, the leather being placed on the roller r^4 .

The knife or cutter for cutting the hide is constructed on the same principle as the tool for paring the edges of the soles and heels, the only difference being in the shape of the cutter, one of which is shown enlarged in Fig. 17. This arrangement supersedes the present expensive stamping-tools, and can be worked with as much ease as the tools for paring.

Having now described the nature of the self-acting machinery or apparatus worked by steam or other power for cutting and shaping the soles and heels of boots and shoes and screwing them onto the uppers or coverings, and also in vises for holding the same, we desire it to be understood that we do not claim the hollow spindle containing the wire for the screws, nor the toothed gearing for giving it revolving motion, nor the arrangement for stopping it by shifting one-half of a clutch-box, nor the dies or cutters for making the screws, nor the shears, nor the method of giving intermittent motion to the table by a ratchet-wheel worked by a lever and catch; but

We claim as our invention—

1. The brake i , lever f^3 , and lever j , for instantly stopping the drum e when the driving power is taken off.

2. The improved vises for holding the boots and shoes so firmly that they can be operated upon with ease and certainty.

3. The bearings or brackets y on the tables, for enabling the vises, and consequently the boots or shoes, to move up and down according to the shapes of the bottom of the soles.

4. The system of employing under each table a rack round at one end and straight at the sides, so as to be adapted to all sorts and sizes of boots and shoes.

5. The cam or pattern plates for determining the aforesaid up-and-down movement with certainty.

6. The employment of the long shaft o' , plates n' and e' , the casting k' , the long pedestal-shaft e' , and the shaft g' , for enabling the table to move to and fro and up and down easily.

7. The deep wheel a^2 , or an ordinary wheel which rises up and down with the wheel f' , for maintaining the wheel f' constantly in gear.

8. The balance-lever q' for raising the table and its appendages when a catch is removed.

9. The cam-shaped hammer s' , raised by the chain z' and weight y' , for forcibly pressing the sole of the boot or shoe against the nose of the shears.

10. The cam v' on the shaft k , the lever u' , and the chain x' , for taking off the weight of the hammer when the boot or shoe has to be moved for a fresh screw and allowing the weight to be put on immediately the cam has passed the tail of the lever.

11. The system of making the holders, guards, and cutters, as shown in Figs. 12, 13, and 14, for paring or shaping the soles and heels after they have been screwed on, and also the employment of similar holders for the finishing-tools.

12. The movable arm or lever l^3 , Fig. 1, for carrying the holders with the paring and finishing tools, and also the levers m^3 and n^3 for enabling the tools to follow the surface and sides of the sole and heel.

13. The cams x^3 and x^4 , Fig. 1, for acting on the levers v^3 for giving by means of the gearing and clutches r^3 alternate motion to the table k^3 .

14. The weight q^3 , or its equivalent, connected directly or indirectly to the slide p^3 , jointed to the movable arm l^3 , for keeping the cutters and tools in their places as their guards ride on the surface of the sole or heel.

15. The apparatus shown in Figs. 15 and 16 for holding the leather to be cut into soles, and also the application to a holder similar to those shown in Figs. 12, 13, and 14 of a cutting-knife, Fig. 17, for cutting the soles from the hide.

16. The adaptation of our improvements either to one machine, as shown in the drawings, or to a machine employed only for cutting the soles, or to a machine for only screwing the soles and heels onto the uppers or coverings, or to one employed only for paring and finishing, as all such improvements are herein described, and illustrated in the accompanying three sheets of drawings.

Done at Manchester, England, this 13th day of October, 1865.

CHAS. H. SOUTHALL.
ROBERT HEAP.

Witnesses:

EDWARD JOSEPH HUGHES,

C. SEPTIMUS HUGHES,

Patent Agents, 20 Cross Street, Manchester.