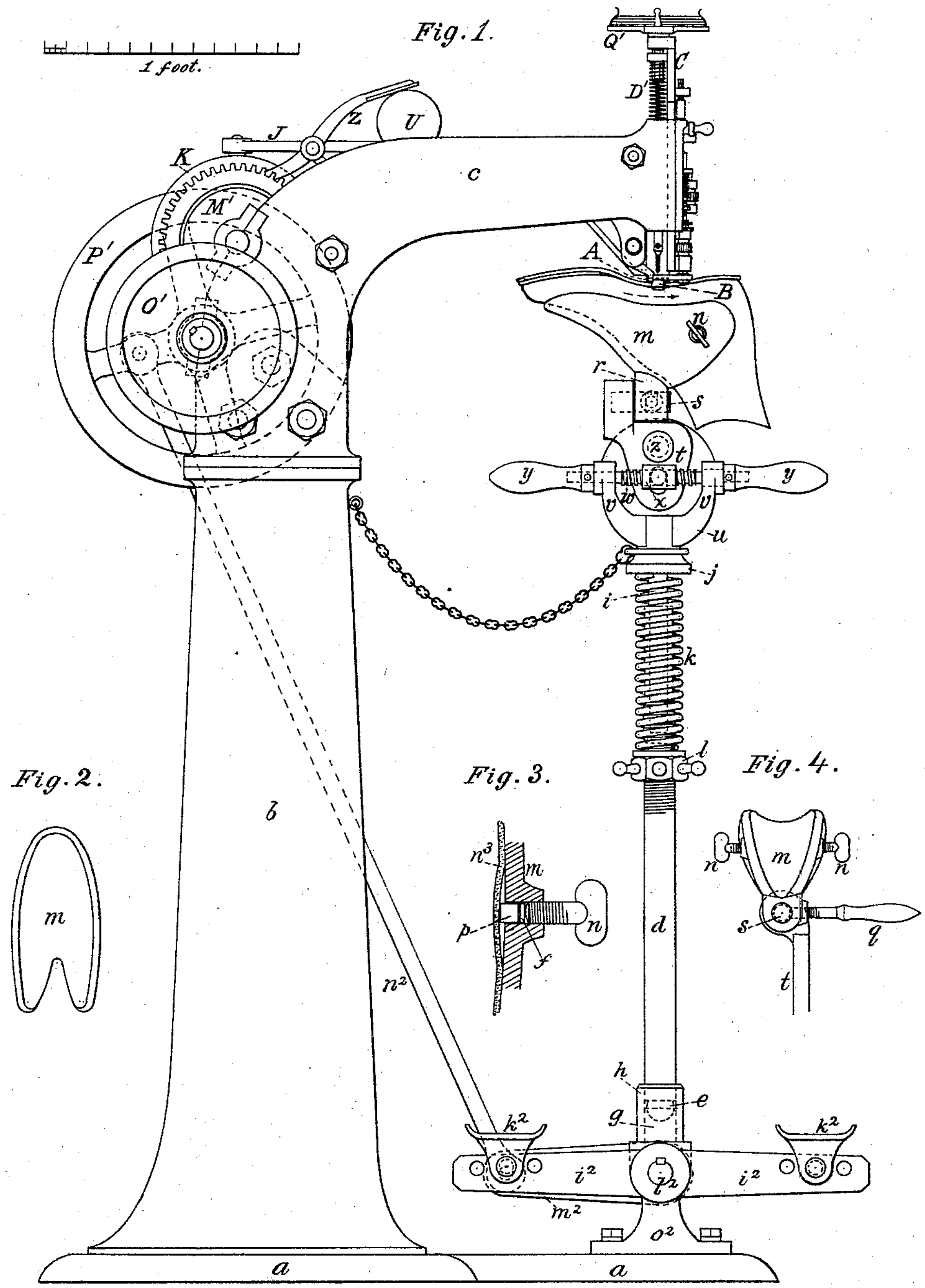
C. M. HIGGINS.

LEATHER SCREW PEGGING MACHINES.

No. 169,541. Patented Nov. 2, 1875.



Witnesses:

Inventor:
Chas. M. Higgins

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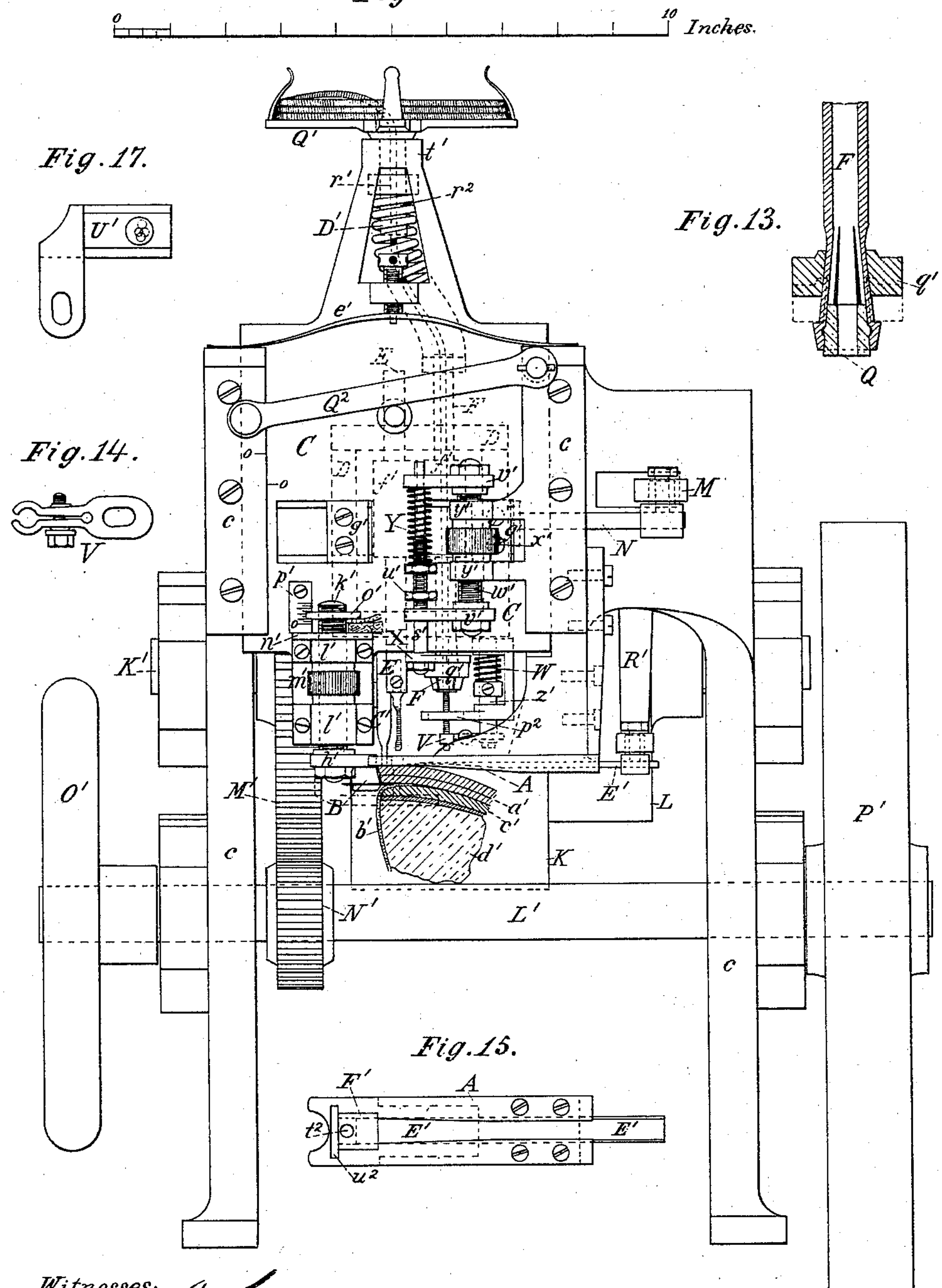
Fig. 5.



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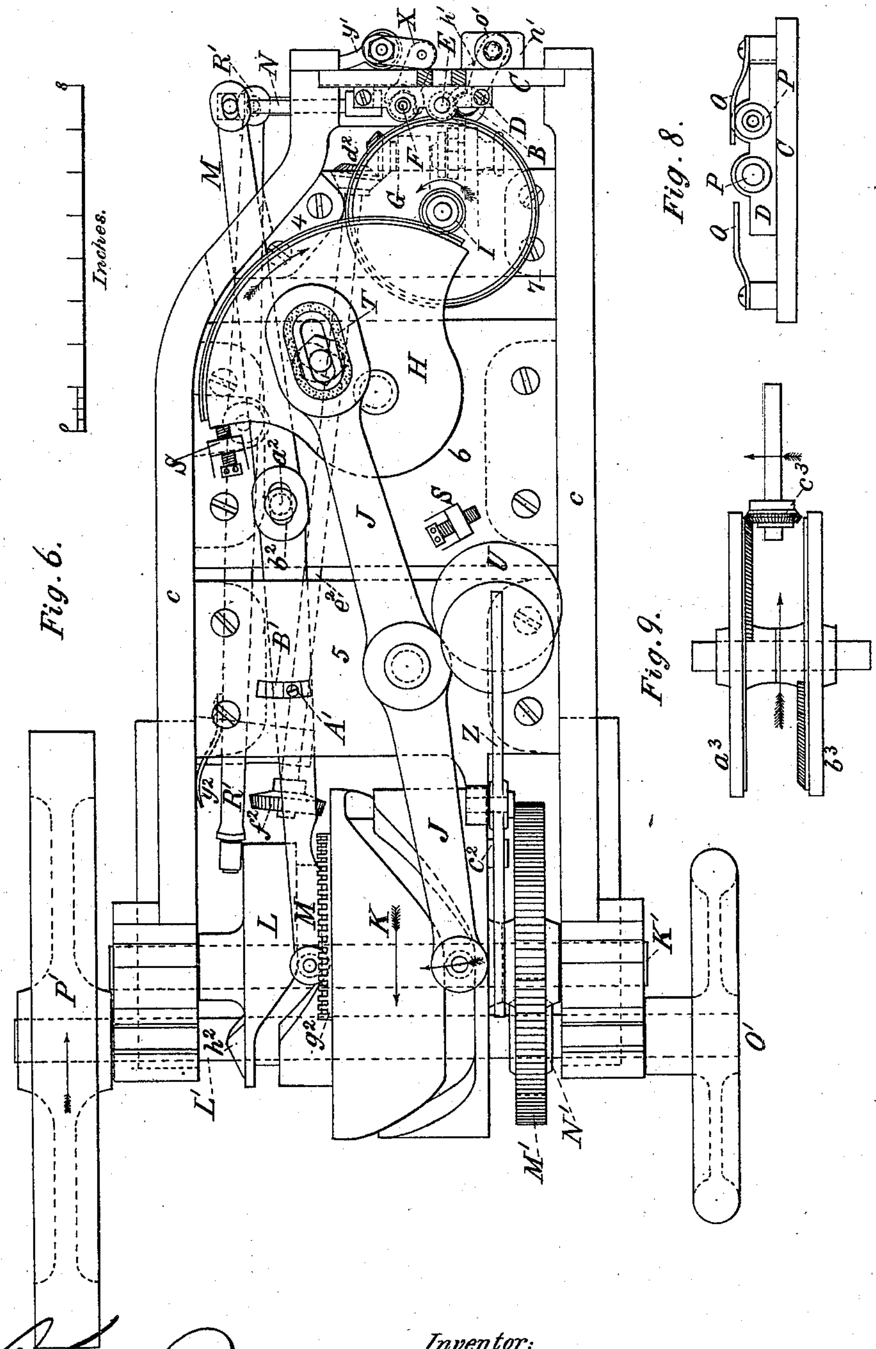

Fig. 6. Fig. 8. Fig. 9.

Witnesses:

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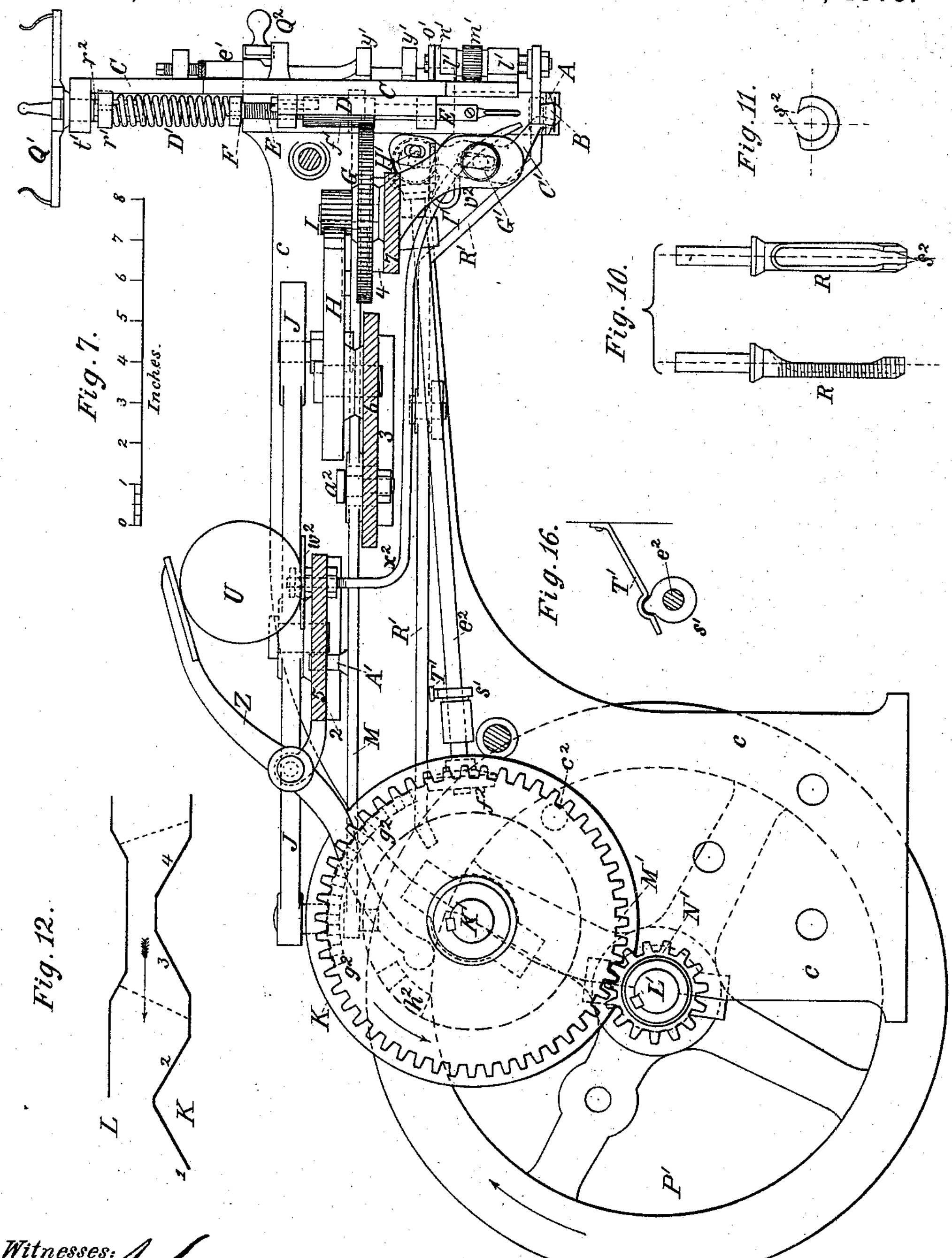

Witnesses:

[signature]

Charles F. Irwin

Inventor:

Chas. M. Higgins.

UNITED STATES PATENT OFFICE.

CHARLES M. HIGGINS, OF BROOKLYN, NEW YORK, ASSIGNOR TO KERAN O'BRIEN, OF SAME PLACE.

IMPROVEMENT IN LEATHER-SCREW-PEGGING MACHINES.

Specification forming part of Letters Patent No. **169,541**, dated November 2, 1875; application filed July 12, 1875.

To all whom it may concern:

Be it known that I, CHARLES M. HIGGINS, of Brooklyn, in the county of Kings and State of New York, have invented an Improved Leather-Screw-Pegging Machine, of which the following is a specification:

The object of this invention is to produce a perfect machine for the fastening together of various kinds of leather or similar work by means of screws or "screw-pegs" of compressed leather or other non-metallic substance, which shall automatically perform all the necessary operations, and contain all means requisite for executing such work in a practical manner. The chief object of the present machine is the fastening of shoe-soles, and the performance of this in a perfect manner while the sole is on the last, in order to obviate the objectionable necessity of two lastings, which exists with the wax-thread and metal-screw machines at present used, which require that the sole be fastened while the shoe is off the last.

As the special features constituting this invention are numerous and fully set forth hereinafter, their formal statement is here avoided, and it is thought sufficient for introduction to state that the operations necessary to be performed in a machine of this kind are: First, the drilling of a hole for the reception of the screw; second, the insertion of the screw into this hole from the end of a long screw-threaded cord, the devices for these operations being shifted into and out of position alternately; third, the cutting off of the inserted screw; and, fourth, the feeding of the work along for a repetition of the operations.

Figure 1 of the annexed drawings is an elevation of the front side of the machine, or of that side at which the operator takes his position. Fig. 5 is an elevation of the front end of the upper portion. Fig. 6 is a plan of the same portion; and Fig. 7 is a front-side elevation of the same, with one side of the frame removed.

The general structure of the machine consists of a flat base, *a*, Fig. 1, from which rises a tapering column, *b*, from the top of which extends a curved overhanging arm, *c*, at the end of which the several operations of the machine are performed on the work placed underneath it, as represented. The arm, as shown in Figs. 6 and 7, is formed in two sides, *c c*, from the inner surface of which project lugs 2 3 4, to which are secured transverse plates 5 6 7, which bind the two sides together, and support several parts of the mechanism. The arm contains all the chief operative portions of the machine, and is bolted, as shown in Fig. 1, to the top of the column *b*.

The work, in the case of a shoe, is secured, as shown in Fig. 1, on the top of a movable support, commonly termed in machines of similar class a "jack," which usually consists of a vertical rod, *d*, jointed at its lower end, and provided at the top with mechanism for holding the shoe and maneuvering it into different positions as the work progresses, which parts, in the jack represented, are of novel construction, as will be now described.

The vertical supporting-rod *d* of the jack has formed on its lower end a ball or socket, *e*, which rests upon a corresponding socket or ball formed on the top of a pin, *g*, projecting from the base. The ball and socket are embraced by a strong band of rubber, *h*, the lower edge of which rests on a shoulder formed on the pin *g*, as represented. The band *h* is strained over the joint, and serves to hold the parts securely in true position, while it allows the rod *d* to bend freely from side to side in any direction, as required, and a simple and efficient joint is thus formed.

The shoe, while rigidly secured on its last, is placed in a metallic socket, *m*, on the top of the jack. This socket is so formed as to embrace the shoe both at front and rear, thus supporting heel and toe, and it conforms to the shape of the shoe in such a manner (which will be more apparent on reference to the plan view, Fig. 2, and heel-end view, Fig. 4) as to prevent the shoe moving backward, forward, or downward, and hence holding it quite rigidly in position, which is an important requisite, while it allows of the shoe being readily placed in position, or removed, from the top, and, as a means of holding the shoe, has the advantage of compactness and simplicity. One of these sockets is adapted for the reception of shoes of several different sizes; but for extreme sizes separate sockets will be provided, and for buttoned shoes a portion of the front of the socket may be cut away to allow the buttons to rest in position without injury. The socket is lined with a suitable soft material, and is preferably provided with binding-screws n n near the heel end, to bear against each side of the shoe, and thus hold it more firmly in position. The screws are so constructed, by being faced with rubber, as to enable a strong gripe to be obtained without injury to the shoe, as shown in Fig. 3, where m is the socket, and n^3 the lining thereof, cemented to the socket, but left free for a space around the screw-hole. A block of rubber, p, lies in the screw-hole, with one end against the lining, and the other in contact with a washer, f, interposed between the rubber and the rounded end of the thumb-screw n. The operation is apparent. When desired the rubber block and washer may be substituted by a rubber-faced plate of increased area, resting in a recess between the inner surface of the socket and the lining, so that the pressure of the screw may be distributed over a larger surface. A perforated lug, r, projects downwardly from the socket, and fits over a pin, s, projecting horizontally from a pivoted plate, t. This forms a joint on which the socket and shoe may be tilted transversely of its length, so as to bring the curved margin of the sole on a horizontal level with the under surface of the pressure-plate A of the machine. This tilting is effected by a handle, q, Fig. 4, arranged at right angles to the pin s, its attached end being screw-threaded, and working through a screw-hole in the side of the lug r, with its extreme end resting in a groove formed on the pin s. By raising or lowering this handle the shoe may be tilted on the center s to the desired angle, and by turning the handle its end will be screwed up tightly against the pin s, so as to hold the shoe firmly in the required position, and these movements, as will be seen, may be conveniently effected by a single grasp of the hand. The plate t is pivoted on a stud, z, to a stand, u, in the recess, between the two forwardly-projecting sides v v. The stand u terminates below in a base or shoulder, j, and a rod, i. The rod i enters the top of the tubular supporting-rod d, in which it is free to move, and the shoulder j rests on the top of a strong spiral spring, k, the lower end of which is supported on an adjustable nut, l, which turns on the threaded portion of the rod d, and by means of which the tension of the spring is regulated, as required. The spring exerts a strong and constant upward pressure against the maneuvering portion of the jack, pressing the shoe-sole tightly against the pressure-plate A, and forcing all its layers into that close contact necessary for the proper execution of the work. A screw, w, extends across the recess of the stand u, and passes through a nut, x, and its ends project through the sides v v, and are secured to the handles y y. The rear surface of the nut x rests flat against the plate t, so that its turning is prevented, and a pin with which the nut is provided projects into a short slot in the end of the plate t, as represented. Thus, by turning the handles y y, the plate t, and with it the shoe, may, through the medium of the nut and screw w x, be tilted longitudinally on the center z, so that the different parts of the vertical curves of the sole—the depressions and elevations—may be brought on a proper level with the pressure-plate.

The advantage of this maneuvering mechanism is, that by means of the screw movement just mentioned, the shoe, when so tilted, will remain immovably in the position in which it may be placed, unaffected by any force except what is applied to the handles y y, and is thus under positive control; also, that it enables the operator to control all the movements of the shoe from the same point, excepting the movement on the center s, which occurs only in turning corners. Thus, by the same grasp of the main handles y y, the operator may move the jack and its attached shoe bodily to or from him, or from side to side on the joint e g, or may turn the upper portion around bodily on the center rod i, and by twisting or turning the handles on their own axis the shoe may be tilted up or down; hence the operator is enabled to have the shoe under full and convenient control, which is highly necessary. If desired, the screw x may be arranged to engage with worm-teeth on the end of the plate t with the same effect; but the construction shown is preferred for the sake of economy of manufacture.

As the invention contemplates the fastening of the shoe-sole while the shoe is on the last, and as, hence, no fixed definite part of the machine can be placed within the shoe, and as the thickness of a shoe-sole varies considerably at different parts, and, moreover, as it is necessary, in order to secure a good fastening, that every screw fully penetrate the sole, it will, therefore, be perceived that it is highly important that some means be provided which will insure the full and uniform penetration of the drill and screw, irrespective of difference of thickness, so that at every operation the drill and screw shall be caused to fully penetrate all the layers of the sole, extending clear to the sole of the last, and to no material extent more or less; for, were the drill to fail to sufficiently penetrate the insole, a proper fastening could not be effected, and, on the contrary, were it to extend any distance beyond, the last would be exposed to injury, and the drill liable to breakage, or its cutting-edge be injured, and especially would this be the case were an iron-soled last used. The means, therefore, by which this desirable result is accomplished constitutes one of the most essential features of this invention, and will be now described.

In Fig. 5, A represents the pressure-plate of the machine, which is a fixed and rigid part depending from one side of the frame c c, and so constructed as to obtain great strength, with little thickness, at the working end. Against this plate the shoe-sole is forcibly pressed, as before described, a fragmentary transverse section of the shoe being shown in position, of which a^1 is the outsole, b^1 the upper, c^1 the insole, and d^1 the last. B is a small but very strong steel roller, the rim of which takes a bearing on the margin of the inner surface of the outsole, preferably by means of an extremely thin, but strong, flange, which enters between the upper and outsole, as represented, and in this position is maintained by the operator as the work progresses around the margin of the sole. Now, this roller B is arranged in fixed position relatively with the drill and screw shown above it, and the outsole of the shoe, which is the only part that varies in thickness, always rests above the flange of the roller, while the upper and insole, which are practically of uniform thickness, always rest below the flange, as represented. Now, it will be obvious that if the stroke of the drill be sufficient for the penetration of the thickest part of the sole, and if the drill is so adjusted relatively to the flange as to start in its stroke from a certain distance above the flange, and stop at a distance below it—say, equal to the thickness of the insole and upper—the drill will invariably, at every stroke, fully penetrate all the layers of the sole, as far as, and no farther than, may be required.

The roller B, together with the spindle E, which carries the drill, and the spindle F, which inserts the screw, are maintained in fixed relative position with each other by both being attached permanently to a vertically-sliding plate or frame, C, which moves in guides on the end of the arm *c c*, as shown most clearly in Figs. 5 and 6. The spindles E F are both arranged in a horizontally-sliding frame, D, in contact with the rear face of the slide C, and secured to it by means of the slides g^1 g^1, which prevent the vertical movement of the frame D, but allow of its being shifted from side to side to bring either spindle to the point of action. The roller B depends from an arm, h^1, which is secured to a screw-stem, k^1, which passes through the sockets l^1 l^1 and nut m^1, all fixed to the slide C. This forms a vertically-adjustable connection of the flange-roller B with the slide C, so that by turning the nut *m*—which is held between the sockets i', and turns on the screw which can slide up and down only—the flange-roller may be raised or lowered for adjustment to the desired relative position with the screw-spindles E F. The slide C is provided at the top with a strong half-elliptic spring, e^1, the center of which bears against an adjusting-screw fixed to the slide, and the ends bear on each side of the fixed frame *c c*, exerting a constant force to raise the slide and its attachments, and draw the rim or flange of the roller up tightly against the pressure-plate, as represented in Fig. 7. Now, as the shoe is fed along, and the different thicknesses of the outsole pass between the flange and pressure-plate, as represented in Fig. 5, the flange is forced down or drawn up correspondingly to he entering thicknesses, and the slide C and all its attachments of course move up and down simultaneously with it. Now, since the flange and the screw-spindles are attached rigidly to the same part—*i. e.*, the slide C—they will be preserved unalterably in the same relative position in which they may have been adjusted, unaffected by the up-and-down movements mentioned, so that, no matter how the thickness may vary, when a proper adjustment is once had such adjustment will be maintained, and the required depth of penetration always effected. The upper socket l^1 is provided with a small level shelf, n^1, and to the screw-stem above and parallel with the shelf is fastened a flat disk, o^1, the top edge of which forms the index to the scale p^1 for the adjustment of the roller B, and when the index is at zero the disk o^1 will be in contact with the shelf n^1, and the roller-flange on a level with the point of the drill when at the bottom of its stroke. Hence, were the drill or screw to descend while the flange was at zero they would stop on a level with the flange, and thus only penetrate the outsole. To effect, therefore, the penetration of the insole, the roller-flange would have to be raised above the zero-point a distance equal to the thickness to be penetrated below the flange. This is done by turning the adjusting-nut m^1, and thus raising the roller nearer to the screw-spindles. The correct distance to raise the roller could generally be approximated to with sufficient accuracy; but for absolute accuracy the shelf n^1 and disk o^1 are provided to receive between them a fragment of the leather from which the uppers and insoles of the shoes being operated upon were made, so that when the disk is screwed down tightly upon this fragment, as represented in Fig. 5, the roller-flange will then be raised above the zero-point a distance exactly equal to the thickness of material below the flange, and, hence, an exact adjustment will be secured, the drill and screw being caused to penetrate every time clear through all the layers of the sole down to the very sole of the last, but no farther.

It will thus be perceived that this problem of fastening the sole perfectly while the shoe is on the last is accomplished by means which are quite simple in their construction, and absolutely positive and reliable in their operation.

It is believed that it will be preferable in practice to so adjust the flange-roller as not to cause an entire penetration of the insole, but leave a thin membrane at the end of each hole, so as to effect a smoother and neater finish within the shoe.

Q^2 is a hand-lever for the pulling down of the slide when placing the work in position.

It may be here mentioned that no particular form of the flange-roller or marginal support B is essential, as it may be in the form of a flat stationary plate or flange, or a roller provided with a thick flange to rest in the groove at the margin of the sole between outsole and upper; but the form shown is deemed best, as by the thin flange entering between the layers of the sole, it is more easily kept in position by the operator, and a better support is secured.

The screw-spindles E F are both arranged close together in the horizontally-sliding frame D, and are both alike, as a similar motion is imparted to each, their upper ends being screw-threaded, and working through screw-holes in the top of the frame D, and each provided with a long pinion, f^1, both of which are driven from the gear-wheel G, arranged just behind them, as shown in Figs. 6 and 7.

As seen more distinctly in Fig. 6, both spindles, together with the sliding frame D, are arranged tangentially of the wheel G, so that as the frame is shifted from side to side the pinions of the spindles are caused to engage alternately with the driving-wheel G.

An alternate reverse rotary motion is imparted to the wheel G to screw the spindles down and up with intervening pauses to allow the pinions to shift. Thus, by the arrangement shown, both pinions are driven from the same wheel, and one movement suffices to throw one pinion out of action and to throw the other into action simultaneously, which is a feature that conduces much to simplicity of mechanism and rapidity of operation.

The wheel G is driven by the toothed sector H, which meshes with the pinion I, and is reciprocated by the lever J, which is vibrated by the main cam K.

The shifting of the sliding frame D is effected by the minor cam L and lever M. The lever projects through an opening in the curved side of the frame c, and is connected with the sliding frame by a short rod, N. As the movement given to the sliding frame must be exactly equal to the distance between the centers of the screw-spindles, the fulcrum of the lever M is made adjustable by means of the slot b^2 and movable pin a^2, and to prevent any longitudinal movement of the lever it is provided with a projecting pin, A′, which moves in a curved slot, B′, as seen in Fig. 6, thus enabling the movement to be accurately adjusted, and the adjustment to be permanently maintained.

A diagram of the direction of the grooves of the cams is shown in Fig. 12. The first and second inclines of the main cam K screw the drill-spindle down and up. A pause then occurs while the thread-spindle is being shifted into position, when the third incline screws it down, inserting the screw, the next pause allowing the cutting off of the screw, and the fourth incline screwing up the thread-spindle. Another pause then occurs to allow the drill-spindle to be shifted back into position for a repetition of the movements. The inclines of the minor cam L, which cause the shifting of the spindles, correspond with the pauses of the main cam, as indicated.

The cam-shaft K′ is fitted with the toothed wheel M′, which is driven by the pinion N′ on the main shaft L′, the gearing being in about the proportion of three or four to one. The main shaft is provided on one side with a smooth hand-wheel, O′, for the convenience of the operator in starting or stopping, and upon the other side with the fly-wheel P′. The fly-wheel is driven by the pitman n^2, as shown in Fig. 1, from the treadle at the base of the machine.

The treadle consists of a lever-bar, i^2, provided on the ends with the pedals k^2, and secured at the center with a rock-shaft, l^2, passing through a bearing, o^2, and joined on the opposite end to the crank m^2, which drives the pitman. It will be seen that this treadle will allow of the use of either foot when the operator stands, or of either or both when sitting. Steam-power, however, will perhaps be more generally used. It will be understood that as either of the screw-spindles is shifted into action the disengaged spindle must be so held from rotating that the teeth of its pinion will remain in the position in which they left the teeth of the wheel, so that the pinion will be sure to engage with the wheel when again shifted into position. This is done by causing a brake-spring or retaining-catch to engage with the spindles when disengagement occurs. In Fig. 8, C is the vertical slide, and D the shifting-frame carrying the spindles. O O are two flat springs, secured to the slide C, and projecting toward the spindles. As either of the spindles rises to the top of its stroke, and while it is being shifted, the top of the spindle, which is preferably fitted with a little roughened roller, P, passes under one of the springs O, the face of which is also roughened, and from the gripe thus obtained the spindle is held immovably in true position for the next movement—a requirement which is quite necessary. A more positive hold, if necessary, may be obtained by providing the face of the spring and roller with gear-teeth, thus forming rack and pinion, of the same pitch as the teeth of the spindle-pinions. This device is not shown in the main view, Fig. 6, from which, also, other minor attachments of the slide C are removed for the sake of greater clearness. It will also be understood that precisely the same number of revolutions must be given to the screw-spindles in one direction as in the other, for if any difference should exist the spindle would move up or down slightly beyond its normal position, and this abnormal movement would be repeated and increased at every stroke, so that the spindle would soon move out of its true relative position. This is prevented by causing the sector H to always move through the exact distance between two fixed, but adjustable, stops, S S, Fig. 6, so that at each sweep of the sector one of its ends is forced tightly against one of these stops, the which is effected by arranging a point of elasticity between the cam K and lever J, and so adjusting the parts that a motion is imparted to the sector a little more than sufficient to carry the sector to the stop, the excess being taken up by the point of elasticity. The necessary elasticity may be secured by a narrow rubber packing, T, introduced in the slotted end of the lever J, as will be understood on reference to Fig. 6. It will also be perceived that this peculiarity requires the use of a positive means of communicating motion to the spindles, such as toothed gearing, belts or other frictional connectors being wholly unfitted from their liability of slippage.

One of the most important elements of a machine of this class is the drill which forms the hole in the leather preparatory to the insertion of the screw, for upon the rapid and easy formation of a clear hole absolutely depends the possibility of the subsequent operations and the success of the machine. The requirements demanded of such a drill, and the circumstances under which it has to act, are so unusual that existing boring-tools are entirely unfitted for the purpose. It is first essentially necessary for economy of time and simplicity of mechanism that the drill form a perfect screw-hole at one operation—that is, tapping and drilling simultaneously. It must entirely remove the material as far as it penetrates, leaving the hole, which should be flat-bottomed, perfectly clear for the reception of the screw, and it should cut smoothly and easily without much heating. Hence, those boring-tools, such as the twist-drill, &c., which form chips in cutting are unfitted, as a large portion of the chips are always left in the hole, which cannot be practically removed, even by a strong air-blast, the great heat which these drills generate aggravating the difficulty by partly fusing the chips and rendering them adhesive. The only kind of drill, therefore, which has been found adapted for this purpose is of the hollow or tubular class, which will remove the leather in one single piece or "core;" but it has been found that if a drill entirely tubular be used the retardation which the ascending cores receive upon all sides within the bore of the drill causes the cores to expand laterally, and become jammed so tightly as to render the drill inoperative, and equivalent to a solid rod. A special drill has, therefore, been devised, and forms one of the most essential features of this invention, and is represented in detail in Figs. 10 and 11. R is the body of the drill, which is perfectly semi-tubular, or its cross-section contains exactly one half-circle, the internal bore being as large as possible consistent with strength. The drill is threaded on its side with a screw of the desired pitch, twenty-seven threads to the inch being preferable, and the lower end, which is flat or level, is beveled to a sharp edge, the bevel being on the outside, so that the hole made is partly cut and partly compressed, and is thus better adapted for the purpose in having a tendency to shrink upon the inserted screw. As the drill rotates and screws downward, the point cuts out the leather in one cylindrical piece or core, and these cores rise freely in the bore, and discharge at the top. Now, in order to insure the wrenching off of the core, and its complete removal as far as the drill penetrates, the extent of the tubular section is increased for a short distance from the point, so as to include considerably more than half the tube, and less than the whole, or preferably about two-thirds or three-quarters of the circle, as represented in Fig. 10, and shown more distinctly in the transverse view, Fig. 11. By the greater frictional surface thus formed, and by the tendency which exists of the core being forced against the sharp edges s^2, such a tight gripe is secured on the core that the drill never fails to wrench it off and carry it up, insuring its invariable removal so far as the drill may penetrate—a requirement of vital importance; otherwise, in absence of this feature, the core would be removed only when the drill fully penetrated a layer of leather, and would be left remaining when it did not fully penetrate a layer—a defect which would be fatal to the successful operation of the machine.

The proportion of one half-circle in the body of the drill is essential to its operation, for were it to contain any considerable degree more, the hold on the cores would be so great as to prevent their easy rising and free discharge, causing the drill to choke and thus become inoperative; and, on the contrary, were it to contain any appreciable extent less than the half-circle, the cores would then not be held in the bore with sufficient security, but would fall out sidewise while the drill was working, and become jammed by it against the side of the hole, thus injuring the hole and interfering with the operation of the drill.

Owing to the small volume, ample cutting-edge, and large vent of the drill, its cutting is rendered very smooth and easy, and, as a consequence, its heating effect is very slight.

The drill is fitted to the drill-spindle E, as shown in Figs. 5 and 7, in any of the usual methods, the spindle being threaded at the top with the same thread as that on the drill, so that when the drill is rotated it is fed down at a proper speed to accurately tap the hole which it forms.

When the drill rises after forming the hole, a blast of air is directed against the drill and hole to blow away the discharged cores as they fall from the drill, and thus prevent them from clogging the hole by falling into or across it.

The blast apparatus consists of a hollow rubber ball, U, Figs. 6 and 7, mounted on a flat disk, w^2, in the manner represented, and connected with a tube, x^2, which extends to the front of the machine, and terminates, near the point of action, in a narrow properly-directed nozzle, as shown in Fig. 7. The ball is compressed, and its contained air thus ejected in a strong jet from the nozzle by a lever, Z, one arm of which carries a flat plate, which bears against the ball, and the other arm is struck by a pin, c^2, projecting from the side of the main cam K, the elasticity of the ball returning the parts to their original position, and the whole forming a simple and efficient device for the purpose.

The thread-spindle F is tubular, and the screw cord or thread of leather or other material with which the work is fastened is passed down through the center of the spindle, emerging at the lower end, which is provided with a clutch to tightly gripe the thread or cord while the spindle is screwing it in, and passing finally through a guide-eye, V, attached to the end of a rod, z', projecting from the shifting-frame D, from which eye the cord passes—when the spindle is shifted into position and rotated—directly into the screw-hole made by the drill. The thread is fed to the spindle from a reel, Q^1, supported on a lug, t^1, projecting backwardly from the top of the slide C, as shown in Figs. 5 and 7, but removed from Fig. 6. This reel is so formed as to receive a coil of the screw-thread flatwise, as represented, and the thread is fed from the center down through the tubular spindle or shank r^2 of the reel, which projects down through the lug t^1 in a line with the point of action.

As the cord is necessarily subjected to much rotation in its insertion, it is requisite to rotate the reel with it in order to prevent the cord becoming twisted. The spindle and reel are, therefore, connected together by a spiral spring, D′, the lower end of which is secured to the top of the thread-spindle, and the upper end is fixed to a sliding collar, r^1, keyed to the reel-spindle.

This device forms a simple and reliable connection to communicate the rotary motion of the thread-spindle to the reel, the sliding collar allowing the thread-spindle to move up and down in its stroke, and the flexibility of the spring allowing the spindle to be shifted sidewise without altering the connection or the relation of the parts.

Although the rotating reel is a positive device for preventing twist, yet it is believed that in continued practice it will prove best to arrange the coils of the cord—say in loose guides—so that the rotation at one end of the cord may be allowed to extend itself along the whole length.

The clutch of the thread-spindle is formed, as shown in Fig. 13, by splitting the end of the spindle into several divisions, which are inclined outwardly, and on the conical surface thus formed a sliding collar, q', having a conical opening, is fitted, the sliding down of which closes the divisions and effects the clutching, and the sliding up of which does the reverse. In the mouth of the clutch is inserted a small block of rubber, Q, having a central hole of size sufficient to freely admit the screw-cord when the clutch is open. When the clutch is closed by the sliding down of the collar the rubber is compressed tightly on all sides against the screw-cord, and a gripe of extreme tightness is thus obtained without injuring the cord in the slightest—a feature which is of the utmost importance, especially where a non-metallic or comparatively soft screw-cord is used, the use of none other being contemplated in this machine.

The thread-spindle, when inserting the screw, starts from the top of its stroke with the clutch tightly closed on the cord, and so continues till it arrives at the end of its stroke, when it is released by the sliding collar striking an adjustable arm, p^2, supported on a spring, w, the whole arranged on and sustained by the rod z', which depends from the shifting-frame, so that as the collar descends the spring becomes gradually compressed till its tension exceeds the resistance of the collar, when the spring at once expands, throwing up the collar and releasing the clutch. The adjustment and tension of the arm and spring should be such as to cause this release just as the spindle arrives at the end of its stroke, and this may be rendered more certain by providing the collar with a retaining-catch which will be released only at the end of the stroke—say, by striking a fixed stop. The spindle having arrived at the end of its stroke and fully inserted the screw, the end of the screw-cord is cut off level with the surface of the work, and immediately after the cutting operation the spindle, with clutch open, rises, and continues to slip over the cord till it has risen a distance equal to the thickness of material under operation, when the clutch then becomes closed, the cord grasped and drawn up during the remainder of the stroke, thus bringing its end up to the original level. The device by which this is accomplished, though simple and effective, is yet somewhat difficult of comprehension in its operation. The clutch-collar, when on the upstroke, strikes against the plate X, Fig. 5, which is attached to the fixed frame of the machine, and secured to the end of a rod, s^1, which is pressed down and kept in definite position by the spring Y and set-nut u^1. The plate X is forked at the end, and straddles the thread-spindle, as shown in Fig. 6, and as the spindle shifts the plate and rod move or rock with it. The rod is free to slide or rock in its supporting-arms v^1 v^1, which are secured to the top and bottom of an adjusting screw-stem, w^1, governed by the adjusting-nut x^1, and the whole supported by the lugs y^1 y^1 projecting immovably from the end of the fixed frame of the machine. Now, the clutching-plate X is so adjusted that when the slide C, with its several attachments, is fully up or at zero, with the thread-spindle at the bottom of its stroke, the clutching-plate will then be in such position as to effect the depression of the collar and the closing of the clutch. Now, as the clutching-plate is attached to the fixed frame of the machine, and as the slide C, with its spindles E F and several attachments, is always drawn down, when the machine is in action, a distance from its zero-point equal to the thickness of material under operation, hence, when the machine is in operation, with the thread-spindle at the end of its stroke, the clutch-collar will always be removed from the clutching-plate a distance equal to the thickness of material, so that as the unclutched spindle rises on its up-stroke it will thus always slip over the cord a distance equal to the thickness of the work; but having arisen fully this distance the clutch-collar will then come in contact with the clutching-plate, and, becoming thereby depressed, will cause the thread to be clutched and drawn up during the remainder of the stroke, thus always bringing up the end of the cord to the same point, level with the point of the drill, and thus continuously maintaining it in true relative position.

The spring Y, while serving to keep the plate X pressed down in definite position to effect the depression of the collar, also serves to allow the spindle to rise after the collar is fully depressed, as will be understood. The guide-eye V, as shown in Fig. 14, is bisected, and the divisions are connected by an adjusting-screw, so that a slight gripe may be thus obtained on the end of the cord, to prevent its being raised up by the slight friction of the spindle when slipping over the cord on its up-stroke. The cutting off of the screw after insertion is effected by a flat knife, E′, working horizontally in a dovetail groove in the base of the pressure-plate A, as shown in Fig. 5, and in the inverted plan view, Fig. 15. The cutting end of the knife is reduced to extreme thinness, and is beveled to a keen edge, which works across the hole t^2, down through which the screw is inserted, the bevel of the edge being on the upper side only. A very thin steel plate, F′, is fitted over the cutting end of the knife, and over the shallow groove in which it slides, and this receives the contact of the work, which is pressed up against it. By this construction the knife is brought as near as possible to the surface of the work without being in real contact with it, which would be objectionable; yet it cuts off the screw on an actual level with the surface of the work, for, owing to the thinness of the plate F′, the leather is bulged up within the hole t^2 sufficiently to bring its surface on an actual level with the edge of the knife. Hence, by the close and level cut effected, little or no after finishing is required, which is important, especially when harness, &c., are fastened, in which the dressed surface of the leather would be liable to injury did the ends of the screws require trimming. Owing to the thinness of the cutting end of the knife, and its being well supported on all sides out of contact with the work, and cutting at the surface where the screw-cord is most unyielding, it is enabled to effect an easy and a very smooth cut without burr, which is highly requisite, since, the end of the screw being cut flat, it requires to be true in order to readily enter the screw-hole. The knife is worked by a lever, R′, Figs. 5, 6, and 7, which extends longitudinally on one side of the machine, and is pivoted to a lug projecting from one side of the frame, its front arm being bent downwardly, as shown in Fig. 7, to a level with the knife, to which it is connected in the manner shown in Fig. 5. The lever is actuated by a small cam, h^2, projecting from the side of the cam L, Figs. 6 and 7, the return movement being effected by the spring y^2, Fig. 6. The feed mechanism consists, as seen in Fig. 7, of a bent or curved lever-bar, C′, pivoted to a long lug, v^2, depending from the fixed plate 7. The lower end of the bar is reduced to small size, and is toothed, and works in the slot u^2, Fig. 15, across the end of the pressure-plate. The bar is actuated at its upper end by a crank, H′, which works in the slotted end of the lever.

As the slot of the lever is made a little shorter than the throw of the crank, it will be perceived that the desired "four-motion" will be imparted to the feed-bar by the rotation of the crank. The shaft of the crank H′ is supported in a bearing on the front edge of the fixed plate 7, (shown in dotted lines in Fig. 6,) and is driven by miter-gear d^2 (shown best in Fig. 6) from the end of a shaft, e^2, which extends on an incline to the rear of the machine, where a bevel-wheel, f^2, which it carries on its end, derives motion from a segment of teeth, g^2, on the side of the main cam K, (as seen in Figs. 6 and 7,) one complete revolution of the bevel-wheel being made at each engagement. The wheel f^2 is held, after each revolution, in true position for the next engagement with the teeth g^2 by means of a disk, s^1, Fig. 16, secured to the shaft e^2, and provided with a projection, which engages with a catch-spring, T′, secured to the frame of the machine.

A spring, I′, attached to the feed-bar C′ tends to retain it in its normal position, or that in which it is at present shown, with the feed-point on a level with the base of the pressure-plate.

The stroke of the feed is regulated by the adjusting-screw G′, the shank of which forms the pivot of the lever C′, and is rendered movable by means of the slots shown in dotted lines.

When harness, belting, or other flat work is to be fastened, the roller B and arm h^1 are removed from the screw k^1 on the slide C, and a flat steel plate, U′, (shown detached in Fig. 17, and in dotted lines in Fig. 5,) is attached in their place. The plate, when attached, extends under and parallel with the pressure-plate A, the work being placed between the two, and the plate U′ being adjusted by means of the nut m^1, so that the drill and screw descend as far as its upper surface. The operation is the same as in the case of the shoe, except that the use of the jack is discarded.

In lieu of the cam K and sector H for driving the screw-spindles, the gearing represented in Fig. 9 may be used, if preferred. a^3 b^3 are two wheels, keyed to the same shaft, and c^3 is a pinion arranged between them, and geared with the screw-spindles. The faces of the wheels are provided with sections of teeth separated by spaces corresponding to the motion desired, the spaces on one wheel being opposite the teeth on the other.

It will be understood that as the teeth of either wheel engage with either side of the pinion an alternate reverse rotary motion, with intervening pauses, will be imparted to the pinion. The pinion may be held stationary, when each pause occurs, by a stop or catch similar to that shown in Fig. 16.

The chief advantage claimed for this system of shoe-fastening is the unquestioned superiority of the product; but to secure the requisite advantage of comparative economy it is essential that the work be executed with a certain degree of rapidity. By my invention this result is effected, in a great measure, by means of the superior drill and the simple shifting movement used, but chiefly by the means whereby I am enabled to fasten the sole perfectly while the shoe is on the last, thus saving the expense of a second lasting—an important item, by which a positive economic advantage is secured.

What I claim as my invention is as follows:

1. In a shoe-soling machine, the roller B, provided with a flange or projection, bearing against the margin of the inner surface of the outsole of a shoe, and adjusted in fixed relative position with the drill or other devices which penetrate the sole, as a means of insuring the accurate and uniform penetration of the sole to the required depth at all points, substantially as herein set forth.

2. In combination with a fixed pressure plate or foot, A, a vertically-moving slide, C, having fixed thereto both the support, or partial support, for the work, and also the drill or other devices for penetrating the work, the former being situated below and the latter above the pressure-plate, substantially as herein shown and described.

3. The combination of the screw-stem k^1, nut m^1, and retaining-socket l^1, whereby a vertically-adjustable attachment of the flanged roller B to the slide C is provided, substantially as and for the purpose set forth.

4. In combination with the roller B, the shaft n^1, and disk o^1, as and for the purpose set forth.

5. In a leather-boring machine, a drill, R, the upper body portion of which is a semi-tube, while the lower extremity includes more than a semi-tube, and is provided with an edge-cutting end, substantially as and for the purpose described.

6. The combination of the cam K, sector H, and lever J with the screw-spindles E F.

7. The combination of the screw-spindles E F and sliding frame D, arranged to reciprocate across the face of a driving-wheel, to effect the simultaneous engagement and disengagement of the respective spindles with one movement, substantially as herein set forth.

8. In combination with the shifting screw-spindles E F, the retaining brakes or springs *o o*, substantially as herein set forth.

9. In combination with the screw-spindles E F and sector H, with mechanism for driving it, the fixed stops S S and elastic slot T, substantially as and for the purpose set forth.

10. In combination with the shifting-lever M, the curved slot B′ and guide-pin A′, and the movable fulcrum a^2 b^2, whereby the lever is prevented from moving out of true position when once adjusted, substantially as shown and described.

11. In combination with the thread-spindle F, the elastic griping-cushion Q, substantially as and for the purpose set forth.

12. In combination with the thread-spindle F and its clutch-collar q', the plate X, attached to the fixed frame, and pressed down and kept in definite position by the spring V, to effect the closing of the clutch at a certain point in the upstroke of the spindle, substantially as herein shown and described.

13. In combination with the thread-spindle F and its clutch-collar q', the arm p^2 and spring W, arranged to effect the opening of the clutch when the spindle reaches the end of its stroke, substantially as shown and described.

14. In combination with the thread-spindle F, an adjustable griping guide-eye, V, adapted to grasp the peg end, substantially as and for the purpose set forth.

15. In combination with the reel Q^1 and spindle F, the flexible connection D′, substantially as and for the purpose set forth.

16. The knife E′, arranged to reciprocate in the base of the pressure-plate A, with its cutting end separated from contact with the work by means of the thin plate F′, substantially as herein set forth.

17. The combination of the rubber ball U and its jet-pipe x^2 with the compressor Z, substantially as and for the purpose set forth.

18. The feed mechanism, composed of the rotary crank H′ and slotted lever C′, the lever-slot being shorter than the crank-throw, substantially as herein set forth.

19. In the jack of a shoe-machine, the tilting handle *q*, having a screw end, in combination with the center-pin *s* and socket *m*, substantially as shown and described.

20. The combination of the actuating-screw *x* and handles *y y* with the pivoted plate *t*, substantially as and for the purpose set forth.

21. In combination with the rod *d* of the jack, the ball and socket *e g* and elastic band *h*, as shown and described.

22. In combination with the shoe-socket *m*, the rubber-faced binding-screws *n n*, as shown and described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CHARLES M. HIGGINS.

Witnesses:

ELIZABETH R. LE COUNT,

MARGARET HIGGINS.