(No Model.) 7 Sheets—Sheet 1.

J. J. BREACH.

MACHINE FOR CUTTING OUT BOOT OR SHOE SOLES.

No. 589,409. Patented Sept. 7, 1897.

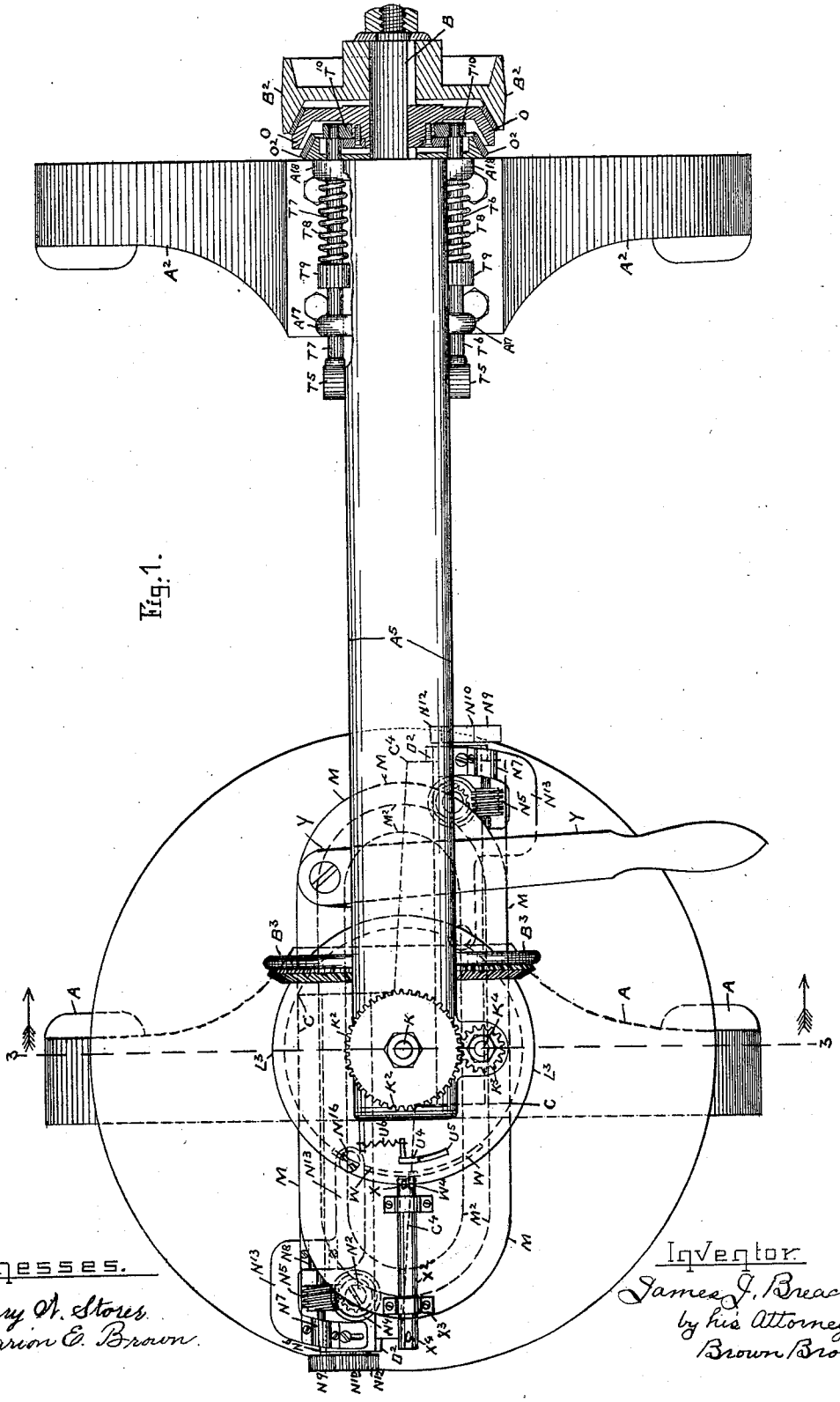


Fig. 1.

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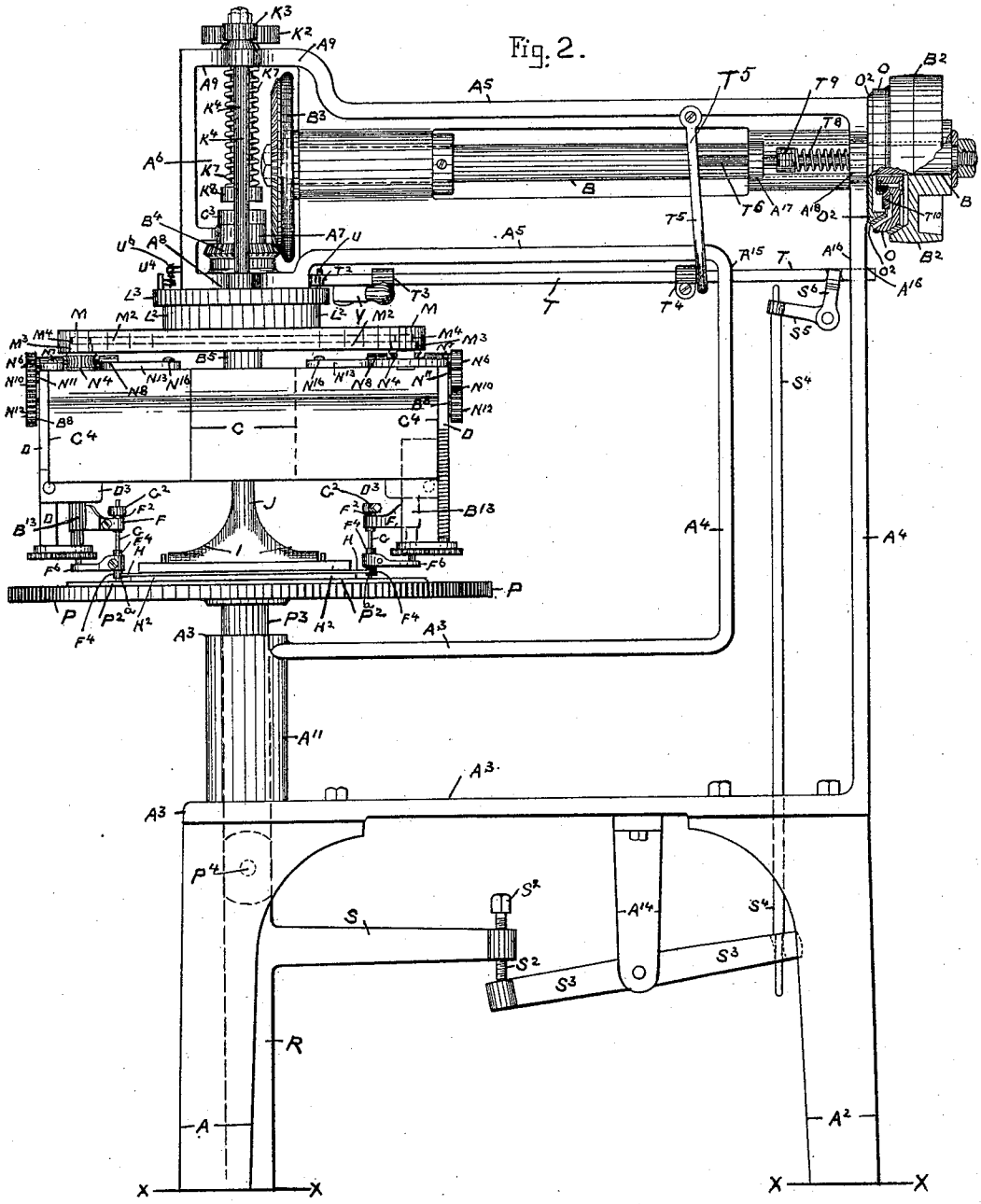
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Fig. 2.



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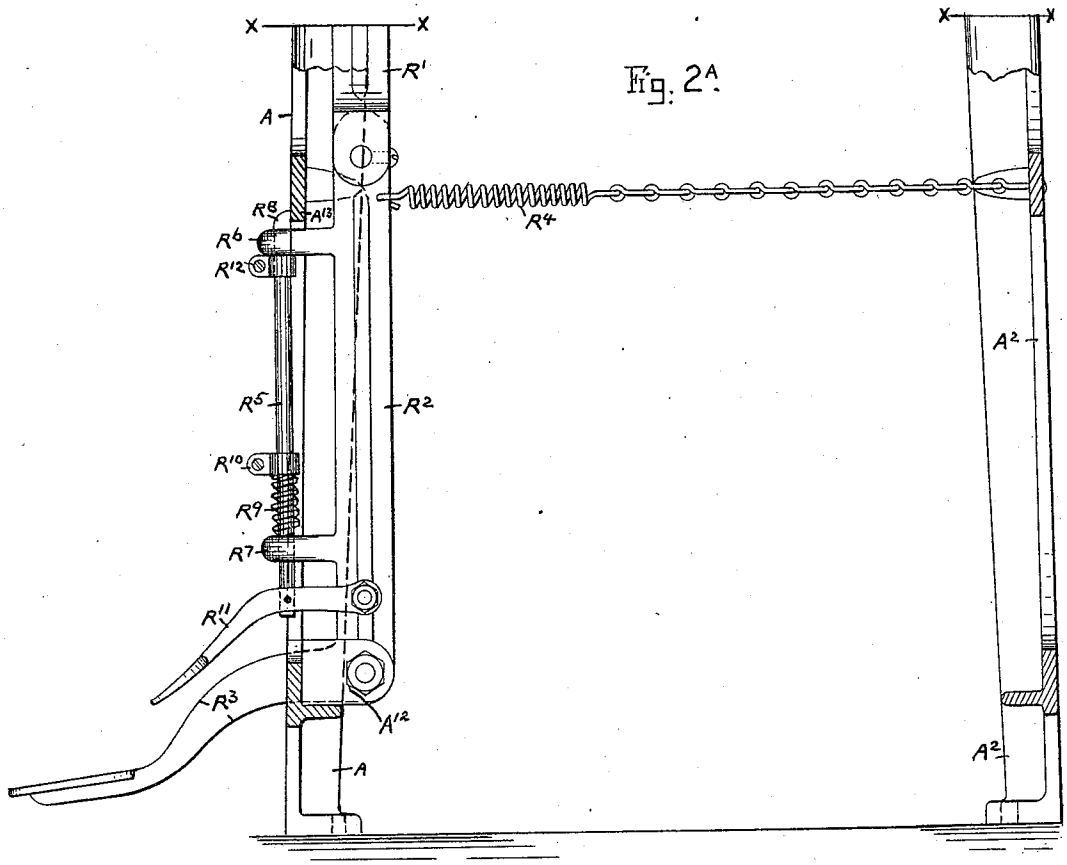
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MACHINE FOR CUTTING OUT BOOT OR SHOE SOLES.

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Fig. 2A.



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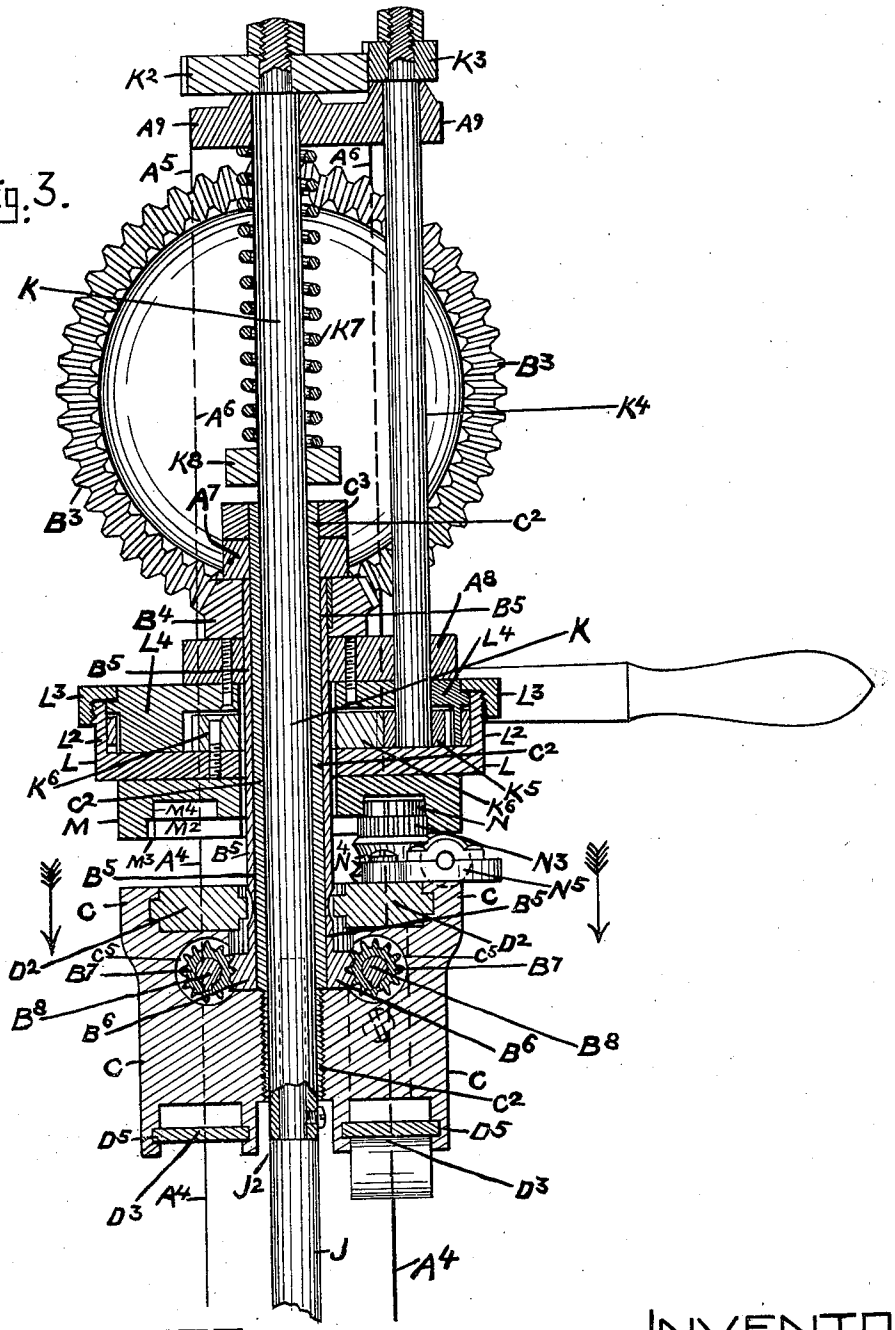
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J. J. BREACH.

MACHINE FOR CUTTING OUT BOOT OR SHOE SOLES.

No. 589,409. Patented Sept. 7, 1897.

Fig. 3.



WITNESSES

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J. J. BREACH.

MACHINE FOR CUTTING OUT BOOT OR SHOE SOLES.

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Fig. 4.

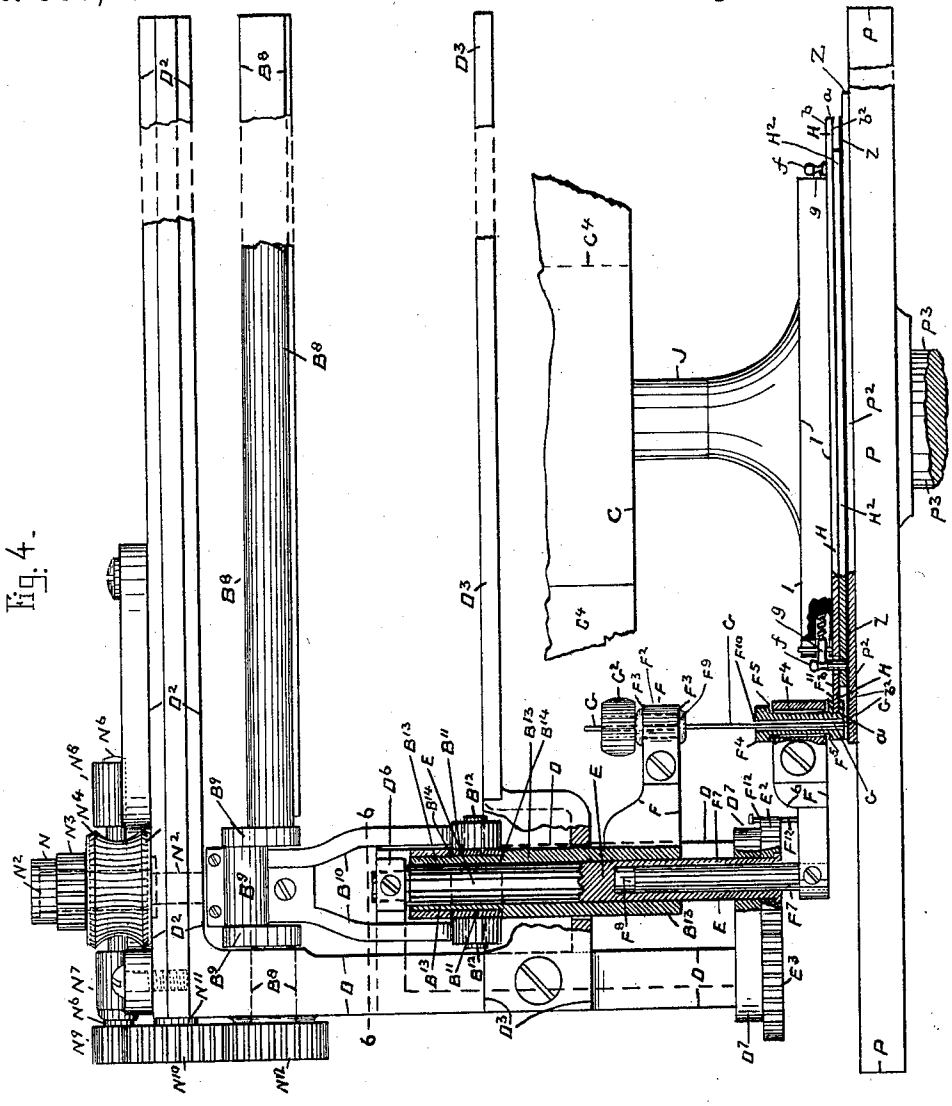


Fig. 5.

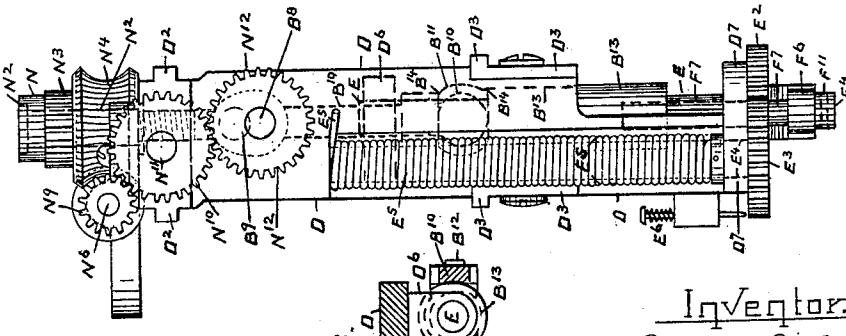
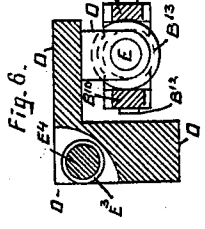


Fig. 6.



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J. J. BREACH.

MACHINE FOR CUTTING OUT BOOT OR SHOE SOLES.

No. 589,409. Patented Sept. 7, 1897.

Fig. 7

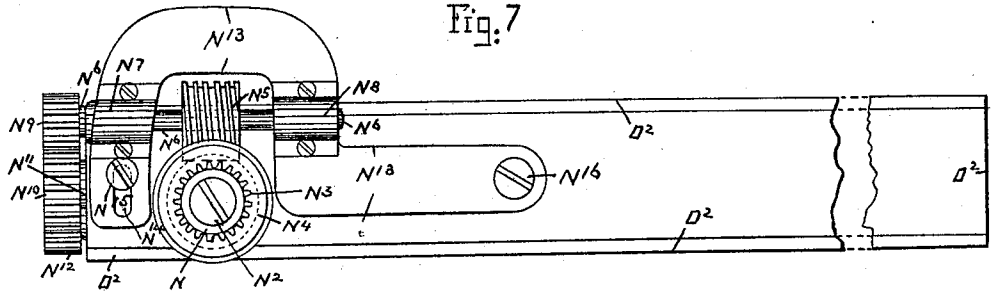


Fig. 10.

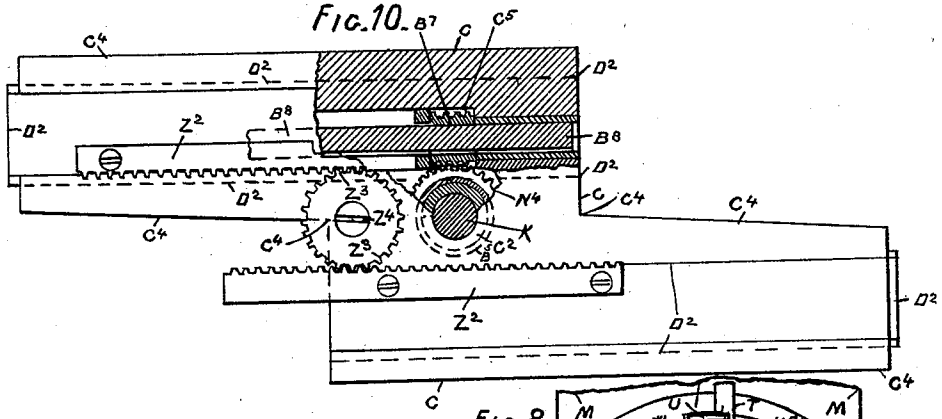


Fig. 8.

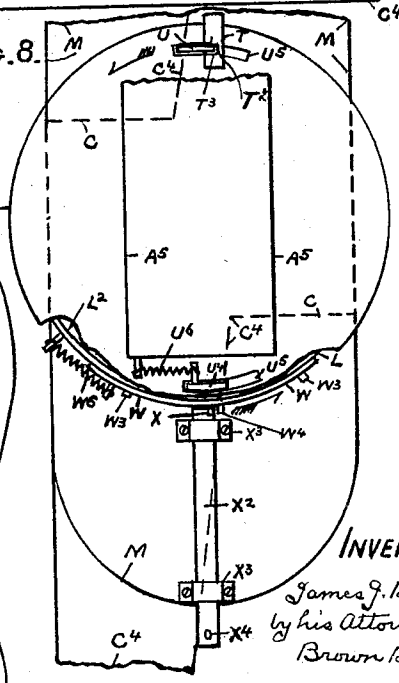
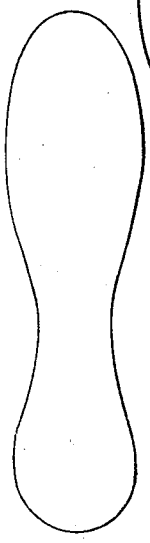


Fig. 11.



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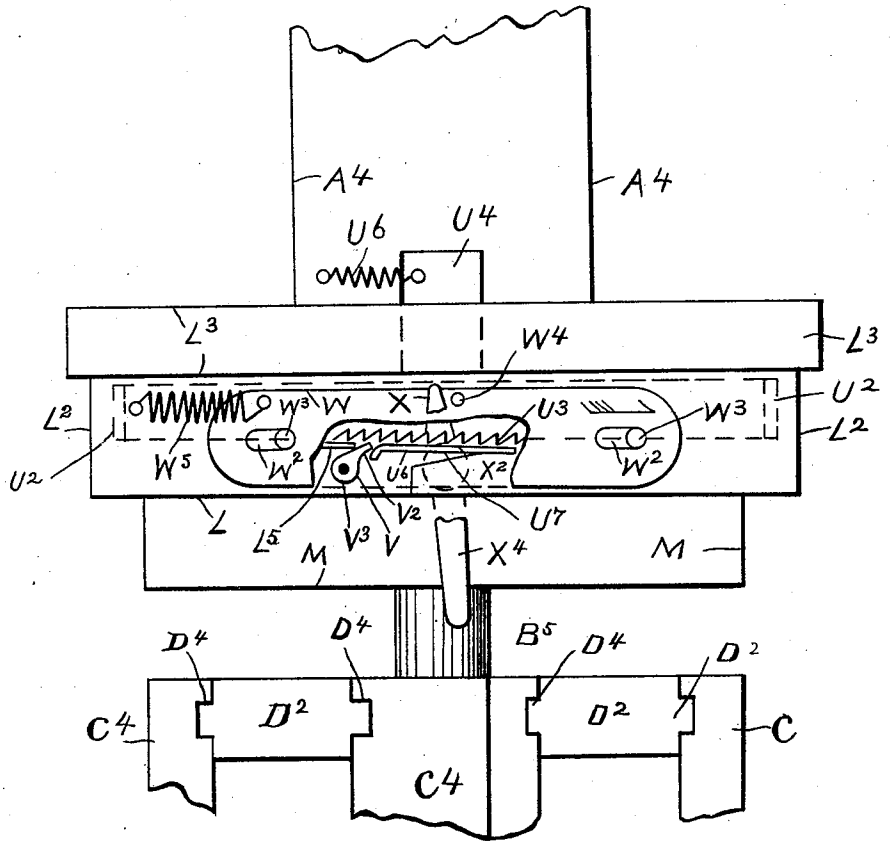
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J. J. BREACH.

MACHINE FOR CUTTING OUT BOOT OR SHOE SOLES.

No. 589,409. Patented Sept. 7, 1897.

FIG. 9.



WITNESSES

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UNITED STATES PATENT OFFICE.

JAMES J. BREACH, OF BOSTON, MASSACHUSETTS.

MACHINE FOR CUTTING OUT BOOT OR SHOE SOLES.

SPECIFICATION forming part of Letters Patent No. 589,409, dated September 7, 1897.

Application filed June 15, 1891. Serial No. 396,366. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. BREACH, a citizen of the United States of America, and a resident of the city of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machines for Cutting Out Boot or Shoe Soles, &c., of which the following is a full, clear, and exact description.

This invention relates to a machine for cuting out articles from sheet material, and more particularly to machines for cutting out full and tap soles from leather, leather-board, or other suitable sheet material.

The object of the invention is to produce a machine which will readily cut out articles from sheet material of irregular curvilinear outline, and a machine employing a reciprocating cutter having provision for always presenting its cutting edge at the proper angle relative to the outline of the article to be cut, and, further, to generally improve the construction and operation of machines of this character.

To this end the present invention consists of the devices and combination of devices which will be hereinafter described and claimed.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view. Figs. 2 and 2^A, with the parts represented placed to coincide along lines *x x* of each figure, make a complete side elevation. Fig. 3 is a vertical section on line 3 3, Fig. 1, parts being in elevation. Fig. 4 is a side elevation, parts being in section, of a portion of the machine, showing the sliding part of the cutter-carrier. Fig. 5 is an end elevation of the sliding part of the cutter-carrier shown in Fig. 4. Fig. 6 is a horizontal section on line 6 6, Fig. 4. Fig. 7 is a plan view of the sliding cutter-carrier. Fig. 8 is an enlarged plan, and Fig. 9 is an end view, of the automatic clutch-operating devices. Fig. 10 is a plan, parts being in section, of a rotating support for the cutter-carrier, and Fig. 11 is a plan view of a sole pattern illustrating a modification.

The machine comprises a frame of suitable size and shape to support the working parts, and may conveniently consist of two leg-frames A A^2, one, A, at the front and the other, A^2, at the rear of a horizontal arm A^3, that is rigidly secured to both of said frames and makes part of a gooseneck standard A^4 A^5, and of which the upright portion A^4 is at the rear and the horizontal portion A^5 extends to the front end of and is directly over and above said horizontal arm A^3.

B is the driving-shaft.

The driving-shaft B is preferably horizontal, as shown, and at its opposite end portions it turns in bearings of the horizontal portion of the gooseneck standard A^4 A^5.

The driving-shaft B has a loose pulley-wheel B^2 confined against lateral movement and a sliding clutching-collar O splined on it and adapted to slide in one direction to clutch the loose pulley B^2 to cause the shaft to rotate and in the other direction to unclutch it from the loose pulley-wheel and to clutch the driving-shaft to the fixed projection O^2 at the rear end of gooseneck A^4 A^5 and thus stop the rotation of said shaft.

The pulley-wheel B^2 is driven by a belt, (not shown,) and if clutched to the shaft B the shaft is driven, and if unclutched from the shaft and clutched to the gooseneck A^4 A^5, as stated, the shaft is rigidly held against rotation.

B^3 is a bevel gear-wheel fixed to the front end of shaft B and located within a chamber A^6 at the front of gooseneck A^4 A^5.

B^4 is a horizontal bevel gear-wheel which meshes with the bevel gear-wheel B^3 and which is fixed on the upper end of a vertical tubular shaft B^5, which at its lower end has a horizontal worm-wheel B^6, which is in mesh with similar worm-wheels B^7 B^7, Figs. 3 and 10, each confined against endwise movement and free to rotate in chambers C^5 of a common head-block C.

The head-block C is rigidly secured to the lower end of a vertical shaft C^2, which is surrounded by the tubular shaft B^5, and at its upper end it is secured to a collar C^3, resting on a horizontal offset A^7 of gooseneck A^4 A^5. The horizontal bevel gear-wheel B^4 on the tubular shaft B^5 is directly under said offset and at rest on the lower wall A^8 of the chamber A^6. By resting collar C^3 on the offset A^7 the head-block C is held in position, and by resting the gear-wheel B^4 on the lower wall A^8 of the gooseneck said gear, its tubular shaft B^5, and worm-gear B^6 thereon are held

in position. The head-block C is the support for the cutter-carrier, all of which will be hereinafter described.

Each worm-wheel B^7 is splined on a separate and similarly-arranged horizontal shaft B^8, and each shaft is rotated by the rotation of and is free to move lengthwise through its worm gear-wheel B^7. Each shaft B^8 is supported and rotates on a separate and similar sliding frame, each of which constitutes a two-part support for the cutter-carrier. Each sliding frame in substance is composed of an upright D, on which said splined shaft is supported and rotates, and of horizontal bars or rails D^2 D^3, one above and the other below said shaft, and parallel with each other and said shaft, and all at right angles to said end upright D. The vertical edges of each rail D^2 D^3 are parallel, and each is adapted to fit and slide in horizontal and parallel square-sided or dovetailed ways or grooves D^4 D^5 of said head-block C, and also of its horizontal end extension C^4, one located at one end and the other at the opposite end of the block, and all so arranged that each slide-frame D D^2 D^3 is at opposite sides of and each at a corresponding distance from a common vertical plane through the axial line of the vertical tubular shaft B^5, before referred to.

Each splined shaft B^8 at the inner side of the end upright D of the sliding frame has a crank B^9, on which is hung a vertical pitman-rod B^{10} of fork shape and having between its arms or tines a tubular block B^{11}, which is held therein by axially coincident and horizontal trunnion-pins B^{12}, whereby it is free to turn or rotate on said pitman-rod. B^{13} is an upright cylindrical sleeve that passes through said tubular block and is free to turn therein, and which has shoulders B^{14} at its upper and lower end portions to hold it against lengthwise movement in said block, while allowing it to freely turn therein. E is a vertical rod which extends through and projects above and below the upper and lower ends of said sleeve B^{13} and at its opposite end portions is rigidly held on upper and lower stationary offsets D^6 D^7 of the end upright D of a sliding frame D D^2 D^3.

The fixed rod E acts as a guide for the sleeve B^{13} as it is moved up and down by the rotation of the splined shaft B^8 through the pitman-rod B^{10} and tubular block B^{11}, and said rod also acts as a bearing for said sleeve as it rotates.

Below the offset D^7 of the sliding frame is a horizontal gear-wheel E^2, which is held loosely to and free to turn on said guide-rod E, and which meshes with a horizontal gear-wheel E^3, fixed at the lower end of a vertical shaft E^4, which at its opposite end portions is held and turns in bearings on the upright D.

E^5 is a coiled spring under tension surrounding the shaft E^4. The spring E^5 is attached at one end to the shaft E^4, and at the other end it rests on the end upright D, the arrangement being such that a turning of the shaft in one direction is against the tension of said spring and in the other direction with the tension of said spring. The sleeve B^{13} has a horizontal radial or side extension or arm F, and this arm at its outer end has a vertical cylindrical block F^2, which is shouldered at its opposite ends F^3, and thereby is held on and is free to turn in said arm. The axial line of this block F^2 is parallel with the axial line of the rotation of the sleeve B^{13} on the fixed vertical guide-rod E, and below said block E^2 is another similar block F^4, which by its end shoulders F^5 is similarly held and is free to turn on another arm F^6 in radial extension of vertical shaft F^7, which is entered into and free to turn in the vertical socket F^8 of the lower end portion of sleeve B^{13} on said guide-rod E and concentric with the axis thereof.

F^{12} is a vertical pin fixed on the lower arm F^6 in position to be engaged with the teeth of the horizontal gear-wheel E^2, and thus said arm F^6 is placed under the tension of the coiled spring E^5 and given a yielding and elastic pressure in its bearing by its block F^4 against the edge of the pattern-plate, all as hereinafter appears.

The axes of the upper and lower blocks F^2 and F^4 are at corresponding distances from the axial line of rotation of the sleeve B^{13} and shaft F^7.

G is a vertical blade which in cross-section is of rectangular shape and extends from block F^2 to block F^4 and through corresponding rectangular bores F^9 and F^{10} of each block, and it is attached to the upper block F^2 by means of a collar G^2, which fits upon and is fastened to a split projection of said block F^2. (See dotted lines, Fig. 4.) In the machine of the drawings there are two of these blades G, and the lower end of each has a chisel cutting edge, so that as each blade is vertically reciprocated the sheet material suitably held and located therefor will be cut out thereby, all as hereinafter appears.

For the purpose of accurately positioning the cutting edge of the knife G relatively to the contour of the article to be cut, so that the cutting edge thereof shall always be in line with the cut which it is desired to make, the knife is preferably swiveled by mounting the same in the freely-movable blocks F^2 and F^4, as described, and said knife and its supporting-blocks are turned to bring its edge in proper position by a suitable guiding contact with the pattern H, which guiding contact may conveniently be secured by the following construction.

The lever-block F^4 in arm F^6 and preferably below the said arm has a peripheral notch F^{11}, suitably shaped to have a guiding contact against the exposed edge *a* of a horizontal pattern-plate H, and, as shown, bears against the upper and lower surfaces *b* and b^2 of said pattern.

The pattern H is detachably held against the under side of a block I, concentrically se-

cured to the lower end portion of a vertical stem or rod J, which has its upper end portion entered into a vertical socket J^2 and detachably secured to the lower end of a vertical shaft K, in upward extension of said stem J, and free to turn in the vertical sleeve C^2 of the head-block C and the collar C^3 of said sleeve and in the upper wall A^9 of the chamber A^6 of the gooseneck A^4 A^5. The shaft K within the chamber A^6 is surrounded by a coiled spring K^7, confined end to end between the upper wall A^9 of said chamber and a collar K^8, fixed on the shaft K. Again, the shaft K at its upper end portion has a horizontal gear-wheel K^2 fixed thereto, and this gear rests on said upper wall A^9 of the gooseneck A^4 A^5 and is in mesh with a smaller horizontal gear-wheel K^3 at the upper end portion of a vertical shaft K^4, which at its opposite end portions turns in suitable bearings of the upper and lower walls A^9 A^8 of the chambered head of the gooseneck A^4 A^5 and at its lower end portion has a horizontal pinion gear-wheel K^5, in mesh with a larger horizontal gear-wheel K^6, which turns about the vertical tubular shaft B^5, which is directly geared, as explained, with the driving-shaft B.

The gear-wheel K^6 is at the upper side of and rigidly held on a horizontal circular disk L, surrounding and free to turn about the tubular shaft B^5. This disk L has an upward-projecting peripheral flange L^2, that is capped by a screw-threaded ring L^3, screwed onto its upper end and shaped to lap horizontally and loosely over a horizontal annular block L^4, which loosely surrounds said tubular shaft B^5 and is made fast to the under side of the lower wall A^8 of the chambered head A^6 and has the upper side of the disk L at a bearing against its under side.

M is a flat and horizontal plate made fast to the under side of the circular disk L and loosely surrounding and free to turn about said tubular shaft B^5. This plate M, as shown, is of greater dimension in one than in the other direction, and at its under side it has a continuous and encircling groove or way M^2, which is of uniform width throughout, and, as particularly shown, Figs. 1 and 3, is composed of two straight and parallel lengths, which at their opposite ends are continued in a semicircle, each of corresponding radius and having the center of both at corresponding distances from and coincident with a straight line through them and the axis of said tubular shaft B^5. This groove or way M^2 has a continuous vertical toothed rack M^3, forming the lower portion of its outer edge, and a vertical flat face M^4 above said rack and forming the upper portion of its said outer edge. The flat face M^4 of the way M^2 forms a bearing for a horizontal friction-roller N, turning loosely on a vertical stud N^2, rigidly held on the upper rail D^2 of a sliding frame D D^2 D^3, and the toothed rack M^3 of the way M^2 has meshing with it a horizontal pinion gear-wheel N^3, turning on said stud N^2 and having a concentric worm gear-wheel N^4, both turning as one. The worm gear-wheel N^4 is in mesh with a worm N^5 of a horizontal shaft N^6, that turns in bearing-blocks N^7 N^8, held on the upper rail D^2 of a sliding frame D D^2 D^3, and outside of the end upright D of said frame it has a pinion gear-wheel N^9, in mesh with a vertical gear-wheel N^{10}, turning on a fixed stud N^{11} of said end upright and in mesh with a gear-wheel N^{12}, held on the splined and crank shaft B^8 belonging to said sliding frame.

P is the platen. This platen is rigid and horizontal, and it is flat on its upper side, and, as shown, its outline is preferably circular. Again, preferably the platen is made of iron or other suitable and rigid metal or other material; but if it is not always suitable its upper side is provided with a sheet P^2 of leather-board or other suitable sheet material, all so arranged as to make it suitable for a cutting-block and also to make it suitable as one jaw or part of a clamp, the other jaw of which is the under side of the pattern H, held on the block I as before mentioned, or preferably, as shown, by the use of an interposed plate H^2, made of iron or other suitable material and held against the under side of the pattern H.

The platen P is rigidly held at the upper end of a vertical spindle P^3, that is contained and is free to move up and down within a vertical guide-bearing A^{11} at the front end of the lower horizontal arm A^3 of the supporting-framework of the machine, and the axial line of this guide-bearing is coincident with the axial line of the vertical tubular shaft B^5, hereinbefore referred to. The spindle P^3 at its lower end is hung by a horizontal pivot P^4 on the upper end R of a vertically-located toggle-lever R' R^2, consisting of an upper arm R' and a lower arm R^2, which are pivoted end to end together. The lower toggle-arm R^2 at its lower end is pivoted to earpieces A^{12} at the lower portion of the front leg-frame A, and below said earpieces it is extended forward and horizontally and adapted as a foot or treadle lever R^3, so that by pressing down said treadle the toggle-arms are straightened out, pulling against the tension of a spiral spring R^4, that is hung at its opposite ends on the lower toggle-arm and on the rear leg-frame A^2. By this operation of the toggle-lever the platen P is raised, and with it the sheet material to be cut out, toward the plate H^2, and finally firmly clamped between said plate H^2 and platen P, secured, preferably, by fastening and holding with suitable means the toggle-lever in its said straightened position.

Means to hold the toggle-lever in its position clamping the sheet material to be cut out between the platen P and the pattern H, as just described, are shown in Fig. 2^A. They consist of a vertical catch-rod R^5, which at its opposite end portion is arranged to play through upper and lower earpieces R^6 R^7 of the lower toggle-arm R^2. This catch-rod R^5,

as the toggle-lever straightens, moves toward the front leg-frame A, and the upper end thereof is adapted to first pass under the lower edge of the vertical lip A^{13} of said leg-frame and to be raised vertically outside of said lip A^{13}, the rod being raised by the tension of spring R^9, confined end to end on said rod between a fixed collar R^{10} and the lower guiding-earpiece R^7 therefor, the rod being held up and its end in contact with the face of lip A^{13} until said catch-rod is depressed by placing the foot on and pressing down a treadle-lever R^{11}, fulcrumed on the lower toggle-arm R^2 and hung on the lower end of said catch-rod R^5, whereby the toggle-lever by the action of its spring R^4 is moved backward, bringing its arms into a more or less angular vertical position and lowering the platen P and releasing the sheet material previously held on it and clamped between it and the pattern H, as has been described.

R^{12} is a collar fixed on catch-rod R^5, which acts by striking the upper earpiece R^6 as a stop to the upward movement of the rod R^5.

The toggle-lever described and in the machine of this invention, as it is practically shown, is utilized to secure from its movements to straighten and to bend its arms movements of the clutching-collar O of the driving-shaft to clutch and to unclutch the driving-shaft B and the driving pulley-wheel B^2, and by mechanism as follows:

S is a horizontal arm which is projected from the rear edge of the upper toggle-arm R′ and toward the rear of the machine.

S^2 is an adjustable vertical pin held on and at the outer end portion of the arm S, so located that as the toggle-lever straightens said pin bears and presses downward on the upper edge of a lever S^3, which intermediately of its length is fulcrumed on a fixed support A^{14}, depending from the under side of the horizontal arm A^3 of the framework of the machine. The rear end of the lever S^3 is connected to the lower end of a vertical rod S^4, that at its upper end is connected to one arm S^5 of a vertically-placed bell-crank lever S^5 S^6, which is fulcrumed on and at one side of the gooseneck A^4 A^5, and the other arm of the bell-crank lever is connected to the rear end of a horizontal rod T, that extends lengthwise along and under the horizontal arm of the framework and is arranged for lengthwise movement through suitable supporting-bearings A^{15} A^{16} of the vertical arm A^4 of the gooseneck A^4 A^5. The horizontal rod T is just above the screw-threaded ring L^3 of the upwardly-flanged disk L, hereinbefore referred to, and one of its vertical sides has a notch T^2, Fig. 8, in position when said rod is suitably placed therefor to be engaged with a vertical arm U of a vertical and edgewise-placed ring U^2, which is contained within and concentrically encircles the flange of said flanged disk L and is constructed and operated as will be hereinafter described.

T^3 T^4 are two collars fixed on the horizontal rod T, and one, T^3, is in position for engagement with a horizontal handle-lever Y, which is fulcrumed on the horizontal arm A^5 of gooseneck A^4 A^5, and when it is moved in the proper direction to strike said collar and thereby move said rod in a direction toward the rear of the machine. The other collar T^4 is in a position on a rearward slide of the rod T, as above stated, to strike the lower portion of a vertical stirrup-shaped frame T^5, which lies on the opposite vertical sides of swings on the horizontal arm A^5, and thereby to swing said frame T^5 to bring it to a bearing on and press against the front end of two horizontal rods T^6 T^7, which are located on opposite sides of the horizontal arm A^4 and are supported and guided by fixed side earpieces A^{17} A^{18} on said arm A^4 and to move said rods rearward against coiled springs T^8, one on each rod, confined between fixed collars T^9 of the rear bearing-earpieces A^{18}. The slide-rods T^6 T^7 at their rear end portions pass loosely through the fixed beveled clutching-block o^2, hereinbefore referred to. The sliding clutching-collar O at its end toward said block O^2 is interiorly suitably shaped to receive and closely fit over said clutching-block O^2, and at its other end toward the driving pulley-wheel B^2 it is externally suitably shaped to enter into and closely fit the inner peripheral wall of the rim of the said pulley-wheel, entering the rim at its end toward said sliding clutching-collar O.

The axis of the slide-rods T^6 T^7 and driving-shaft B are parallel and in a common horizontal plane, and the slide-rods are axially at corresponding lateral distances from the axis of the driving-shaft.

T^{10} is a flat ring fixed on the rear ends of the slide-rods T^6 T^7 and lying within and engaging a peripheral groove of the hub of the sliding clutching-collar O, and thus the slide-rods T^6 T^7 are engaged with the clutching-collar, so that when the rods are moved in either direction the clutching-collar is correspondingly moved, while at all times it is free to rotate in unison with the shaft B, and thus by a slide of the clutching-collar O in one direction the driving-shaft B and pulley-wheel B^2 are clutched and in the other direction the driving-shaft and fixed clutching-block O^2 are clutched. The slide of the clutching-collar O to clutch driving-shaft and pulley-wheel is against the springs T^8 about the slide-rods, and the slide of the clutching-collar to clutch driving-shaft and block O^2 is by the tension of said springs, and the slide of the collar to clutch driving-shaft and pulley-wheel can be secured by straightening the toggle-lever R R^2 or by a proper swing of the handle-lever Y each way independent of the other.

The drawings show the driving-shaft B and its pulley-wheel B^2 as clutched by straightening the toggle-lever R R^2 and so held by the engagement of clutch-rod R^5 with front leg-frame A, as described. Again, they show the platen P and pattern H as closed and having

clamped between them the sheet material to be cut out; also, two cutters to cut out the clamped sheet material, a cutter at each end of the pattern along its longest axis, and the cutters and their carriers as in their lowest position; also, the horizontal rod T connected to the toggle-lever and to the sliding clutching-collar O^2, as engaged by its side notch T^2, with the upright U of the ring U^2 contained within the flanged disk L. In other words, all parts of the machine so far as has been described are shown as in the position required from the particular arrangement of the machine described to begin and to proceed with the cutting out from the clamping sheet material of a piece thereof of dimensions and outline substantially corresponding to those of the pattern and under an operation of the parts to be explained, but before doing so the ring U^2, before referred to, its particular construction and arrangement, and the parts for operating it will be described. Entirely around the lower edge of the ring U^2 are ratchet-teeth U^3, Fig. 9, and diametrically opposite to the arm U, which engages the rod T for operating as has been described, the ring has another upwardly-projecting arm U^4, and this arm and said arm U pass through separate and similar slots U^5 of the top of the flanged disk L, said slots extending in a circular direction, having its center coincident with the axis of rotation of the tubular shaft B^5.

The flange L^3 of the disk L at its front side has an opening at which is a flat spring U^7, fixed at one end to said flange or disk and at its other free end in position to bear upwardly against the under side of the toe V^2 of a pawl V, which is fulcrumed at its heel V^3 on the inside of a plate W, arranged to slide on and about the perimeter of the flange L^3 of the disk L, and whereon it is confined and guided by its lengthwise slots W^2 and fixed pins W^3 on said flange L^3 and which engage said slots.

W^4 is a pin projecting horizontally from the slide-plate W and in position to be struck by the upper end portion of a vertical arm X of a horizontal shaft X^2, which turns in bearing-blocks X^3, fixed on the upper side of the grooved and rack plate M, and has the vertical plane of its axial line coincident with that of the central longitudinal line of and projects beyond the end of said plate, where it is provided with a vertical depending arm X^4, that has its lower end portion in position to be struck and acted on by the upper side of the bearing-block N^7 or other suitable projection of the upper side of a sliding frame D D^2 D^3 as said frame turns, as before explained, about the axis of the tubular shaft B^5, before referred to.

The parts above explained and which are between the turning two-part cutter-carrier support of the machine and the slide-plate W of the disk L are constructed and arranged so that by the turn of said support and the abutment and action of its said bearing-block N^7 on the dependent arm X^4 of the horizontal shaft X^2 said shaft is rotated in a direction to carry the upper arm X of said shaft X^2 into a position to act on the pin W′ of the slide-plate W to move said slide W in the direction of the arrows, Figs. 8 and 9, carrying the pawl V in the same direction. The movement of the pawl V, by the movement of plate W, causes the spring U^7 to force the pawl in engagement with the ratchet-teeth of the ring U^2, and thus said ring and its upright arms U U^4 are moved around on the disk L and causes the arm U to be disengaged from the slide-rod T, connected with the sliding clutching-collar O, as has been explained, which by the action of the springs causes the collar O to be moved away from pulley B^2, as has been described, thus stopping the rotation of the driving-shaft B. As the bearing-block N^7 moves past the dependent arm X^4 of the horizontal shaft X^2 the slide W and the ratchet-ring U^2 are each returned to their normal positions, the slide W by the tension of a spiral spring W^5, fixed at its opposite ends on said slide and on the flanged disk L, and the ratchet-ring U^2 by the tension of a spiral spring U^6, fixed at its opposite ends on the front arm U^4 of said ring and on the chambered head A^6 of the gooseneck A^4 A^5.

The pawl V, carried by the slide W, as explained, in the normal position of the slide has its toe V^2 at rest against under side of a fixed shelf L^5 of the flanged disk L, all so that the pawl is thereby held out of engagement with the teeth of the ratchet-ring U^2, while free to engage with said teeth as the slide W begins to move, and continues its movement, as aforesaid, for the reason that by such movement the pawl moves away from said shelf L^5 and so is released from its restraint, and as it is pressed upward by the spring U^7 necessarily it is engaged and held in engagement with the teeth of said ratchet-ring, which thereby is carried with the slide W on its continued movement.

Fig. 4 shows by a heavy line a sheet Z of leather clamped in position for being cut out by the knife G in accordance with the sole-pattern H, and, furthermore, said figure shows means for holding the pattern in position by the under plate H^2, against which the leather Z is directly clamped, as has been explained. These means may consist of vertical pins *f* at opposite ends of and fixed to the plate H^2 and projected upward through holes suitably located on the pattern. Above the pattern each pin is grooved peripherally and at its groove is engaged with a horizontal spring-bolt *g* at each end of the lower portion of the block I in suitable position to engage the pins, as aforesaid. By pushing back the spring-bolts *g* the pattern is released for removal and placing thereon of another, all as is obvious without further explanation, and with the bolts engaged with the pins the plate H^2 is held in close contact with the pattern and the pattern held on the block I.

The operation of the machine and its several parts, with a leather sheet clamped on the cutting-block, all as described, on a rotation of the driving-shaft B, is as follows: The two-part support holding the two cutting-carriers, and consisting of head-block C and slide-frames D D^2 D^3 on said block, is, with its supporting-sleeve C^2, rotated around the axis of the vertical tubular shaft B^5 by means of meshing gear-wheels B^3 B^4 on said shafts and the driving-shaft B, a worm gear-wheel B^6 on the lower end of shaft B^5, two worms B^7, meshing said worm-wheel B^6 on its opposite sides and free for the longitudinal slide therethrough of separate horizontal splined shafts B^8, supported and turning in suitable bearings of said slide-frames D D^2 D^3. The rotation of the splined shafts B^8, as explained in each case, imparts a vertical reciprocation to the vertical cutting blades or chisels G to and through the leather clamped on the cutting-block, and as the two-part support for the cutter-carriers rotates, as explained, cutting the leather along a line which corresponds in direction and shape to the outline of the fixed pattern H. This up-and-down movement of the cutting-blades G is secured by means of the cranks B^9 on the splined shafts B^8, stirrup-shaped pitmen B^{10}, hung on said cranks, vertical sleeves B^{13}, suspended on said pitmen and moving up and down and swinging on fixed vertical guide-rods E of the slide-frames D D^2 D^3, carrying said splined shafts B^8, in combination with upper radial arms F, held on and swinging with said sleeves B^{13}, and lower radial arms F^6, held on vertical rods F^7, turning within said guide-rods E for said sleeves B^{13}, vertical blocks F^2 F^4, held and swiveling on said radial arms and vertically joined by said cutting-blades G, which swivel in conjunction with said blocks as they are moved up and down through the lower swiveling blocks, as before stated. This swiveling of the blocks is caused by the bearing of the lower blocks against and their travel around the edge of the pattern H, and to this edge they are confined with an elastic pressure exerted by coiled springs E^5, connected to them and the sliding frames, as explained, and, furthermore, the lower swiveling blocks and the upper swiveling blocks and the parts connecting them, and the splined shafts B^8, and slide-frames supporting said shafts, all as has been explained, are moved toward and away from the vertical axial line of the pattern, or, in other words, the vertical axial line of rotation of the two-part support of the cutter-carriers, by means of the gear-wheels N^{12} of the splined shafts B^8, a stationary toothed rack M^3 and pinion gear-wheels N^3, meshing said rack, and intermediate gear-wheels meshing each other, and said gear-wheels N^{12} and pinion gear-wheels N^3 and their shafts or studs severally located between said gear-wheels N^{12} and said pinion gear-wheels N^3, as follows, to wit: Gear-wheels N^{10}, meshing said gear-wheels N^{12}, turning on studs N^{11}; gear-wheels N^9, fixed on shafts N^6, turning in bearing-blocks N^7 N^8 of the sliding frames D D^2 D^3; worms N^5, fixed on said shafts N^6, and worm gear-wheels N^4, turning on studs N^2 and carrying said pinion gear-wheels N, meshing said toothed rack M^3.

The result of the operation of the machine, as explained, is the cutting out from the clamped leather sheet of a piece corresponding substantially in outline and size to those of the pattern H. This result is accomplished in the machine of the drawings by a half-rotation of the two-part supports C and D D^2 D^3 for the cutter-carriers, for the reason that two cutters are simultaneously cutting the leather sheet at opposite points thereof and continuously moving at the same time and in the same direction around the pattern and each for one-half or thereabout of the entire length of the outline of the pattern.

On the completion of the cutting out of the leather, as explained, the run of the machine is then arrested by an automatic unclutching of driving-shaft B and driving-pulley wheel B^2 by the release of the upright arm U of ratchet-ring U^2 from engagement with the sliding rod T, forming part of the collar O of the clutching mechanism, all as described. This release of arm U is caused from a partial rotation of ratchet-ring S^2 by the pawl V of the slide-plate W, which then is moved on and about the vertical edge of the horizontal circular disk L by the action of the upper lever-arm X on the pin W^4 of said sliding plate W. This movement of said plate W is produced by a partial rotation or rock of the shaft X^2, carrying lever-arm X in bearing-blocks X^3 of the plate M, having the toothed rack M^3, and it is secured by the impingement and riding against the dependent or lower lever-arm X^4 on shaft X^2 of a bearing-block N^7 on a slide-frame of the two-part and rotating cutter-carrier supports C and D D^2 D^3.

The unclutching, as stated, of the driving-shaft B and pulley-wheel B^2 is because of the slide on the shaft of the clutching-collar caused by coiled springs T^8, and immediately as they are unclutched the shaft is clutched to the collar O^2 of the supporting-framework of the machine, and thereby is secured an absolute and instant arrest of the rotation of the driving-shaft B and the stopping of the machine.

With the machine stopped, as explained, the cutting-block P, constituting, with the pattern-plate H, the holding-clamp of the leather to be cut, all as stated, is then released for the removal of the cut-out piece of leather and for the insertion of a new piece therebetween, which is then clamped to and between the pattern-plate H and cutting-block, as now to be explained.

The unclamping of the cut-out piece is secured by a downward movement of the cutting-block P, in part because of its own weight, but positively because of the bend of the tog-

gle-lever R R^2 from the recoil or tension of its coiled spring R^4, as said lever is released by depressing the treadle-lever R^{11} sufficiently to disengage the catch-rod R^5 from the machine-supporting leg-frame A.

The clamping of the leather sheet is secured by depressing the treadle-lever R^3, which straightens out the toggle-lever R R^2, and thus raising the cutting-block P the leather sheet is clamped between it and the pattern and to the latter, on which the whole is made fast by the then automatic engagement of the catch-rod R^5 with the leg-frame A, all as is obvious without further explanation.

The toggle-lever R R^2, as particularly shown and described, is connected with the clutching mechanism of the driving-shaft B and pulley-wheel B^2 for the bend of the toggle-lever R R^2 to secure an unclutching of said shaft and pulley-wheel and to allow said shaft to be clutched to the supporting-frame of the machine, as before explained, and for the straightening of said toggle-lever to secure the clutching of said shaft and the pulley-wheel.

The unclutching above stated results from the bend of the toggle-lever R R^2, which releases the bearing-pressure of the arm S of the toggle-lever on the lever S^3, and, through said lever S^3, vertical rod S^4, bell-crank lever S^5 S^6, slide-rod T, and stirrup-frame T^5, the springs T^8 of the clutching-collar O to action to move said collar and rod in a direction freeing or unclutching said collar from the loose pulley-wheel B.

The clutching above stated results from the straightening of the toggle-lever R R^2, which through its arm S brings pressure on and movement of the lever S^3 in a direction and also a movement of vertical rods S^4, bell-crank lever S^5 S^6, slide-rod T, collar T^4, stirrup-frame T^5, and rods T^6 T^7 of clutching-collar O^2, all so that the clutching-collar O is pressed against its springs T^8 into contact with the loose pulley-wheel B^2, and thereby said wheel and shaft B clutched and so held by the then fastening, as has been explained, of the toggle-lever in its straightened position, and also by the then engagement, as before explained, of said slide-rod T and an upright arm U^4 of the ratchet-ring U^2. The machine, as has been explained, plainly has two means for clutching the driving-shaft B and pulley-wheel B^2—to wit, the means in connection with the toggle-lever R R^2 and the sliding clutching-collar O and the handle-lever Y; and, again, also two means for holding the driving-shaft B and pulley-wheel B^2 clutched—to wit, the means in connection with the toggle-lever R R^2 and the sliding clutching-collar O, and the means consisting, among others, of the upright arm U to engage the slide-rod T and of ratchet-ring U^2 and pawl V for said ring, all as has been fully explained; and, again, for automatically unclutching the driving-shaft and pulley-wheel means to release said arm U from engagement with the slide-rod T as the two-part supports C and D D^2 D^3 rotate, provided all else is suitable therefor, and for unclutching the driving-shaft and pulley-wheel as the clamped leather sheet material is unclamped, provided all else is suitable therefor.

If for holding the driving-shaft and pulley-wheel clutched both mechanisms described are used or arranged in one machine, then to unclutch the driving-shaft and pulley-wheel by either of them the other must first be released. The means most preferably are those acted upon by the rotating two-part support for the cutter-carriers, in which case the handle-lever Y, arranged as described, suffices for the purpose of clutching the driving-shaft and pulley-wheel.

The rotating block C, forming one part of the two-part support for the cutter-carriers, is shown as provided with two sliding frames D D^2 D^3; but it is obvious that but one such carrier may be used or that more than two may be used, each being suitably adapted, as also the block C, to receive them all, as has been explained.

With two sliding frames D D^2 D^3 for the cutting operation only a half-rotation of the block C is necessary to complete the circuit of the pattern H, whereas with one sliding frame D D^2 D^3 a complete rotation of the block C would be necessary, and with three or more sliding frames D D^2 D^3 the necessary rotation of the block C would be proportionately reduced from a complete rotation.

Again, each sliding frame D D^2 D^3, as shown, is adapted for separate and distinct operations from a common toothed rack M^3 of plate M, to which both are geared, all as described. However, in lieu of this arrangement one frame only may be geared to said plate M and the other operated from the one so geared—for illustration, Fig. 10—by providing each sliding frame with a toothed rack-bar Z^2, both parallel to and having their toothed edges presented toward each other, and the block C, with the gear-wheel Z^3, turning on a fixed stud Z^4 of said block and in mesh with both of said bars Z^2, all so that the movement of the sliding frame, from its mesh with said plate M, is directly and immediately imparted to the other sliding frame.

In Fig. 7 the bearings N^7 N^8 for the shaft N^6, carrying the worm N^5 and pinion gear-wheel N^9, are shown as severally carried by a plate N^{13}, which at one end is of a semicircular shape and at the other end is straight and attached to the top rail D^2 of a sliding frame D D^2 D^3 by a set-screw N^{16}, on which, loosened, the frame turns as a fulcrum, so as thereby to adjust the mesh of the worm N^5 with the worm-gear N^4, the plate then moving, by its slot N^{14}, on a set-screw N^{15}, screwed into said rail D^2 and suitably loosened therefor. By tightening up the set-screws N^{16} N^{15} the said plate N^{13} is fastened to said rail, thus fixing the worm N^5 adjusted.

According to the number of sliding frames

D D^2 D^3 of the machine, and if the driving-shaft B and gear-wheel B^2 are to be held clutched by the engagement of a projecting arm, such as U or U^4 of the ratchet-ring U, and a slide-rod T of the clutching mechanism, all as explained, said ratchet-ring obviously should be provided with a corresponding number of said arms, suitably located.

The swiveling of the cutter-blade G, as described, secures the presentation of the cutting edge of the blade always in a line parallel with the line of direction of the edge of the pattern at the part of which it may be at any given time operating as it is traveling about the pattern. Again, by the means of the swinging arms F F^6, under spring-pressure and having a cutter-blade swiveled thereon, all as explained, the cutter-blade through its lower swivel-block at a bearing against the edge of the pattern H is allowed, but necessarily within given limits, to move in and out in conformity to the varying outline of the pattern and independently of the slide of the sliding frame D D^2 D^3, carrying it, and by which in turn is automatically accomplished the placing of the cutter in position to conform to extreme varying distances of points at the edge from the center point of the pattern, and which is produced by the operation of the gearing meshing the sliding frame and the toothed rack M^3 of the plate M, which is generally of the outline and diameters substantially agreeing with those of the pattern generally considered—that is to say, considering the pattern without reference to the in-and-out variations in shape which its outline may have to suit a given or special outline within given general limits—for illustration, a boot or shoe sole.

It will be noted that a plate M, having a toothed rack M^3 of given dimensions, may be used with a series of patterns of varying dimensions, and in the operation of the machine, as explained, the cutting out desired secured from the particular pattern which may be used, and the reverse is also true—that is to say, that plates M, each having a toothed rack M^3 of varying dimensions as to each, may be used with a single pattern of given dimensions and the cutting desired from the pattern accomplished in the operation of the machine, as explained.

If the pattern and the toothed rack of the plate M are of exactly corresponding outlines, varying only as to dimensions, the arms F F^6 may be rigid, for the reason that the necessary in-and-out movement of the cutters would be then accomplished by the slide of the sliding frame D D^2 D^3 of and rotating with the head-block C.

The leather sheet when clamped as stated is under elastic pressure exerted on the pattern H by the then compression of the coiled spring K^7, which is about and confined endwise on the vertical shaft K, to which the pattern is secured, as explained.

With the leather-clamping parts of the machine opened as explained, then the two-part support C and D D^2 D^3 as a whole, together with the toothed rack-plate M, flanged disk L, and gear-wheel K^6, can be swung about the vertical axial line of shaft K, causing thereby a rotation of pinion gear-wheel K^5 and through its shaft K^4 and the pinion gear-wheel K^3 on said shaft in mesh with gear-wheel K^2 of the shaft K a rotation of said shaft K and with it the pattern H, by all of which the pattern can be placed in any given direction, according as may be desired.

Having fully described the construction of my machine and its mode of operation, I claim as new and desire to secure by Letters Patent of the United States—

1. In a machine for cutting sheet material, the combination with a pattern of a reciprocating cutter, a cutter-guide through which the cutter reciprocates arranged to bear against the edge of the pattern, and mechanism for causing the cutter and its guide to travel along the pattern, substantially as described.

2. In a machine for cutting sheet material, the combination with a pattern, of a reciprocating swiveling cutter, a freely-revoluble guide turning on the swiveling axis of the cutter, and arranged to bear against the edge of the pattern, substantially as described.

3. In a machine for cutting sheet material the combination with a rotary block, of a slide moving radially thereon, and a reciprocating knife carried by said slide, and connected mechanism for actuating the knife and slide, substantially as described.

4. In a machine for cutting sheet material, the combination with a rotary block, of a slide moving radially thereon, swinging arms on said slide, and a reciprocating knife mounted in said arms and connected mechanism actuating the knife and slide, substantially as described.

5. In a machine for cutting sheet material, the combination with a rotary block, of a slide moving radially thereon, swinging spring-pressed arms on said slide, a reciprocating cutter mounted in said arms, and connected mechanism for actuating the knife and slide, substantially as described.

6. In a machine for cutting sheet material the combination with a radially-movable knife-carrier, of a reciprocating swiveling knife carried thereby and connected mechanism for actuating the knife and radially moving the knife-carrier, substantially as described.

7. In a machine for cutting sheet material the combination with a rotary block, of slides movable thereon and reciprocating cutters carried by said slides, and connected mechanism for actuating the cutters and slides, substantially as described.

8. In a machine for cutting sheet material, the combination with swinging arms, of freely-

revoluble blocks carried thereby, and a reciprocating cutter movable in said blocks, substantially as described.

9. In a machine for cutting sheet material the combination with swinging spring-pressed arms, of freely-revoluble blocks carried thereby, and a reciprocating cutter movable in said blocks, substantially as described.

10. In a machine for cutting sheet material the combination with a power-driven cutter, of a clamp to clamp the material to be cut, and connected mechanism operating to actuate said cutter upon the clamping of the material, and to stop the operation thereof at a predetermined point, substantially as described.

11. In a machine for cutting sheet material the combination with a rotary block of radially-movable cutters carried thereby, and connected mechanism for simultaneously radially moving said cutters in opposite directions during the cutting operation, substantially as described.

12. In a machine for cutting sheet material the combination with a pattern-support and pattern, and apertures in said pattern, of a spacing-plate, and bolt and stud connections between said plate and support, for clamping the pattern, substantially as described.

13. In a machine for cutting sheet material the combination with a reciprocating cutter and a swiveling grooved block through which said cutter passes, of a pattern having an exposed edge fitting the groove in said block, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JAMES J. BREACH.

Witnesses:
ALBERT W. BROWN,
MARION E. BROWN.