No. 676,457. Patented June 18, 1901.

J. J. BREACH.

MACHINE FOR CUTTING ARTICLES FROM SHEET MATERIAL.

(Application filed July 14, 1900.)

(No Model.) 7 Sheets—Sheet 1.

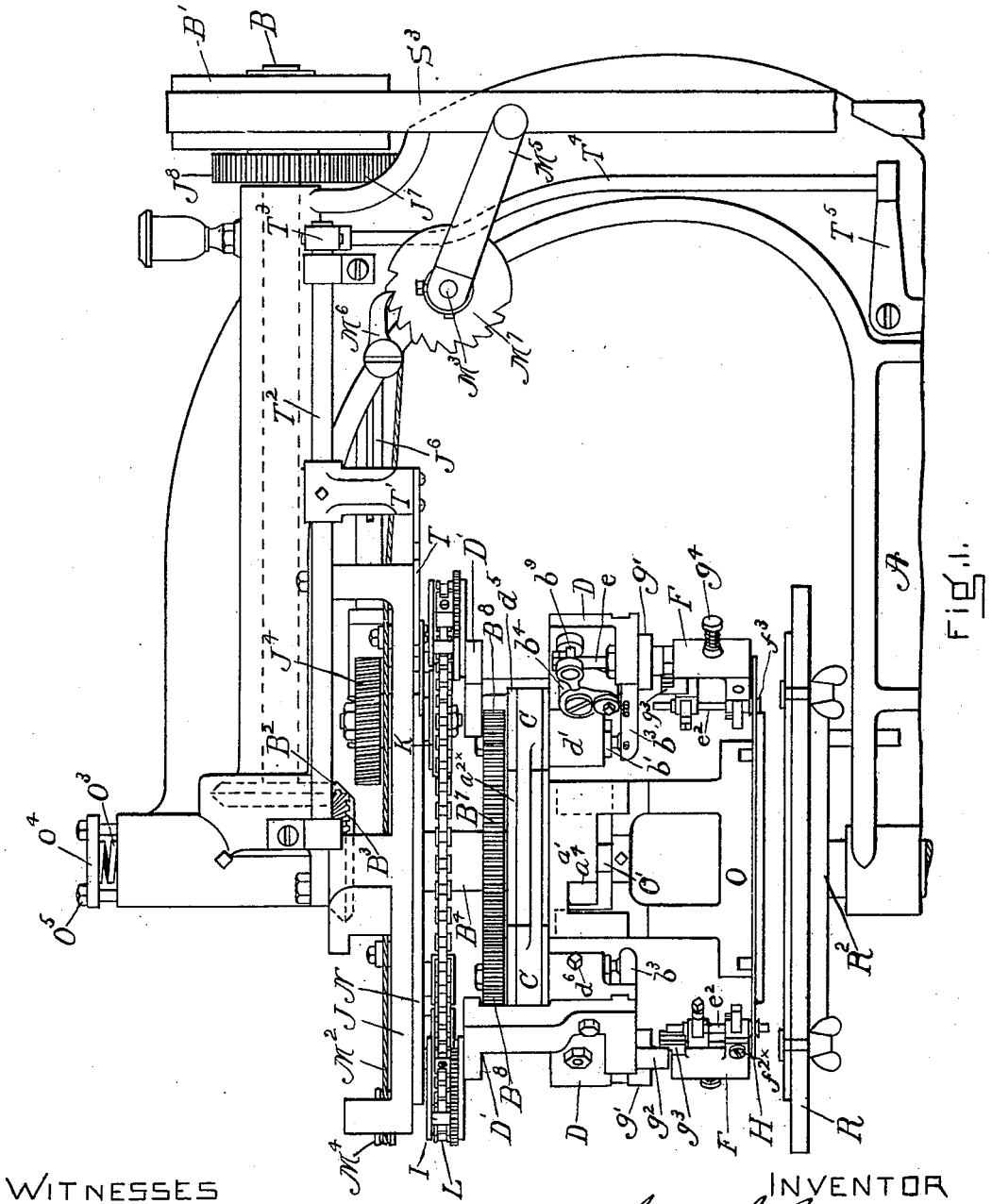

Fig. 1.

WITNESSES

Edward S. Day

Horace Van Everen

INVENTOR

James J. Breach

by his Attorney

Benjamin Phillips

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(No Model.) 7 Sheets—Sheet 2.

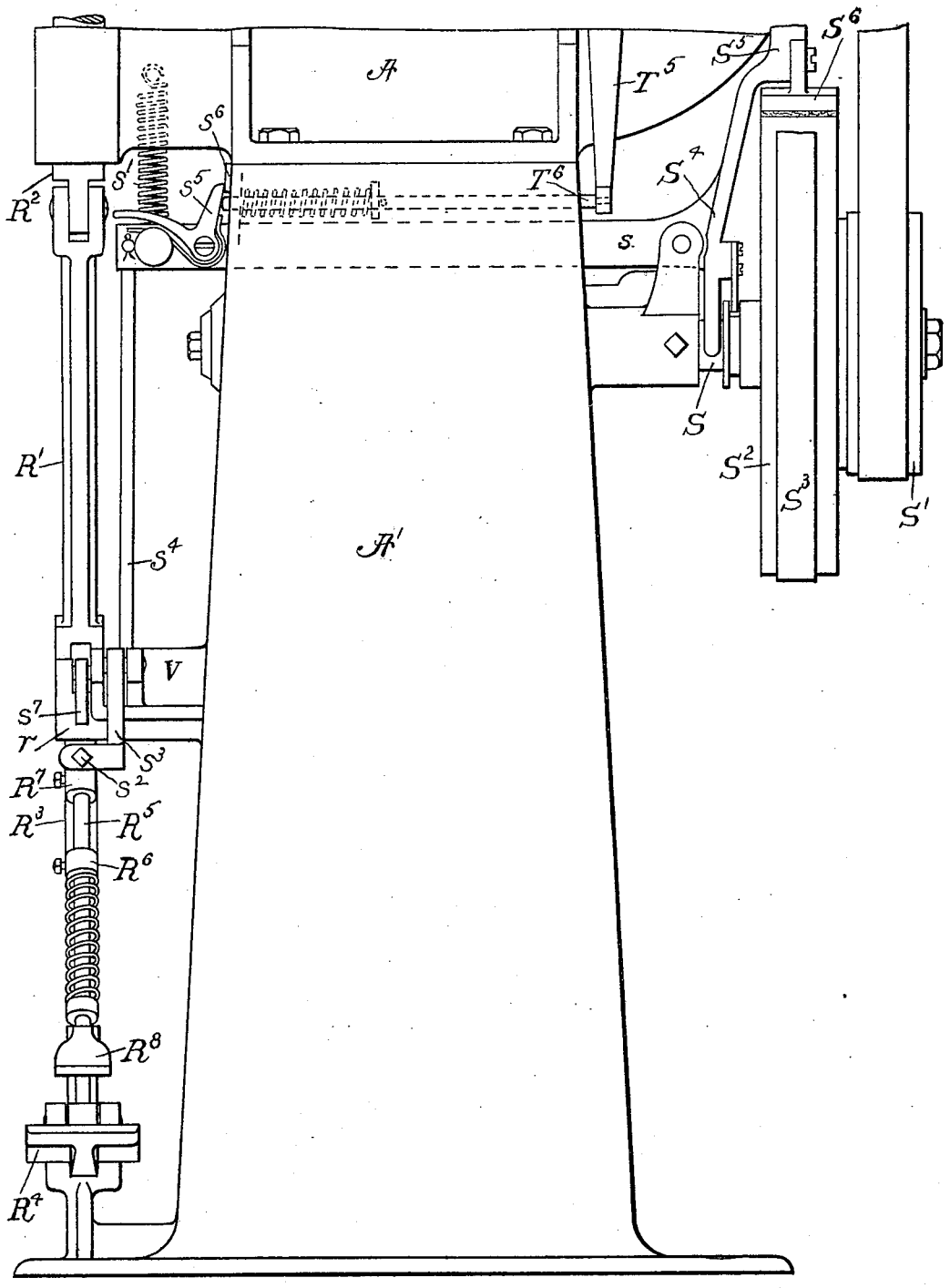

Fig. 2.

WITNESSES
Edward S. Day
Horace Van Everen

INVENTOR
James J. Breach
by his Attorney
Benjamin Phillips

No. 676,457. Patented June 18, 1901.

J. J. BREACH.

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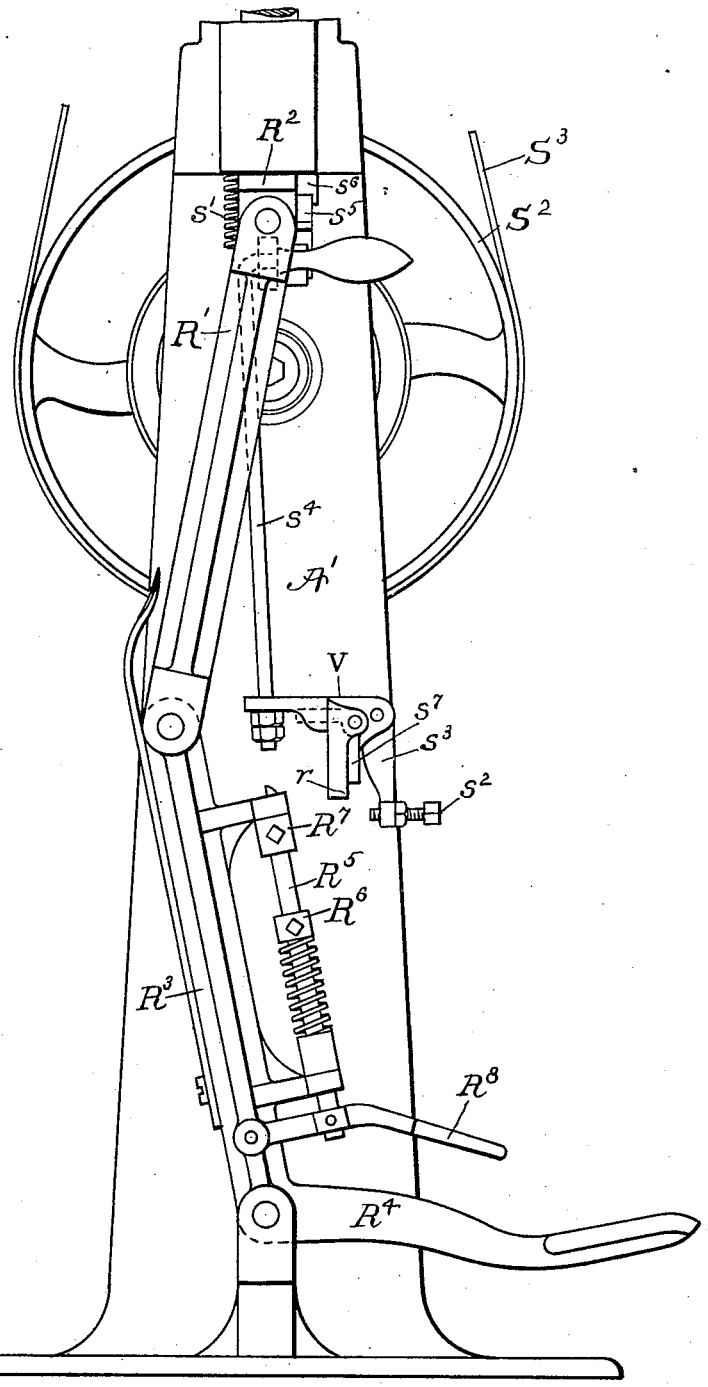
(No Model.) 7 Sheets—Sheet 3.



WITNESSES

Edward S. Day

Horace Van Everen

Fig. 3.

INVENTOR

James J. Breach

by his Attorney

Benjamin Phillips

No. 676,457. Patented June 18, 1901.

J. J. BREACH.

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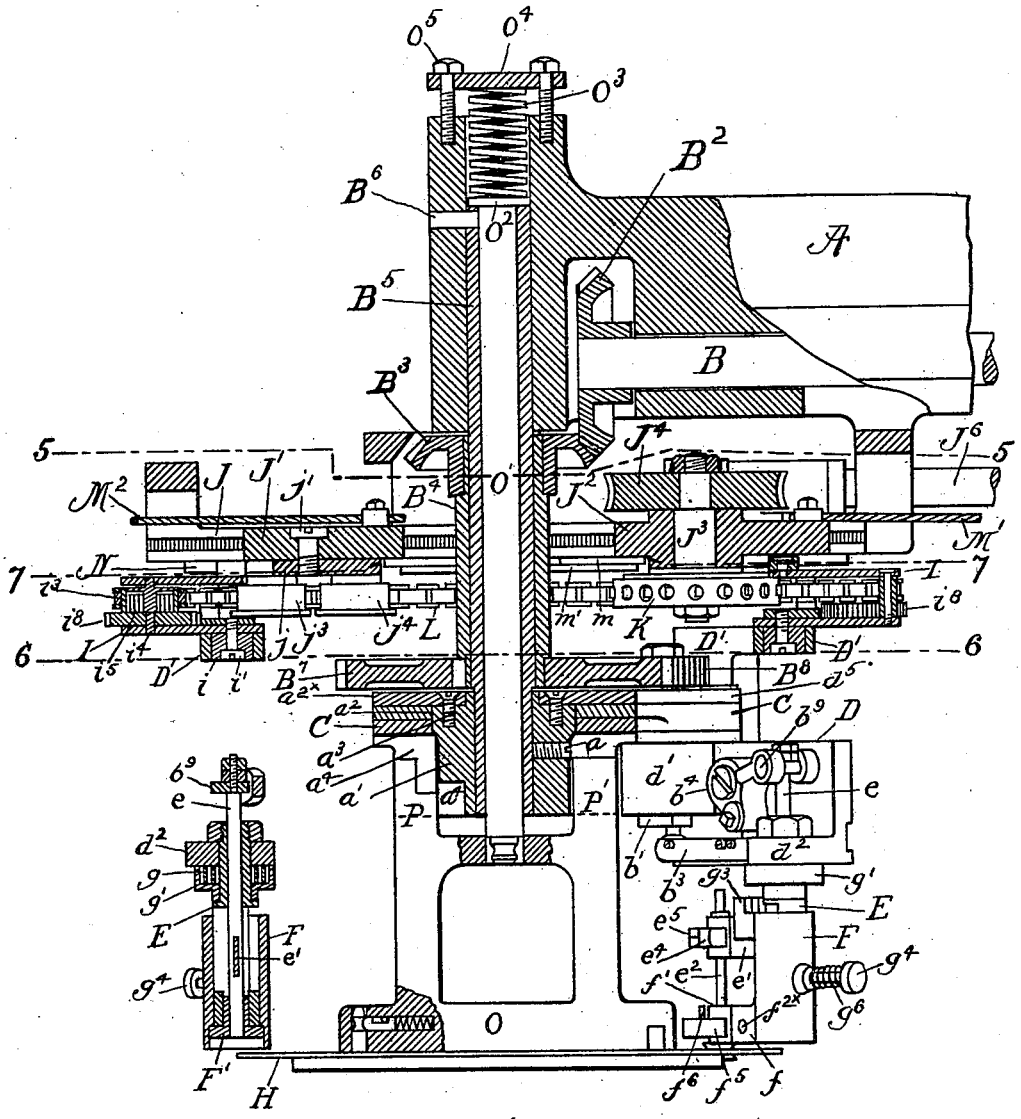

Fig. 4.

WITNESSES

Edward S. Day

Horace Van Everen

INVENTOR

James J. Breach

by his Attorney

Benjamin Phillips

No. 676,457. Patented June 18, 1901.

J. J. BREACH.

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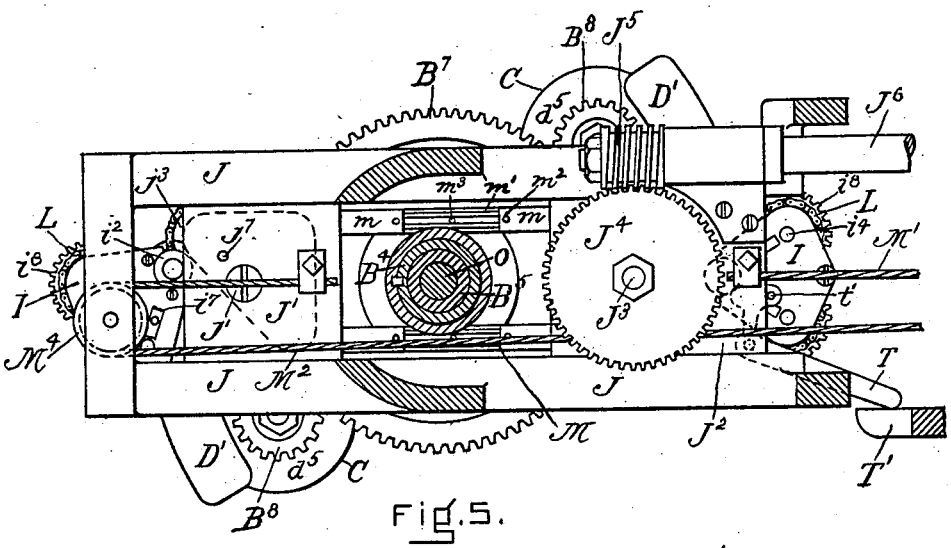

Fig. 5.

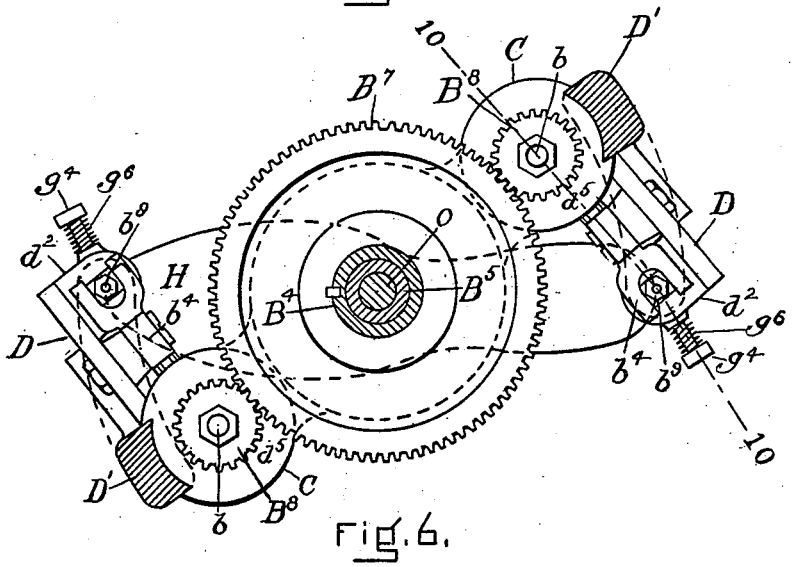

Fig. 6.

WITNESSES

Edward S. Day

Horace Van Everen

INVENTOR

James J. Breach

by his Attorney

Benjamin Phillips

No. 676,457. Patented June 18, 1901.

J. J. BREACH.

MACHINE FOR CUTTING ARTICLES FROM SHEET MATERIAL.

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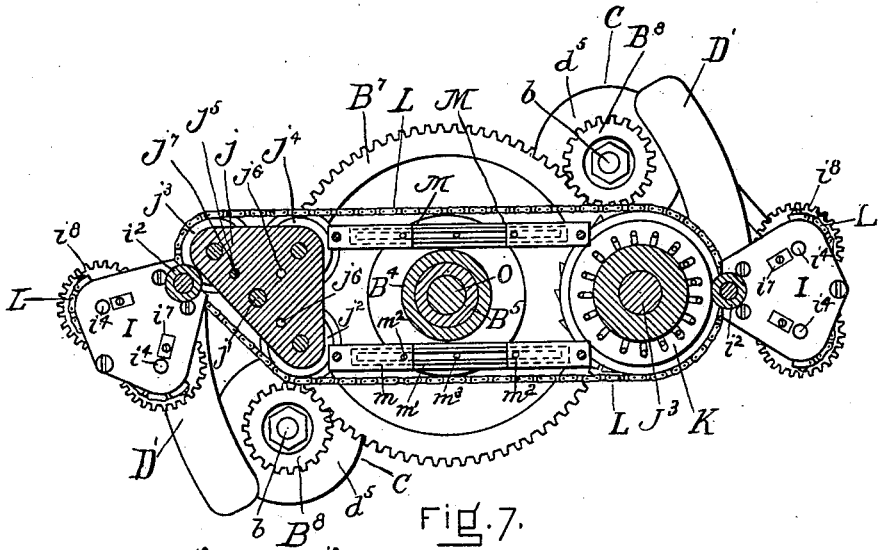

Fig. 7.

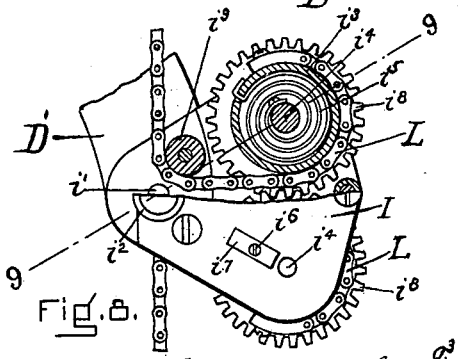

Fig. 8.

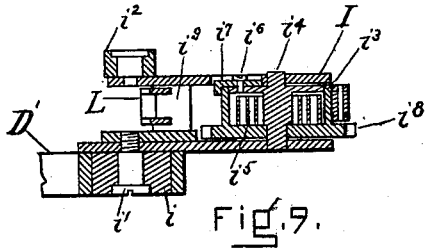

Fig. 9.

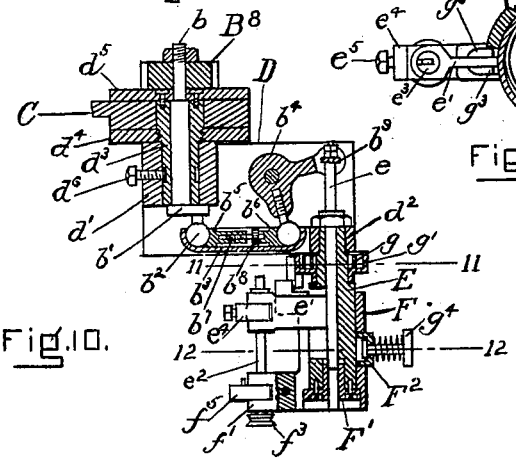

Fig. 10.

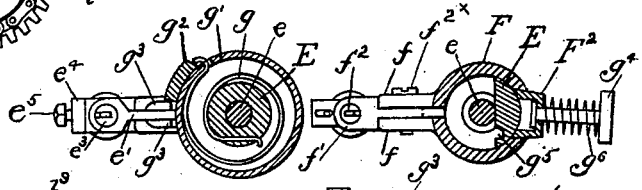

Fig. 11.

Fig. 12.

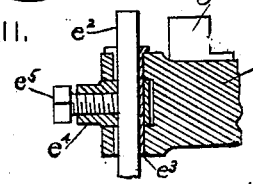

Fig. 13.

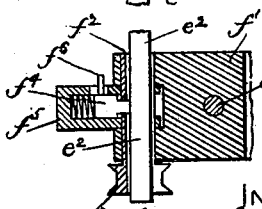

Fig. 14.

WITNESSES

Edward S. Day

Horace Van Everen

INVENTOR

James J. Breach

by his Attorney

Benjamin Phillips

No. 676,457. Patented June 18, 1901.

J. J. BREACH.

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(Application filed July 14, 1900.)

(No Model.) 7 Sheets—Sheet 7.

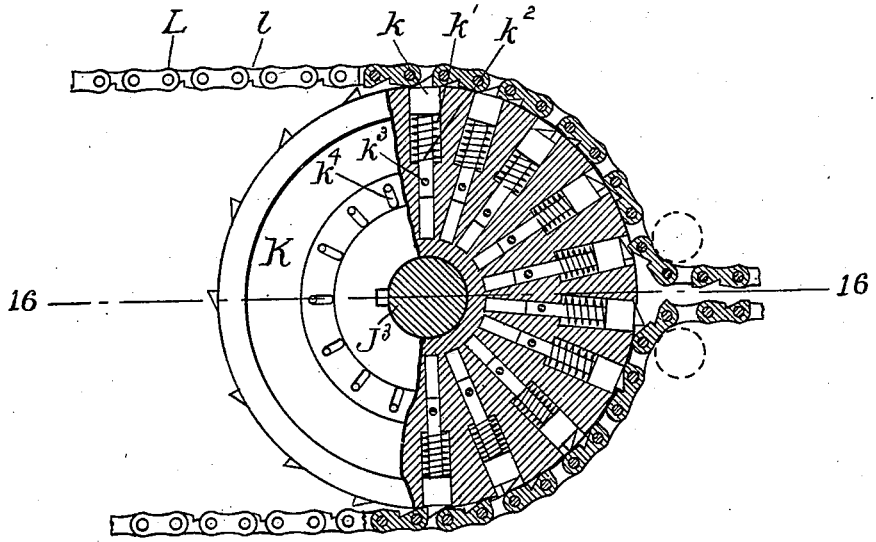

Fig. 15.

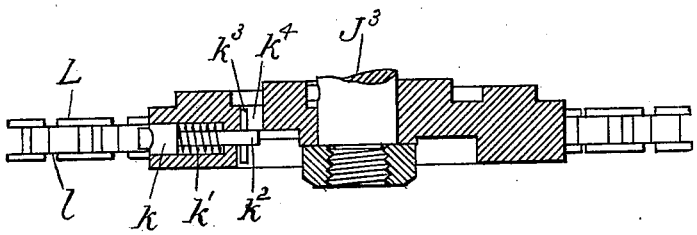

Fig. 16.

WITNESSES

Edward S. Day

Horace Van Everen

INVENTOR

James J. Breach

by his Attorney

Benjamin Phillips

UNITED STATES PATENT OFFICE.

JAMES J. BREACH, OF BOSTON, MASSACHUSETTS.

MACHINE FOR CUTTING ARTICLES FROM SHEET MATERIAL.

SPECIFICATION forming part of Letters Patent No. 676,457, dated June 18, 1901.

Application filed July 14, 1900. Serial No. 23,599. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. BREACH, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machines for Cutting Articles from Sheet Material; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to machines for cutting articles from sheet material, and more particularly to machines for cutting boot or shoe soles from leather, leather-board, or other suitable material.

The object of my invention is to provide a machine of improved construction and increased efficiency for cutting out boot and shoe soles, and more particularly to provide such a machine of the same general type as is disclosed in my Patent No. 589,409, dated September 7, 1897, in which one or more reciprocating cutting-knives are caused to travel about the periphery of a pattern-plate of a shape corresponding to that of the sole to be cut out.

With these objects in view my invention consists in the devices and combinations of devices hereinafter described and claimed.

The machine hereinafter specifically described as embodying my invention comprises one or more arms or supports swinging on a common center, one or more arms pivoted to each support and capable of a laterally-swinging movement independent of the support, a knife-carrier on each arm so supported thereby as to be capable of a lateral movement independent of the arm, a guide for controlling the movement of the arms with relation to the supports, and a pattern for controlling the movement of the knife-carriers with relation to the arms. A reciprocating knife is mounted in each knife-carrier, and the connected mechanism for actuating the knife is so supported by the knife-carrier, pivoted arm, and rotary support as to be operative throughout the path of travel of the knife.

In the illustrated embodiment of my invention shown in the accompanying drawings, Figure 1 represents in side elevation the upper part or head of a machine constructed in accordance with my invention. Fig. 2 represents in side elevation the base upon which the head shown in Fig. 1 is mounted, Figs. 1 and 2 together forming a side elevation of the complete machine. Fig. 3 is a view in front elevation of the base of the machine shown in Fig. 2. Fig. 4 is a longitudinal sectional view of a portion of the head of the machine and the cutting mechanism carried thereby. Fig. 5 is a sectional plan view taken on line 5 5, Fig. 4. Fig. 6 is a sectional plan view taken on line 6 6, Fig. 4. Fig. 7 is a sectional plan view taken on line 7 7, Fig. 4. Fig. 8 is a detail plan view of the tension and take-up device for the driving-chain, a portion of the casing being broken away. Fig. 9 is a sectional view on line 9 9, Fig. 8. Fig. 10 is a sectional view on line 10 10, Fig. 6, showing the mechanism for operating the reciprocating knife. Fig. 11 is a sectional view on line 11 11, Fig. 10. Fig. 12 is a sectional view on line 12 12, Fig. 10. Fig. 13 is a detail sectional view showing the manner in which the cutting-knife is mounted. Fig. 14 is a detail sectional view of the lower portion of the reciprocating knife and its guiding mechanism. Fig. 15 shows in plan view, partly in section, the driving-chain and the sprocket-wheel cooperating therewith; and Fig. 16 is a sectional view on the line 16 16 of Fig. 15.

In the drawings, A represents the head of the machine-frame, which may be of any suitable construction for supporting the operating parts, and A' a base upon which the head is mounted. Journaled in the upper overhanging portion of the head A is a horizontal shaft B, driven in any suitable manner, as by the pulley B'. This shaft is provided with a bevel-gear B^2, meshing with a bevel-gear B^3, carried upon the upper end of a tubular shaft B^4, which is journaled upon a tubular shaft B^5, rigidly secured, as by the pin B^6, in the overhanging head of the machine-frame. The shaft B^4 carries at its lower end a large gear-wheel B^7, meshing with pinions B^8 on short vertical shafts, from which the reciprocating knives are actuated, as will be described. The tubular shaft B^5 extends downwardly from the overhanging head of the machine, and secured thereto, as by a set-screw a, is a casting a'. This casting is formed with a flat upper surface, and projecting upwardly from

such surface is a stud a^2, adapted to form a pivotal bearing for two rotary arms C. These arms constitute rotary supports for the knife-carrying arms or frames and, as shown in Fig. 6, consist of hub portions embracing the stud a^2, projecting from the upper surface of the casting, and outwardly-extending portions which extend beyond the periphery of the gear-wheel B^7. The hub portions of these arms are reduced to one-half the thickness of the outwardly-extending portions and are held upon the stud on the casting a' by means of the plate $a^{2\times}$, screwed upon a projecting portion of the stud and locked in position by the screws a^3, passing through the plate $a^{2\times}$ and entering screw-threaded holes in the top of the stud.

Pivotally mounted at the outer end of each of the arms C, so as to be capable of a lateral swinging movement, is an arm or frame D, from which the knife-carrier is supported. Each frame consists of a body portion having the inwardly-extending projections d' and d^2. The pivotal connection between the frame D and the arm C is constructed as follows: d^3 is a hollow stud seated in the projection d' and rigidly held therein by the set-screw d^6. The end of the stud d^3 extends above the upper surface of the projection d' and through the arm C, a washer d^4 being interposed between the arm and the projection d'. The arm C is held on the stud between the washer d^4 and a washer d^5, secured to the top of the stud, the washer d^4 having a screw-threaded connection with the stud, whereby it can be adjusted to take up any wear between the arm and the washers.

Journaled to the hollow stud d^3 is a vertical shaft b, having secured thereto at its upper end the pinion b^8, before referred to, and provided at its lower end with a crank b'. The crank-pin b^2 of this crank connects by means of a ball-and-socket joint with a link b^3, connecting by means of a second ball-and-socket joint with a bell-crank lever b^4, pivoted on the inner wall of the frame D and actuating the knife, as will be described. The end of the crank-pin and one end of the bell-crank lever are provided with balls which enter suitable sockets in the link b^3 to form the ball-and-socket joints referred to, and as a means for taking up any wear in the parts the inner sides of the sockets are formed by blocks b^5 b^6, arranged to slide in the link and adjustable toward the balls by means of a screw-threaded rod b^7, one end of which is seated in the block b^6 and the other end of which has a screw-threaded engagement with the block b^5. The rod b^7 is provided with a knurled disk b^8, by which it may be rotated to adjust the blocks.

A stud E extends downwardly from the head or frame D, being secured to the frame by a nut on the upper screw-threaded end of the stud, which passes up through a hole in the projection d^2. This stud is hollow to act as a bearing for a reciprocating rod e, which forms a part of the knife-carrier. The upper end of the rod e has a swivel connection with one arm of the bell-crank lever b^4, as is clearly shown in Fig. 4. The arm of the bell-crank is forked and journaled in the fork is a pivot-pin b^9, through a slot in which the reduced upper end of the rod e passes, suitable holding and locking nuts on the upper end of the rod supporting it in position. By this construction the rod e is reciprocated by the bell-crank b^4 and is free to turn on its axis. Extending laterally from the rod e is an arm e', in which the swiveling knife-blade e^2 is mounted. The swivel-mounting for the knife is formed by the cylindrical block e^3, journaled in the outer end of the arm e' and slotted to receive the knife-blade. The knife is held in the block by a set-screw e^5 in the block e^4, through which the block e^3 passes and which extends through an elongated slot in the outer end of the arm e'. The set-screw passes through the block e^4 and through a slot in the block e^3 to engage the knife to thereby hold it in position in the block e^3, which is supported in the arm e', so as to be capable of a limited rotary movement on its axis, by the block e^4.

Surrounding the stud E is a cylindrical casing F, held thereon by a washer F', secured to the lower end of the stud and engaging a shoulder formed in the lower end of the casing. This casing is slotted at one side and through the slot the arm e' extends. At its lower end the casing is provided with laterally-extending arms $f\,f$, and between these arms a block f' is rigidly held by means of the clamp-screw $f^{2\times}$. Loosely journaled in the outer end of the block f' is the knife-guide, consisting of a slotted cylindrical block f^2, provided at its lower end with a grooved guiding-block f^3 for engaging the pattern. The knife e^2 passes loosely through the block f^2 and one side of the knife is engaged by a spring-pressed pin f^4, mounted in a block f^5, through which the block f^2 passes. The spring-pressed pin passes through an opening in the block f^2 to engage the knife, and the block f^5 passes through an elongated slot in the end of the block f', rigidly secured to the casing F. By this construction it will be seen that the block f^2 is held in the arm formed by the arms $f\,f$ and block f' by the pin f^4 and that it is capable of a limited rotary movement about its axis. A pin f^6, projecting from the pin f^4 through a slot in the block f^5, allows for the retraction of the pin f^4 and the removal of the block f^2. The main object of the pin f^4, however, is to form a yielding stop for the knife, the function of which will appear hereinafter.

The rod e, with its arm e', and the casing F, with its arms $f\,f$ and block f', constitute a carrier for the knife e^2, and this carrier is free to swing laterally about the axis of the stud E as a center, one side of the stud E being cut away, as shown in Figs. 10 and 12, to allow this swinging movement of the arm e'.

The carrier is actuated to hold the knife-guide in contact with the pattern by a spring arranged to act on the casing F. This spring is shown in Figs. 10 and 11, in which g represents a coiled spring having one end secured to the stud E and the other end secured to a barrel g', loosely journaled on the stud E and provided with a projection g^3, adapted to engage a projecting portion g^3 of the casing F. During the operation of the machine the knife-guide will normally be pressed against the pattern by the action of the spring. The knife-carrier can be swung backward against the force of the spring, and to lock the parts in their retracted position I provide the locking device, (shown in Fig. 12,) consisting of a spring-pressed pin g^4, carried by the casing F or a block F^2 secured thereto, adapted to engage a notch g^5, formed in the cut-away side of the stud E. The spring g^6 normally forces the pin outwardly. To lock the parts in their retracted position, the pin is pressed in until its flanged inner end is in line with the notch g^5. The casing is then released, and as it moves under the action of the spring g the flanged end of the pin enters the notch and is retained thereby.

In the construction as above described it will be seen that the knife-blade is carried by a spring-pressed laterally-swinging arm pivoted on a laterally-swinging arm or frame, pivoted in turn on a rotating support, whereby the path of travel of the knife will be the resultant of the component movements of these parts. The movement given to the arms C is one of rotation, and since the pivot of the arms is fixed the outer ends of the arms will travel in the arc of a circle. By having the axes of the arms and of the gear-wheel B^7 coincide the pinions B^8 at the outer ends of the arms will always be in engagement with the gear B^7 as the arms are swung about their pivots, and by the connections above described between the knives and shafts b, to which the pinions are secured, the mechanism for reciprocating the knives will be operative throughout the path of travel of the knife.

The movement of the knife-carrier with relation to the frame D may be and preferably is controlled by a pattern-plate in substantially the same manner as in my Patent No. 589,409. This pattern-plate is shown at H and is secured to a presser-foot O in substantially the same manner as in my patent above referred to.

The movement of the frames D with relation to the arms C is controlled by a combined driving and guiding mechanism whereby the arms C are rotated upon their pivots and at the same time those portions of the frames D to which the knife-carriers are connected are moved in a path approximating the shape of the path in which the knife travels. Projecting upwardly and inwardly from the frame D is an arm D′, having a pivotal connection with a frame I, by means of a stud i, secured to the bottom plate of the frame by a screw i'. The frame I is provided with a chain-tension and take-up device, as will be described, and the pivot-pin i for the arm D′ is in a direct line with the portions of the chain leading from the frame. On the upper plate of the frame I is a guide-roll i^2, the axis of which coincides with the axis of the pivot-pin i and which coöperates with certain guides, to be described, as the frame travels with the chain. The axes of the roll i^2 and pin i also coincide with the axis of the rod e of the knife-carrier, whereby the path described by the guide-roll will determine the path of travel of the knife-carrier.

Supported from the under side of the overhanging head of the machine-frame are horizontal guide-rails J J and adjustably supported in guide-slots cut in the inner surface of said rails are blocks J′ J^2. (See Fig. 4.) The block J^2, has journaled therein a short vertical shaft J^3, carrying at its lower end a sprocket-wheel K and at its upper end provided with a work-gear J^4, meshing with a worm J^5 on a shaft J^6, connecting with the shaft B by means of the intermeshing gears J^7 J^8. The block J′ carries at its lower side a triangular plate j, secured thereto by means of a set-screw j'. Journaled at the corners of the plate j, by means of suitable studs extending upwardly into the plate, are chain-guiding rolls j^2 j^3 j^4. The plate j is provided with three holes j^5 j^6 j^6 at equal radial distances from the set-screw j', and adapted to engage with one of these holes is a pin j^7, (see Fig. 5,) extending downwardly through a hole in the block J. By loosening the set-screw j' and removing the pin j^7 the plate j may be revolved on the screw j' as a pivot to change the position of the guiding-rolls j^2 j^3 j^4, and thereby alter the shape of the path of the chain for a purpose which will be explained hereinafter.

The chain L passes over the rolls j^2 j^3 j^4 and sprocket-wheel K and has connected thereto the frames I, so that the frames travel with the chain as it is driven by the sprocket-wheel K. The path traveled by the chain is of the same general shape as the article to be cut out, and as the pivot for the arm D′ is in line with the chain and also in axial alinement with the rod e of the knife-carrier the chain will cause the knife-carrier to move in a similar path. In order to confine the pivot of the arm D′ to a certain fixed path and prevent deviations therefrom on account of the flexibility of the chain, I provide fixed guides to coöperate with the guide-roller i^2 on the frame I. These guides consist of the plate j, against which the roller i^2 bears while the knife is passing around the toe of the pattern-plate, internal side guides M, secured to and extending between the blocks J′ J^2, (see Fig. 7,) and external side guides N, secured to the bottom of the guide-rails J J. (See Fig. 4.) In passing around the large sprocket-wheel K the chain is supported by the face of the wheel

and no guide for the roller i^2 is found necessary.

The knife-carrier, under the tension of the spring, can move independently of the frame D, as has been stated, to cause the knife to follow the curvilinear outline of the pattern, and it will be evident that within limits variations may be made in the size or form of the pattern-plate without changing the shape of the path traveled by the chain.

In order to provide for a wider variation in the form or size of the article to be cut out and to enable patterns of widely-differing size to be used in the machine, I provide means for adjusting the blocks J' J^2, carrying the supporting-rolls for the chain, to thereby adjust the path of travel of the knife-carrier to correspond approximately to the outline of the pattern used.

Attached to the blocks J' J^2 are flexible cords or chains M' M^2, the cord M' passing directly to a winding-shaft M^3 at the rear of the frame A and the cord M^2 passing over a guiding-pulley M^4 at the front of the frame and then rearwardly to the winding-shaft M^3. The shaft M^3 is provided with a handle M^5, by means of which it may be turned to wind up the cords M' M^2, and thereby move the blocks J' J^2 simultaneously in opposite directions. A pawl M^6, engaging ratchet-teeth on a disk M^7, secured to the shaft M^3, locks the winding-shaft from backward rotation. As the blocks J' J^2 are moved from one position to another the length of the path traveled by the chain will be altered, and to allow for corresponding variations in the length of the chain I provide a chain-tension and take-up device which will now be described. Each frame I carries two spring-barrels i^3, loosely journaled on studs i^4, extending between the upper and lower plates of the frame I, and to the outer surface of each barrel one end of a chain L is attached. A spiral spring i^5 is contained within each barrel, one end being secured to the barrel and the other to the stud i^4. To prevent the stud from turning under the tension of the spring, a flange is formed on the upper end of the stud, and secured to said flange by means of a screw i^6 is a block i^7, extending upwardly through a slot in the upper plate of the frame I. The lower ends of the barrels i^3 are provided with intermeshing gears i^8, whereby the barrels move in unison to take up or let off equal amounts on both sections of the chain. The chain is guided in its passage from the frame I by guide-rolls i^9, so situated that the line formed by the two sections of the chain passes through the axis of the guide-roll i^2 and pivot i.

In order to preserve the continuity of the internal guides M for the roll i^2 when the blocks J' J^2 are adjusted, these guides are composed of sections $m\,m$ and m', the sections m being secured to the under side of the blocks J' J^2 and the section m' being mounted to slide in the lower sides of the sections $m\,m$. (See Figs. 4, 5, and 7.) Pins m^2 on the sections $m\,m$, extending into a slot cut in the upper side of the section m', prevent the endwise separation of the sections $m\,m'$, and a pin m^3, extending upward from the middle point of the section m, prevents said section from being abnormally displaced from its central position by striking against the ends of the sections $m\,m$. As the blocks J' J^2 are adjusted to different positions, the length of the chain passing over the sprocket-wheel K and guide-rolls j^2 j^3 j^4 is varied, and it will be evident that for all positions of the blocks j' j^2 the length of the chain will not be an exact multiple of the length of a link. An ordinary sprocket-wheel having teeth of uniform pitch cannot be used to drive such a chain, and I have accordingly devised an improved form of sprocket-wheel which is adapted to engage and drive a chain whether its length is an exact multiple of the length of a link or not and regardless of variations in the pitch of the chain due to wear or other cause. One form of this sprocket-wheel is illustrated in Figs. 15 and 16, wherein is shown a sprocket-wheel provided with yielding teeth arranged to be depressed below the rim of the wheel and spaced at varying distances apart. As shown, the teeth consist of beveled projections on blocks k, seated in radial recesses in the wheel K and pressed outwardly by springs k', surrounding stems k^2, projecting inwardly from the blocks. The springs are seated in the recesses and bear against the inner side of the blocks, the outward movement of the blocks being limited by laterally-projecting pins k^3 on the inner ends of the stems k^2, engaging slots k^4 in the wheel K. The teeth are irregularly spaced about the periphery of the wheel and are preferably so arranged that the distance between successive teeth in a group increases from the first to the last tooth in the group. The five teeth at the upper right-hand side of Fig. 15 are shown so arranged. The teeth of the sprocket-wheel are adapted to engage notches in the chain L formed by the intervals between the blocks l and by recesses cut in the inner face of each block. These notches are preferably spaced at uniform distances apart to give the chain a definite pitch, although it will be evident that they might be irregularly spaced, in which case the teeth of the sprocket-wheel could be spaced at uniform distances apart, if desired.

The presser-foot O, to which the pattern-plate H is secured, is carried at the lower end of a rod O', extending upwardly through the hollow sleeve B^5 and supported therein by the projecting flange O^2, resting on the upper end of the sleeve. Bearing against the upper end of the rod O' is the coiled spring O^3, the upper end of which is seated against a plate O^4, adjustable vertically by means of the screws O^5 to vary the tension of the spring on the rod. The frame of the presser-foot has two upwardly-extending projections P P', which enter guiding-slots cut in the casting

a', the upper end of the projection P being notched at its inner side. The side of the casting a' is also provided with a notch a^4, leading into the guiding-slot for the projection P. By means of this construction the presser-foot can be removed from the machine or replaced by lowering it until the upper end of the projection P is on a level with the notch a^4 and by then moving it to the right, as viewed in Fig. 4, and then laterally at right angles, the notched upper end of the projection P passing through the notch a^4.

R designates the platen, between which and the presser-foot O the work is clamped during the action thereon of the cutting-knives. The platen is formed or provided with a suitable cutting-surface and is adapted to be raised and lowered by a toggle-lever, the upper arm R′ of which is pivoted to the stem R^2 of the platen, sliding in a vertical bearing formed in the lower front portion of the machine-frame. The lower arm R^3 of the toggle-lever is pivoted at the lower part of the base of the machine and is provided with a horizontally-extending treadle R^4, by means of which the toggle may be straightened and the platen R raised. As a means for locking the toggle-lever in its straightened position I provide the lower arm of the lever with a sliding catch-rod R^5, mounted in lugs projecting from the arm and pressed upwardly by a spring surrounding the rod, having one end bearing against the lower lug of the lever and the other end bearing against an adjustable collar R^6, clamped to the rod. The upward movement of the rod is limited by a collar R^7, clamped to the rod, engaging the upper lug on the lever. The upper end of the rod engages a bracket r on the base A′ to lock the toggle-lever in its straightened position. A treadle R^8, pivoted to the arm R^3 and to the lower end of the rod, serves to release the rod to free the toggle-lever, which is then moved to lower the platen by a spring secured to the lower arm R^3 of the lever and having its free end engaging the upper arm R′ when the lever is in its straightened position.

Means are provided whereby a movement of the toggle-lever beyond its straightened position will start the machine into operation. The main driving-shaft S is mounted in the upper part of the base of the machine and is provided with the fast and loose pulleys S′ S^2. A belt S^3 passes over the loose pulley S^2 and over the pulley B′ on the shaft B, from which the operating parts of the machine are actuated by the connections hereinbefore described. S^4 designates a clutch-operating lever pivoted to the base of the machine, one arm of which engages the collar of a clutch of any suitable construction for connecting the loose pulley to the driving-shaft. An arm s of this lever extends through an opening in the base of the machine and has connected thereto a spring s', which acts on the lever to move the clutch to disconnect the loose pulley from the driving-shaft S.

Pivoted on the bracket V in a position to be actuated by the toggle-lever is a bell-crank lever s^3, and connecting the horizontal arm of this bell-crank with the end of the arm s is a rod s^4. The vertical arm of the bell-crank is provided with an adjustable screw s^2, with which the upper projecting lug on the toggle-arm R^3 is adapted to engage. When the toggle-lever is in its straightened position, the lug is out of engagement with the vertical arm of the bell-crank; but as the toggle-lever is swung by its straightened position the lug engages the screw s^2, and thereby actuates the bell-crank to pull down the arm s through the connecting-rod s^4 to actuate the clutch and connect the loose pulley S^2 to the driving-shaft S. The arm s is locked in its lowered position by a locking-pawl s^5, pivoted to the outer end of the arm and adapted to engage a projection s^6 on the base A′. By the above-described construction it will be seen that the toggle-lever is first straightened to raise the platen R to clamp the work and then given a further movement to throw the machine into operation. Ordinarily the operator can control the movement of the toggle-lever to first clamp the work and thereafter if the work is properly positioned to throw the machine into operation. As a safety device to prevent the toggle-lever being moved sufficiently to throw the machine into operation until the work is properly positioned, however, I provide a pivoted latch s^7, extending into the path of the lever to form a stop for the lever when it reaches its straightened position. When it is desired to give the lever a further movement, this latch is turned back out of the way.

At the end of the cutting operation the loose pulley S^2 may be unclutched from the driving-shaft S and the machine stopped by lifting the locking-pawl s^5 to release the arm of the clutch-operating lever by means of a handle attached thereto. I prefer, however, to stop the machine automatically at the end of the cutting operation by means which will now be described.

T designates a lever pivoted on the under side of the block J^2, one arm of which extends into the path of the guide-roll i^2 on the frame I and the other arm of which is adapted to contact with an arm T′ on a shaft T^2, journaled at the side of the overhanging head of the machine-frame. The movement of the lever T in one direction is limited by a stop-pin t' on the lever contacting with the edge of the block J^2. The shaft T^2 is provided with an arm T^8, connecting by means of a rod T^4 with one arm of a bell-crank lever T^5, pivoted to the frame of the machine, the other arm of which is connected to one end of a spring-pressed rod T^6, mounted to slide in the upper part of the base A′. This rod bears against the locking-pawl s^5 and is moved,

through the connections above described, to release the pawl from engagement with the arm *s* of the clutch-operating lever when the guide-roll i^2 actuates the lever T.

The clutch-operating lever S^4 is provided with an upwardly-projecting arm S^5, to which is secured a brake-shoe S^6, adapted to engage the loose pulley S^2 when the lever is moved to disconnect the pulley from the driving-shaft.

Briefly stated, the operation of the machine above described is as follows: The platen R having been raised to clamp the work and the loose pulley S^2 having been clutched to the driving-shaft S, the shaft B will rotate and through the bevel-gears B^2 B^3 and tubular shaft B^4 will rotate the large gear-wheel B^7. The gear B^7, meshing with the pinions B^8 at the upper ends of the short vertical shafts *b*, will give a rapid movement of rotation thereto, and from these shafts vertical reciprocating movements will be given to the cutting-knives through the cranks *b'*, links b^3, and bell-crank levers b^4. The sprocket-wheel K, engaging the chain L, will be driven at a relatively slow rate of speed from the shaft B through the worm-gear J^4, worm J^5, shaft J^6, and gears J^7 J^8. As the chain L travels it will rotate the arms C on the pivots and at the same time move the frames D about their pivotal connections with the arms C to cause those parts of the frames D forming the pivotal supports of the knife-carriers to travel in a path corresponding to the path of the chain. Each knife-carrier as a whole will thus move in a path corresponding to that of the chain, and as it thus moves the cutting-knife will be caused to travel in a path corresponding to the article to be cut out by the engagement of the guiding-block f^3 with the edge of the pattern-plate H. The knife-carrier swings about the rod *e* as a pivot under the action of the spring *g* to keep the guiding-block f^3 in contact with the edge of the pattern-plate, and the swivel mounting of the knife in its carrier enables the block f^3 to turn the knife on its axis to keep its edge parallel with the outline of the pattern.

The knife-carrier has a continuous movement in a plane parallel to the work, and it is evident that if the knife were rigidly mounted in the carrier it would be dragged through the work while in engagement therewith. To avoid this action, I mount the knife so as to be capable of a limited horizontal movement independent of the carrier while in engagement with the work. In the construction hereinbefore described this independent movement of the knife is permitted by the spring-pressed pin f^4. When the knife is out of engagement with the work, it will be held in the position shown in Figs. 13 and 14 and will travel with the carrier. As the knife enters the work it will be stopped thereby, and during the continued movement of the carrier the knife will be pressed back against the pin f^4, which will yield to allow a relative movement between the knife and carrier, there being sufficient play between the blocks e^3 e^3 and the carrier-arm *e'* to permit this movement. As the knife rises from the work it will be returned to its original position by the spring-pin f^4.

In cutting out soles with pointed toes the plate *j'*, carrying the chain-guiding rolls j^2 j^3 j^4, will be in the position shown in Fig. 7; but when it is desired to cut out soles with broad or square toes the plate is rotated on the screw *j'* to bring the rolls j^2 j^4 at the end of the path traveled by the chain and locked in position by the pin j^7. The path of the chain is thus made to conform more nearly to the general outline of the article to be cut out.

To separate the blocks J' J^2, and thereby lengthen the path of travel of the chain, the winding-shaft M^3 is rotated by means of the handle M^5, the chain automatically adjusting itself to its new path as the blocks are drawn apart by the cords M' M^2. When the pawl M^6 is raised from the ratchet-teeth of the disk M^7, the blocks will be drawn toward eachother by the tension exerted on the chain by the tension and take-up devices.

The machine above described is provided with two cutting-knives supported from two independently-swinging arms or supports. It is to be understood, however, that my invention is not limited to this specific arrangement, as a greater or less number of knives might be provided. It is also to be understood that my invention, considered in its broader aspects, is not limited to a construction in which each knife is carried by an independent support. While I consider a construction embodying a reciprocating knife as being the best, I do not consider my invention limited as to some of its more generic features to such construction, as such features may be used in connection with the usual form of drag-knife or other forms and arrangements of the knife without any material departure therefrom.

While I have illustrated and described a chain composed of two sections with tension and take-up devices interposed between the ends of the sections, it is to be understood that other means might be employed to allow the chain to adjust itself to the length of the path to be traveled thereby without departing from the spirit of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A machine for cutting sheet material, having, in combination, a rotary support, a frame pivoted thereto, a knife-carrier movably mounted on said frame, a reciprocating knife mounted in said carrier and mechanism for actuating the knife and frame, substantially as described.

2. A machine for cutting sheet material, having, in combination, a rotary support, a frame pivoted thereto, a knife-carrier pivoted to said frame, a reciprocating knife mounted

in said carrier, and mechanism for actuating the knife and frame, substantially as described.

3. A machine for cutting sheet material, having, in combination, a rotary support, a frame movably mounted thereon, a reciprocating knife carried by said frame, mechanism for actuating said knife, and independent mechanism for actuating said frame, substantially as described.

4. A machine for cutting sheet material, having, in combination, a rotary support, a frame movably mounted thereon, a knife-carrier movably mounted on said frame, a reciprocating knife mounted in said carrier, mechanism for actuating said knife and independent mechanism for actuating said frame, substantially as described.

5. A machine for cutting sheet material, having, in combination, a plurality of independent rotary supports mounted on a common center, a frame movably mounted on each support, a reciprocating knife carried by each frame, and mechanism for actuating the knives and frames, substantially as described.

6. A machine for cutting sheet material, having, in combination, a rotary support, a frame pivoted thereto, a reciprocating knife carried by said frame, a shaft concentric with the pivot of the frame, actuating devices connecting said shaft and knife, mechanism for rotating said shaft and mechanism for actuating said frame, substantially as described.

7. A machine for cutting sheet material, having, in combination, a rotary support, a frame pivoted thereto, a knife carried by said frame, a pattern, a knife-guide arranged to bear against the edge of said pattern, and means for actuating said frame to cause the knife and its guide to travel along the pattern, substantially as described.

8. A machine for cutting sheet material, having, in combination, a rotary support, a frame pivoted thereto, a spring-pressed knife-carrier pivoted to said frame, a knife mounted in said carrier, a pattern, a knife-guide arranged to bear against the edge of said pattern, and means for actuating said frame to cause the knife and its guide to travel along the pattern, substantially as described.

9. A machine for cutting sheet material, having, in combination, a rotary support, a frame movably mounted thereon, a reciprocating knife carried by said frame, mechanism for actuating said knife, and a traveling chain, for actuating said frame, substantially as described.

10. A machine for cutting sheet material, having, in combination, a rotary support, a frame movably mounted thereon, a knife carried by said frame, and mechanism for actuating and guiding said frame having provision for adjustment for varying the path traveled by the knife, substantially as described.

11. A machine for cutting sheet material, having, in combination, a rotary support, a frame movably mounted thereon, a knife-carrier movably mounted on said frame, a knife mounted in said carrier, a pattern for guiding the knife, and mechanism for actuating and guiding said frame having provision for adjustment for varying the path traveled by the knife-carrier, substantially as described.

12. A machine for cutting sheet material, having in combination, a knife-carrier, a traveling chain for actuating said carrier, guiding-rolls at one end of the chain-path and means for changing the relative position of said rolls to alter the shape of the chain-path, substantially as described.

13. A machine for cutting sheet material, having, in combination, a knife-carrier, a knife mounted to reciprocate and move laterally therein, and mechanism for actuating the knife, substantially as described.

14. A machine for cutting sheet material, having, in combination, a knife-carrier, a knife mounted to reciprocate and move laterally therein, mechanism for reciprocating the knife, and a spring for moving it laterally, substantially as described.

15. A machine for cutting sheet material, having, in combination, a knife-carrier, a swiveling knife mounted to reciprocate and move laterally therein, and mechanism for actuating the knife, substantially as described.

16. In a machine for cutting sheet material, a knife-carrier having in combination, a cylindrical casing mounted upon a hollow stud, an arm projecting from said casing, a rod reciprocating through said hollow stud, an arm projecting from said rod and a knife mounted in said arms, substantially as described.

17. In a machine for cutting sheet material, a knife-carrier having in combination, a cylindrical casing mounted upon a hollow stud, an arm projecting from said casing, a rod reciprocating through said hollow stud, an arm projecting from said rod, a knife mounted in said arms, and a spring-barrel mounted upon the stud and engaging the casing, substantially as described.

18. In a machine for cutting sheet material, a knife-carrier having, in combination, a cylindrical casing mounted upon a stud, an arm projecting therefrom, a knife mounted in said arm, a spring for swinging the casing about the stud, and a locking device carried by the casing and engaging a recess in the stud for locking the casing against the action of the spring, substantially as described.

19. A machine for cutting sheet material, having, in combination, a knife-carrier, an endwise-traveling chain for actuating said carrier, means for varying the length of the path traveled by the chain, and means for varying the length of the chain, substantially as described.

20. A machine for cutting sheet material, having, in combination, a knife-carrier, an endwise-traveling chain for actuating said carrier, means for varying the length of the

path traveled by the chain, and a tension and take-up device for automatically varying the length of the chain, substantially as described.

21. A machine for cutting sheet material, having, in combination, a presser-foot provided with guiding projections, a stationary block provided with slots engaged by said projections, and a slot extending transversely thereto so arranged that the presser-foot can be disengaged from the block by being moved sidewise in said first-mentioned slots, and then at an angle thereto, substantially as described.

22. A machine for cutting sheet material, having, in combination, a knife-carrier, an endwise-traveling chain for actuating said carrier, means for varying the length of the path traveled by the chain, and means for automatically varying the length of the chain, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES J. BREACH.

Witnesses:
FRED O. FISH,
ALFRED H. HILDRETH.