(No Model.) 3 Sheets—Sheet 1.

R. HATHAWAY, E. G. PAULL & C. D. HUNT.

TACK MACHINE.

No. 551,279. Patented Dec. 10, 1895.

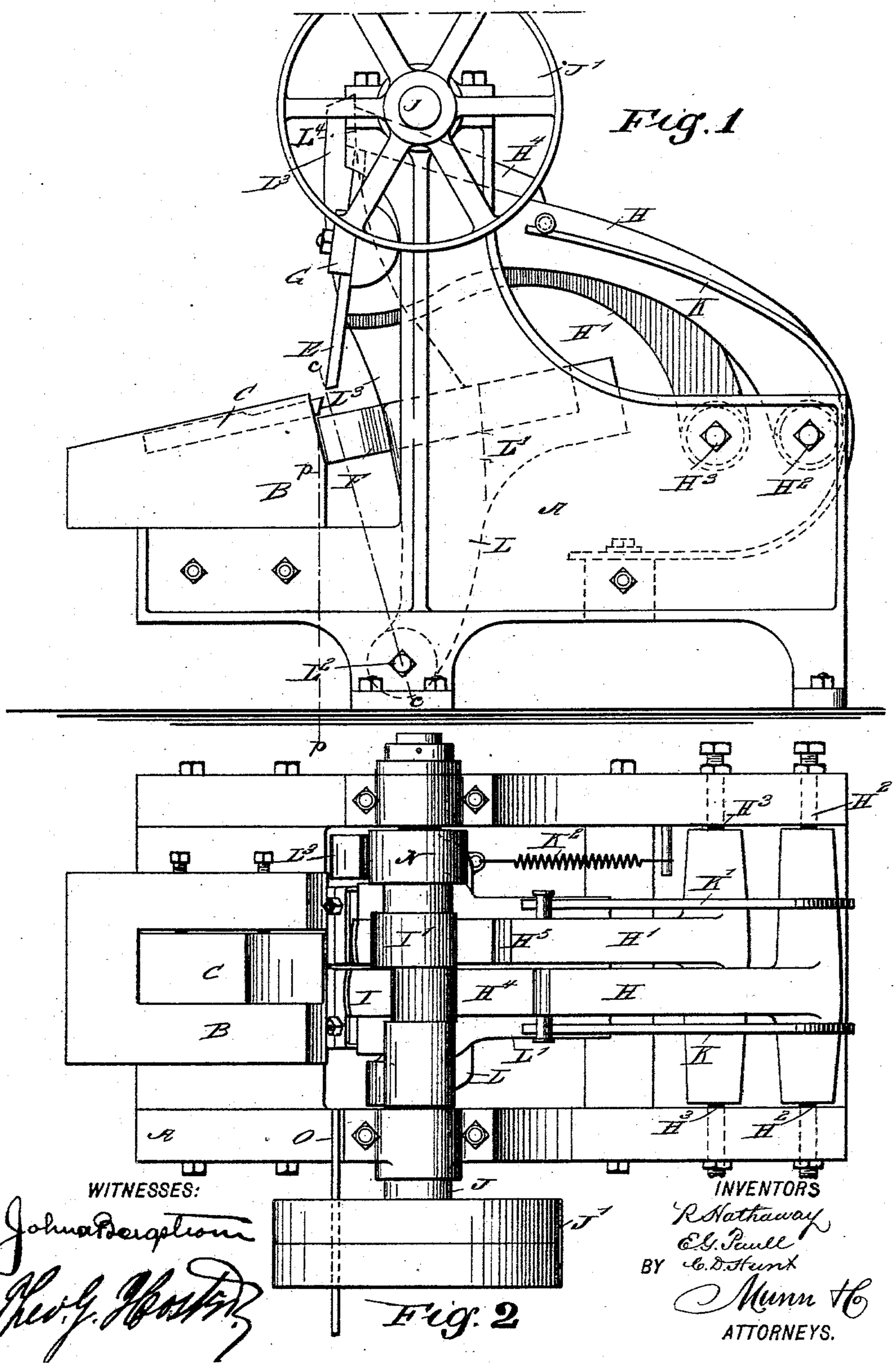

Fig. 1

Fig. 2

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TACK MACHINE.

No. 551,279. Patented Dec. 10, 1895.

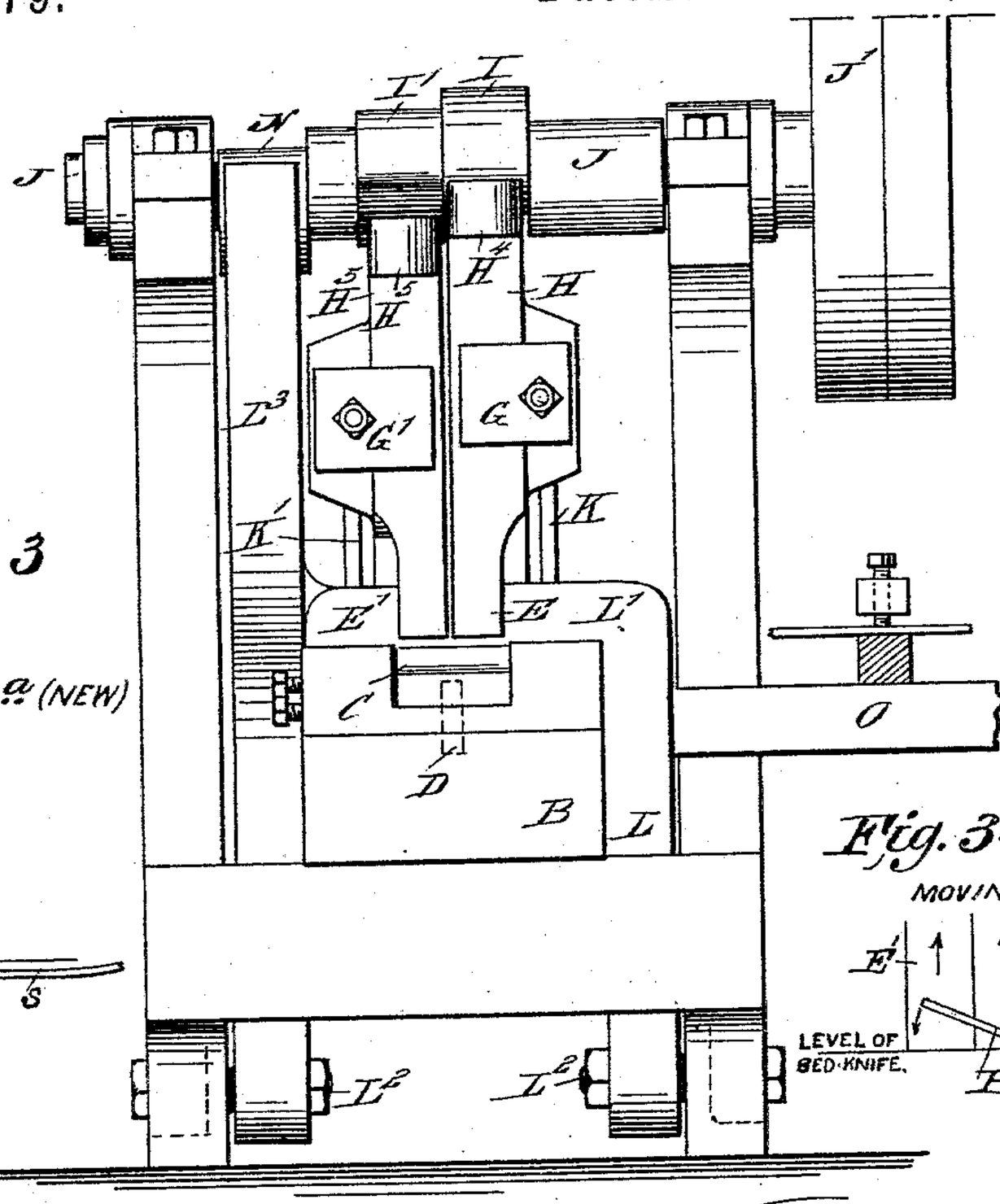


Fig. 3

Fig. 3a (NEW)

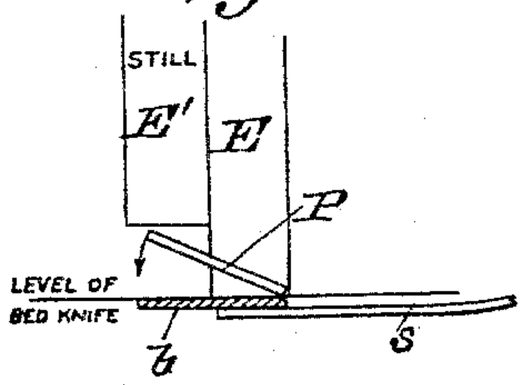
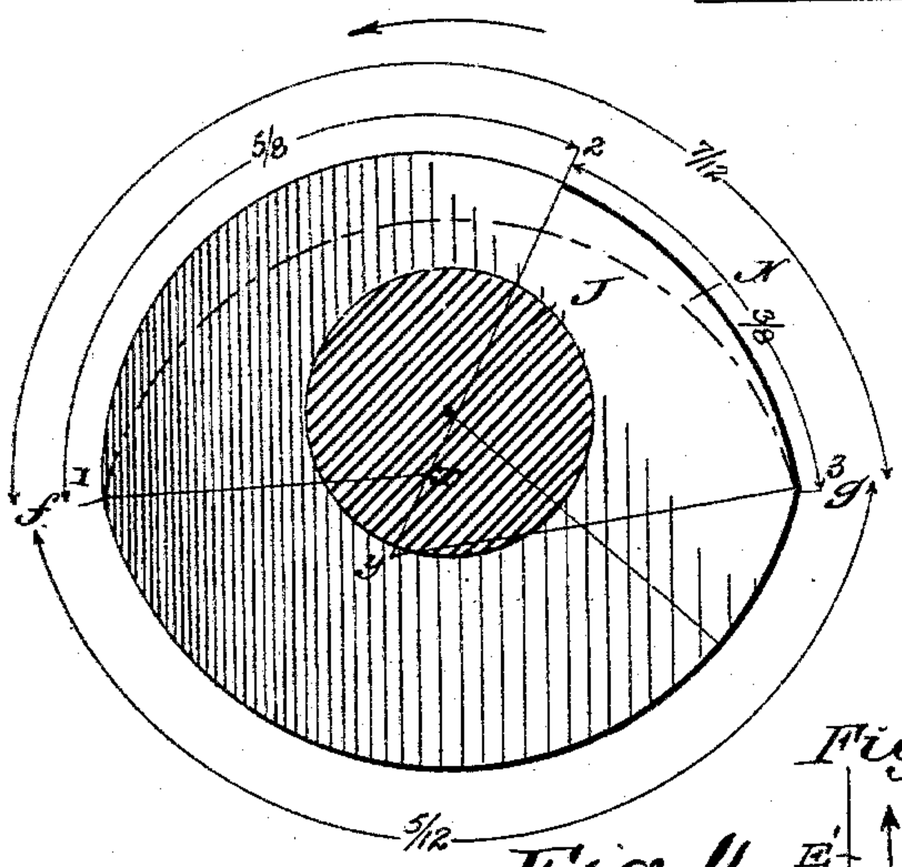


Fig. 3b (OLD)



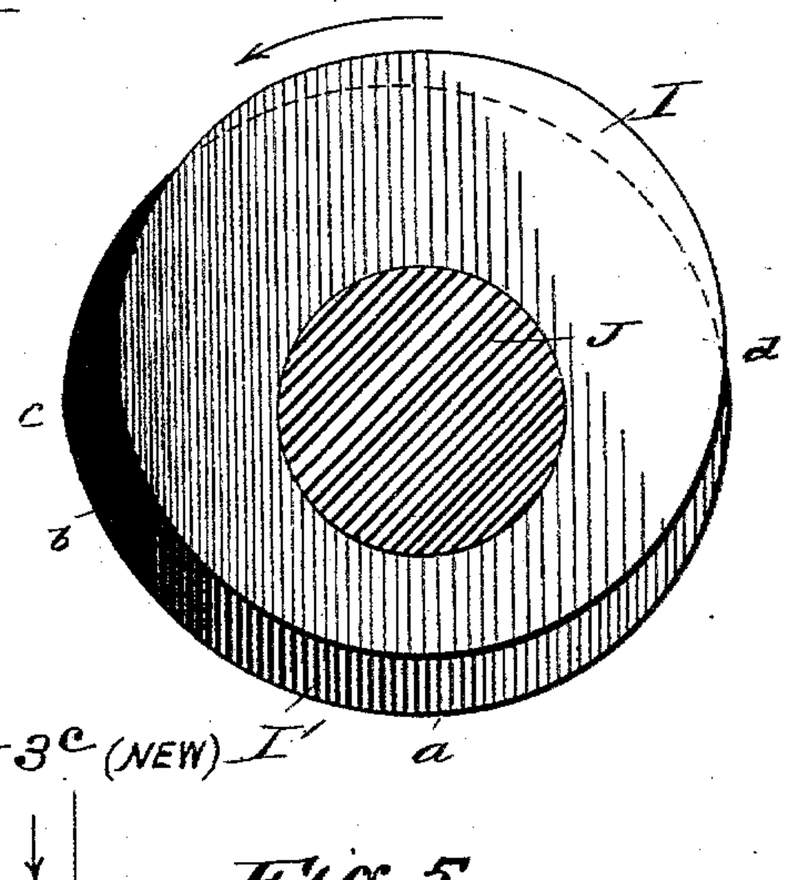


Fig 3c (NEW)

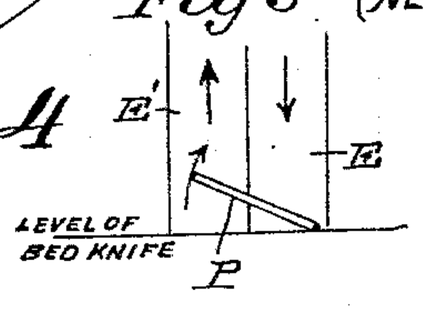


Fig. 4

Fig. 5

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(No Model.) 3 Sheets—Sheet 3.

R. HATHAWAY, E. G. PAULL & C. D. HUNT.

TACK MACHINE.

No. 551,279. Patented Dec. 10, 1895.

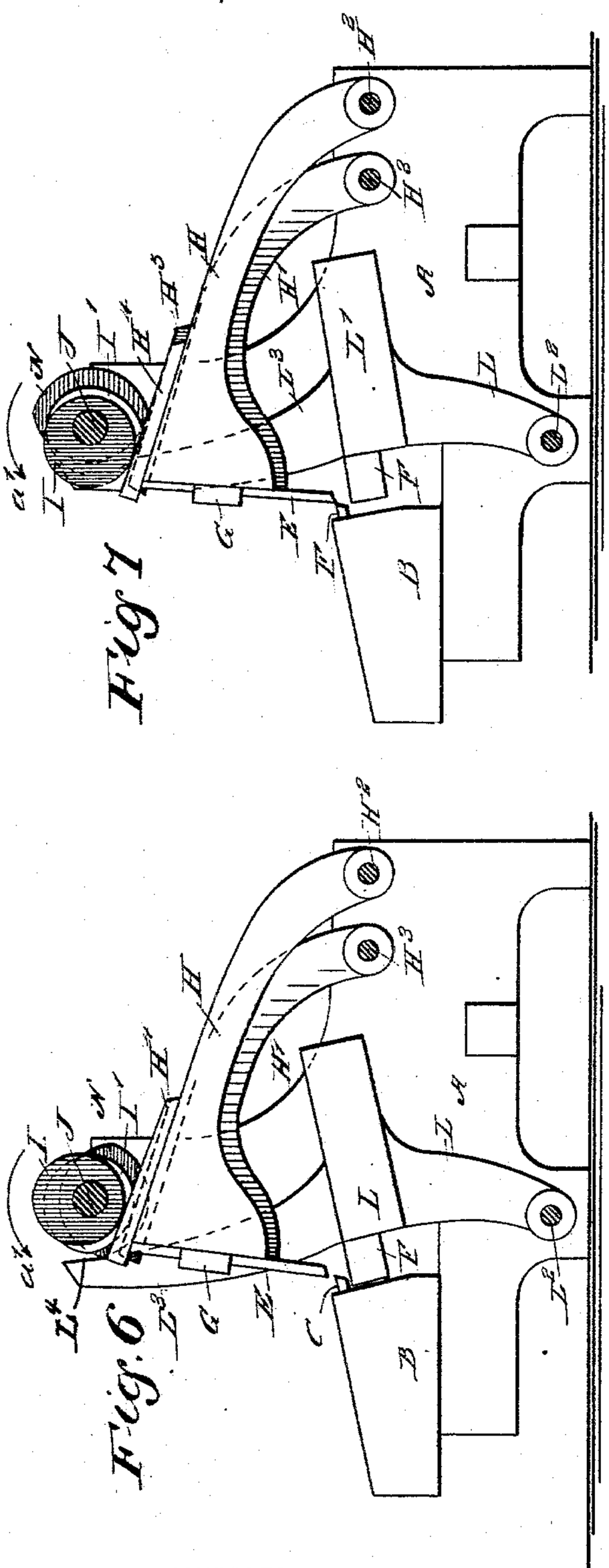

Fig. 1

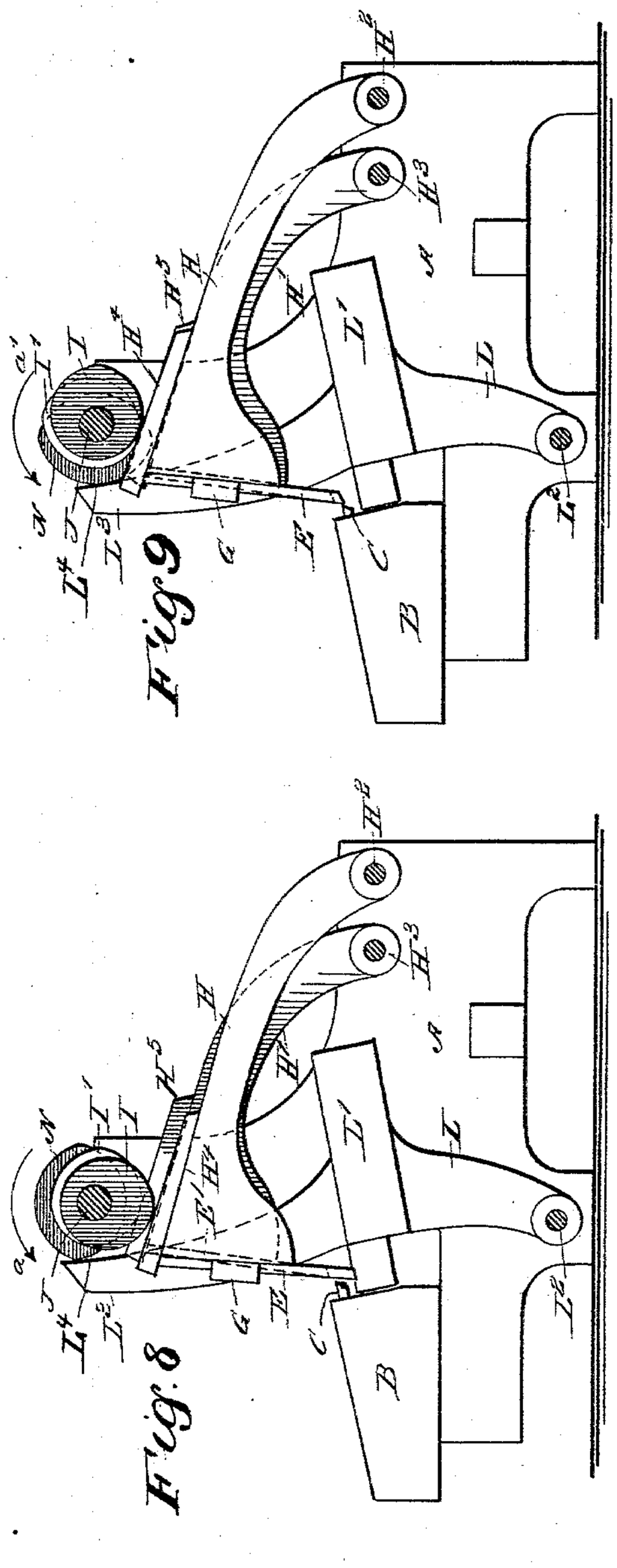

Fig. 9

Fig. 6

Fig. 8

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UNITED STATES PATENT OFFICE.

RUSSELL HATHAWAY, ELBRIDGE G. PAULL, AND CYRUS D. HUNT, OF FAIRHAVEN, MASSACHUSETTS.

TACK-MACHINE.

SPECIFICATION forming part of Letters Patent No. 551,279, dated December 10, 1895.

Application filed October 2, 1894. Serial No. 524,751. (No model.)

To all whom it may concern:

Be it known that we, RUSSELL HATHAWAY, ELBRIDGE G. PAULL, and CYRUS D. HUNT, of Fairhaven, in the county of Bristol and State of Massachusetts, have invented new and useful Improvements in Tack-Machines, of which the following is a specification.

The object of our improvements is to so construct a tack-machine that it can be run at high speed and secure the following results: good feeding of the plate, the following of its cam by the gripping-lever, and diminution of the wear of the leader-knife.

Our improvements consist principally of the form of the lazy-cam, the form of the gripping-cam, and the centering of the gripping-lever.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement. Fig. 2 is a plan view of the same. Fig. 3 is a front elevation of the same. Figs. 3^a, 3^b, and 3^c are detail views showing the relation between the movements of the blank or plate in the feeder and the cutting-knives, both in the present invention and in the old machines. Fig. 4 is an enlarged sectional side elevation of the driving-shaft, showing the cam for operating the gripping-lever and the lines describing the same. Fig. 5 is a similar view of the driving-shaft, showing the cams for the leader-knife and the lazy-knife; and Figs. 6, 7, 8, and 9 are reduced sectional side elevations of the machine, showing the working parts in different positions.

The improved tack-machine is provided with a suitably-constructed frame A, supporting at its front end a bed B, having a pocket containing the bed-knife C, resting on top of the bed-die D, the said knife and die being securely held in place by set-screws in the usual manner.

The front cutting-edge of the bed-knife C operates in conjunction with the leader-knife E and the lazy-knife E′, both made straight and having their adjacent edges fitting one on the other, as is plainly illustrated in Fig. 3. The bed-die D operates in conjunction with the gripping-die F, in the manner hereinafter more fully described.

The leader-knife E and the lazy-knife E′ are fastened by clamps G and G′, respectively, to the front or free ends of the levers H and H′, respectively, hung on centers H^2 and H^3, respectively, carried in the rear of the frame A, as is plainly illustrated in the drawings. The levers H H′ are provided with straight cam-plate surfaces H^4 and H^5, formed or secured on the top of the free ends of the said levers H and H′. The cam-plate surfaces H^4 and H^5 of the levers H and H′ engage the under side of the cams I and I′, secured on or formed integrally with the cam-shaft J, mounted to turn in suitable bearings in the upper front part of the frame A, the said shaft J being provided with pulleys J′, or other suitable mechanism connected with suitable machinery for imparting a rotary motion to the said shaft in the direction of the arrow a'. (See Figs. 6, 7, 8, and 9.)

Springs K and K′, secured in the rear part of the frame A, engage the levers H and H′, so as to press the latter upward and hold the same with their cam-surfaces H^4 and H^5 in contact with the cams I and I′. The gripping-die F is held in a pocket in the bed L′ of the gripping-lever L, pivoted at L^2 in the lower part of the frame A, the gripping-lever being provided at one side with an upwardly-extending arm L^3, engaging the front of a cam N, formed or secured on the shaft J. A spring K^2, held on the frame A, pulls on the arm L^3, so as to hold the cam-surface L^4 of the latter in contact with the cam N.

On the frame A is supported the arm O, Fig. 3, extending transversely to the bed B. This arm O supports a spring *s*, which pinches and holds the blank *b*, Fig. 3^a, after it is cut off, between said spring and the leader-knife E, as is well known, so as to hold the blank cut from the metal plate by the knives E and E′ until the gripping-die F clamps the cut-off blank in position on the bed-die D.

As heretofore constructed, the leader-knife E and lazy-knife E′ both descended together and cut the blank as one knife, both remaining down while the feeder is turning over the plate, the lazy-knife remaining stationary

when down while the leader-knife descends lower and carries the blank, clamped between it and the spring, to range of engagement with the gripping-dies, to which it is then delivered.

The operation of our invention is as follows: When the main cam-shaft J is rotated in the direction of the arrow *a'*, Figs. 6 to 9, then the cams I and I' impart a downward swinging motion to the levers H and H', and a return movement of the said levers is produced by the springs K and K'. A forward and backward swinging motion is given to the gripping-lever L during each revolution of the cam-shaft J, so that all the levers operate in unison. Now when the several parts are in the starting position, as illustrated in Fig. 6, then the leader-knife E and the lazy-knife E' are in an uppermost position—that is, their cutting-edges are above the cutting-edge of the bed-knife C—to permit of feeding the metal plate between the knives E and E' and the bed-knife C. At the same time, the gripping-die F is in a forward position and on the point of receding on the further movement of the cam-shaft J in the direction of the arrow *a'*. Now, during the first quarter-revolution of the cam-shaft J, beginning in Fig. 6 and ending in Fig. 7, the two cams I and I' move the levers H and H' simultaneously and uniformly downward, to cause the knives E and E' to move simultaneously together and to cut a blank off the metal plate, the cutting being completed at the end of the quarter movement of the shaft. The cams I and I' during this quarter movement are in contact with the levers H and H' from the points *a* to *c*, (see Fig. 5,) the point *b* indicating the commencement of the cutting and the point *c* indicating the end of the cut. During the next half-revolution (beginning in Fig. 7, continuing in Fig. 8, and ending in Fig. 9) the cam I' permits the lever H' and lazy-knife E' carried thereby to return, while the leader-knife E moves still farther downward, (see intermediate position, Fig. 8,) owing to the shape of the cams I and I', as indicated between the points *c* and *d*. (See Fig. 5.) During the next quarter-revolution of the shaft J beginning in Fig. 9 and ending in Fig. 6, the lazy-knife E' remains (in consequence of the concentric bearing of its cam) at a standstill in its uppermost position until the cutting-edges of the knives E and E' are again in alignment, the same as at the beginning of the revolution. As previously stated, the gripping-die F commences its return stroke at the time the knives E and E' move downward, the arm L^3 then beginning to travel on the cam N, from the point *f* to the point *g* of Fig. 4 or position Figs. 6 to 8. The first arc of the eccentric being five-eighths of it, causes the complete return movement of the gripping-die F, Fig. 7, and the second arc the remaining three-eighths of the eccentric, causes (see Fig. 8) a forward movement to take hold of the cut-off blank and to press the same in contact with the bed-die D, the die F remaining in this forward clamping position during the rest of the revolution, from *g* to *f*, Fig. 4, which is somewhat less than one-half, and the die begins its return movement at *f*, Fig. 4, or the position shown in Fig. 6, when the knives E and E' begin to move downward at the next revolution of the shaft.

In the machines heretofore in use, the two cutting-levers are operated by eccentric-cams described around the same center, really one eccentric which imparts the necessary downward movement to the cutting-levers and knives attached to them, but the latter portion of the eccentric operating the lazy-knife was cut to a curve concentric to the axis whereby the lazy-knife, after having cut off the blank, remained still while the concentric arc of its cam passed over its cam-plate. The lazy-knife is thus necessarily down while still, and remains down until the leader, having carried the blank down between the dies, rises to the point where it left the lazy-knife, when the two knives rise simultaneously being operated by eccentrics described around the same center. The lazy-knife being thus held down, while the plate is being turned over, interferes with the turning and feeding of the plate. This is shown in Fig. 3^b, which shows the old relation of the parts where P is the plate in process of being turned over at the time when the knives E and E' are down. As the plate is pressed forward against the knives constantly by the weight that feeds it between the knives, there is unavoidable friction between the rising edge of the plate and the knives, and as the knives are rising while the opposite edge is turning down there is an antagonizing friction on that edge, so that there is friction between both the turning-up edge of the plate and the knives, and the turning-down edge, and in the turning-down movement the knives are rising with a liability of the plate riding up with the knife, causing poor feeding. When we consider that the turning edge of the plate travels more than two miles each ten hours, it can be seen that the avoidance of this friction is of moment in promoting rapid feed in tack-making.

In our invention the lazy-knife rises in unison with the rising side of the plate whichever way the plate is turned, (see Fig. 3^c,) and when the plate P is turning down the lazy-knife E is up and still, as seen in Fig. 3^a.

By having the face of the lazy-knife a little forward of the face of the leader-knife, the plate presses on the face of the lazy-knife and rises simultaneously with it, thus avoiding any friction between the rising edge of the plate and the face of the knives, as is the case in the old machine in which the plate begins to turn while the knives are down. This, our first improvement, is secured by having the concentric arc of the lazy-cam on the lean part instead of on the full part of the cam, and supplementing it with two continuous arcs of two different eccentrics, which give

the required movement of the lazy-knife in unison with the movement of the plate as it is being turned over, and so avoids all friction between the plate and the lazy-knife. This return movement of the lazy-knife in harmony with the rising edge of the plate aids the turning of the plate, avoids friction between the plate and the knives, and secures good feeding of the plate while the machine is running at high speed.

Our second improvement consists in the form of the gripping-lever cam.

In the old machine the gripping-lever cam consists of one eccentric giving the necessary motion, and a concentric arc, described around the center of the spindle on the full part of the cam, in order to hold the blank between the dies long enough to be headed and to permit the header to leave the head it has formed to avoid the breaking of the dies by the gripping-die starting too soon. This concentric arc of the cam necessarily requires nearly one-half of the cam, five-twelfths, leaving but little more than one-half of the cam, seven-twelfths, as an eccentric to give the necessary movement to the gripping-die to permit the tack to drop out, and the blank to pass down between the dies when carried down by the leader-knife. In rapid running the gripping-lever will not follow or remain in contact with its cam, but will thump, due to the rapid pitch of this cam to the center of the spindle.

By our improved form of the gripping-cam the time of the travel of the gripping-lever on the cam toward the center of the spindle is prolonged and its movement rendered more gradual and the travel of the gripping-lever is reduced, and yet we get the necessary space between the dies when the blank is carried down between them. This diminished travel of the gripping-lever with the necessary space between the dies, is secured by the cam having two eccentrics instead of one, as in the old machine. Thus, referring to Fig. 4, the eccentric of what we term the "leaving part" of the cam is shown from 1 to 2, and is constructed by a radius whose center is at x and comprising five-eighths of the eccentric. The arc of the coming part of the cam shown from 2 to 3, comprises but three-eighths of the eccentric and is described from a center at y. The arc of the leaving part 1 to 2 is constructed by a shorter radius than the arc of the coming part of the cam from 2 to 3 and embraces more than half of the eccentric, and hence the leaving part of the cam is necessarily fuller than the leaving part of the cam in the old machine, which is shown by dotted lines. The arc comprising the coming part of the cam is formed by a longer radius than the arc of the leaving part, so that the gripping-die does not start to come as soon as in the old machine, thereby allowing sufficient space between the dies for the blank to pass down between them, though the gripping-die does not travel so far away from the bed-die as in the old machine. This fullness of the gripping-cam on the leaving part and diminished travel of the gripping-lever, obtained by using two eccentrics of different radii, with the arc of the shorter radius on the leaving part, enables the gripping-lever to follow its cam when running the machine at a high rate of speed, and we secure the maximum distance between the dies, when the blank is carried down between them, with the minimum movement of the gripping-lever.

Our third improvement is the centering of the gripping-lever in a line c c, Fig. 1, drawn from the bed-die score at a right angle to the plane of the bed-die pocket.

By the universal rule of building tack-machines, the gripping-lever is centered in a line drawn from the bed-die score, perpendicular to the plane of the bed-piece—*i. e.*, in the line p p of Fig. 1. In cutting the blank it is necessary that the moving knives should be ground on a bevel, so that the lower surface of their cutting-edges will be nearly in the plane with the bed-knife. The blank held firmly up against the cutting-edge of the leader by the bearer-spring is necessarily carried laterally its whole width across the cutting-edge of the leader by the gripping-die a distance of over two thousand feet each day.

In the old machine the gripping-die, moving in the plane of the bed-piece when it carries the blank into the bed-die score, necessarily wears off the cutting-edge of the leader. By our improvement this difficulty is overcome by the direction of the movement of the gripping-die, which is parallel to the cutting-surface of the leader-knife, and the leader-knife will run much longer than in the old machine, because subject to much less wear on account of the direction of the movement of the gripping-die.

In the old machine the gripping-die necessarily moves when gripping the blank, at an angle with the bed-die and the bed-knife which rests upon it, and as a result of this direction of the movement of the gripping-die, the bed-die with the bed-knife resting on it is frequently crowded up from the bottom of the pocket, thereby preventing that firm foundation for the bed-knife that is necessary to secure good cutting of the blanks. This difficulty resulting from the bed-die being crowded up is overcome by our improvement of centering the gripping-lever, so the gripping-die will, when in its forward position, move in the plane of the bed-die pocket, and in the line of the axis of the bed-die while gripping the blank.

Having thus described our invention, what we claim is—

1. A tack machine having two cams operating the two levers carrying the leader and lazy knives, said cams being constructed and arranged as described to actuate the leader knife and to secure the return movement of the lazy knife in unison with the movement of the plate as its edge rises to turn over while

the leader is moving down, the parts being combined substantially as described and for the purpose set forth.

2. A tack machine having two cams operating the two levers carrying the leader and lazy knives, said cams being constructed and arranged as described to actuate the leader knife and to maintain the lazy knife up and still, while the edge of the plate is turning down, the parts being combined substantially as described and for the purpose set forth.

3. In a tack machine, the combination with the gripping lever, of its cam formed with two continuous arcs of eccentrics constructed around different centers, having the arc of the leaving part longer and fuller than the arc of the coming part, substantially as and for the purpose set forth.

4. In a tack machine, the combination with the bed die, of the gripping lever centered in a line drawn from the bed die score at a right angle to the plane of the bed die pocket and the hereindescribed cam for operating said gripping lever, substantially as described, and for the purpose set forth.

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