

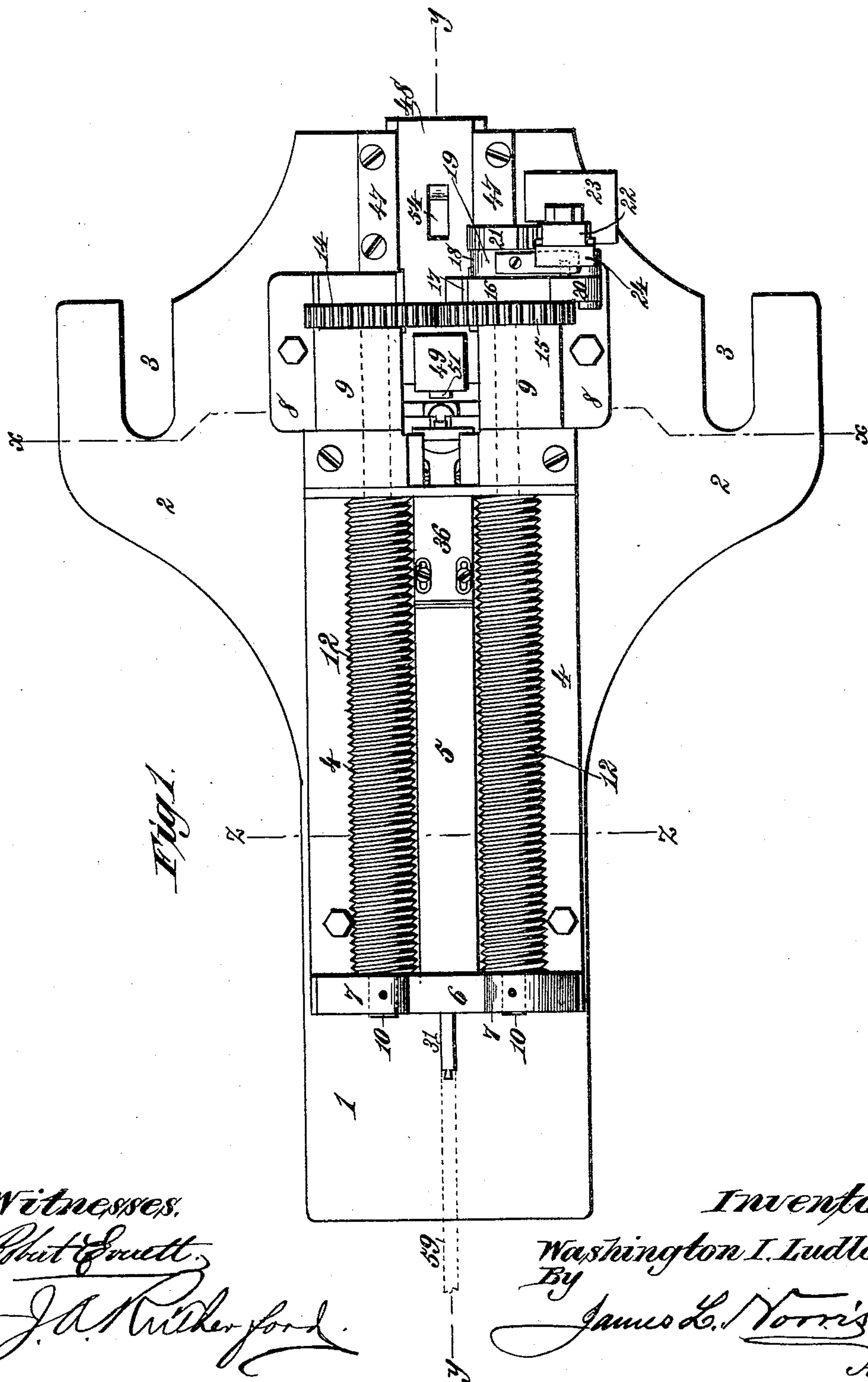
(No Model.)

4 Sheets—Sheet 1.

W. I. LUDLOW.  
MACHINE FOR MAKING STAPLES.

No. 439,077.

Patented Oct. 21, 1890.



Witnesses:  
*Robert Emmett*  
*J. A. Rutherford*

Inventor:  
*Washington I. Ludlow*  
By *James L. Norris*,  
Atty.

(No Model.)

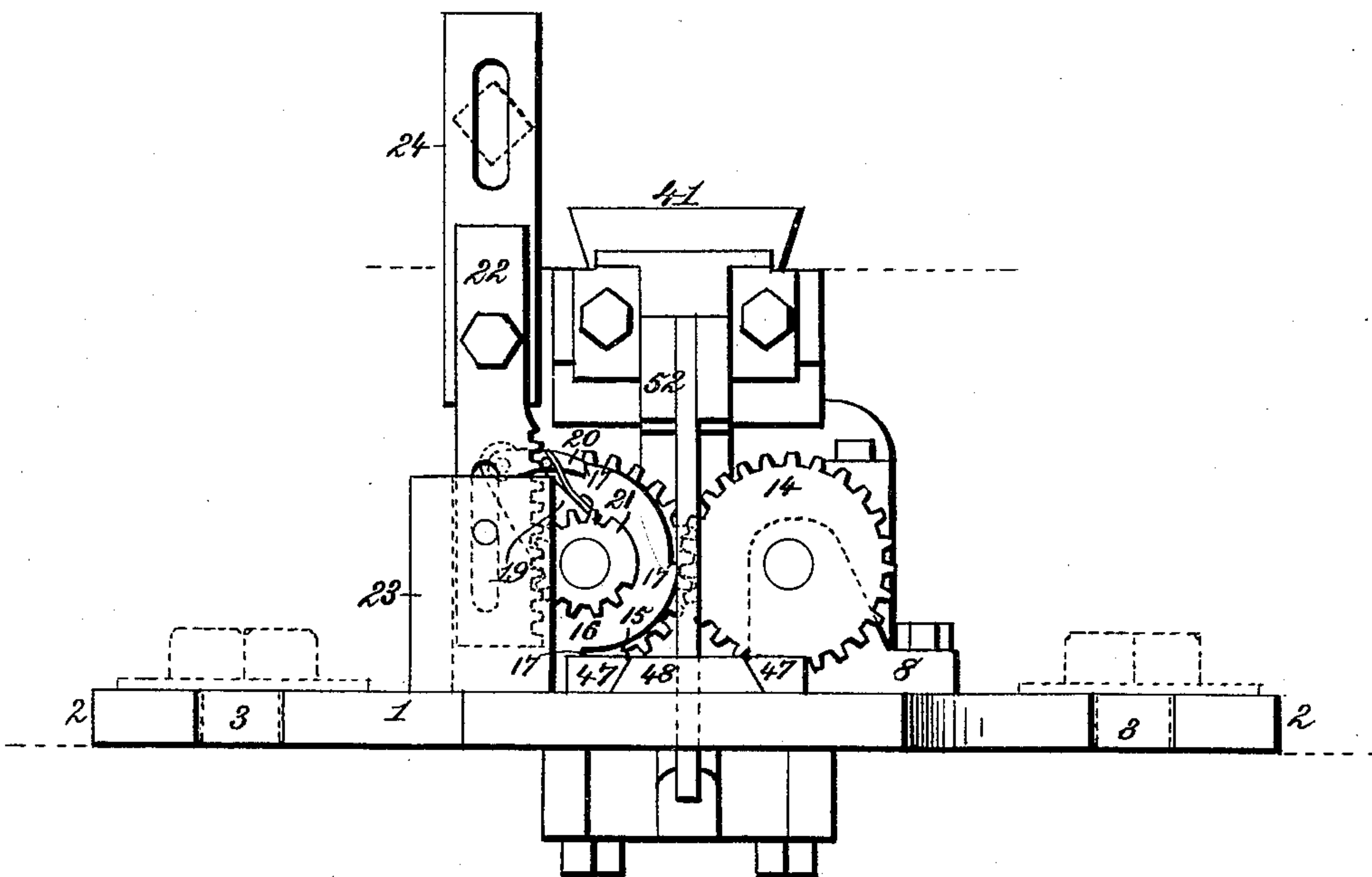
4 Sheets—Sheet 2.

W. I. LUDLOW.  
MACHINE FOR MAKING STAPLES.

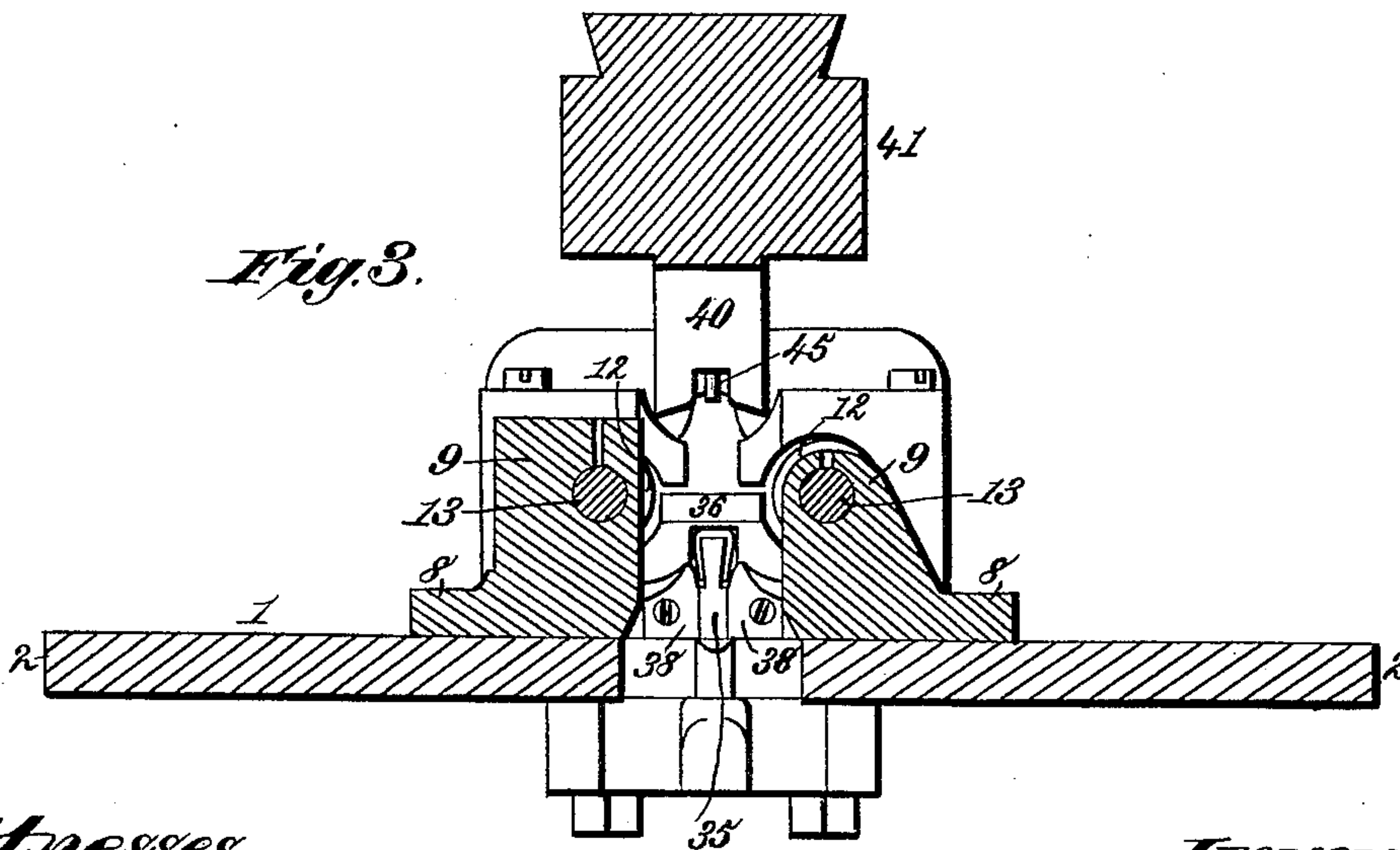
No. 439,077.

Patented Oct. 21, 1890.

*Fig. 2.*



*Fig. 3.*



Witnesses,

*Robert G. Pratt*

*J. A. Rutherford*

Inventor,

*Washington I. Ludlow*

By

*James L. Norris*

*Atty.*

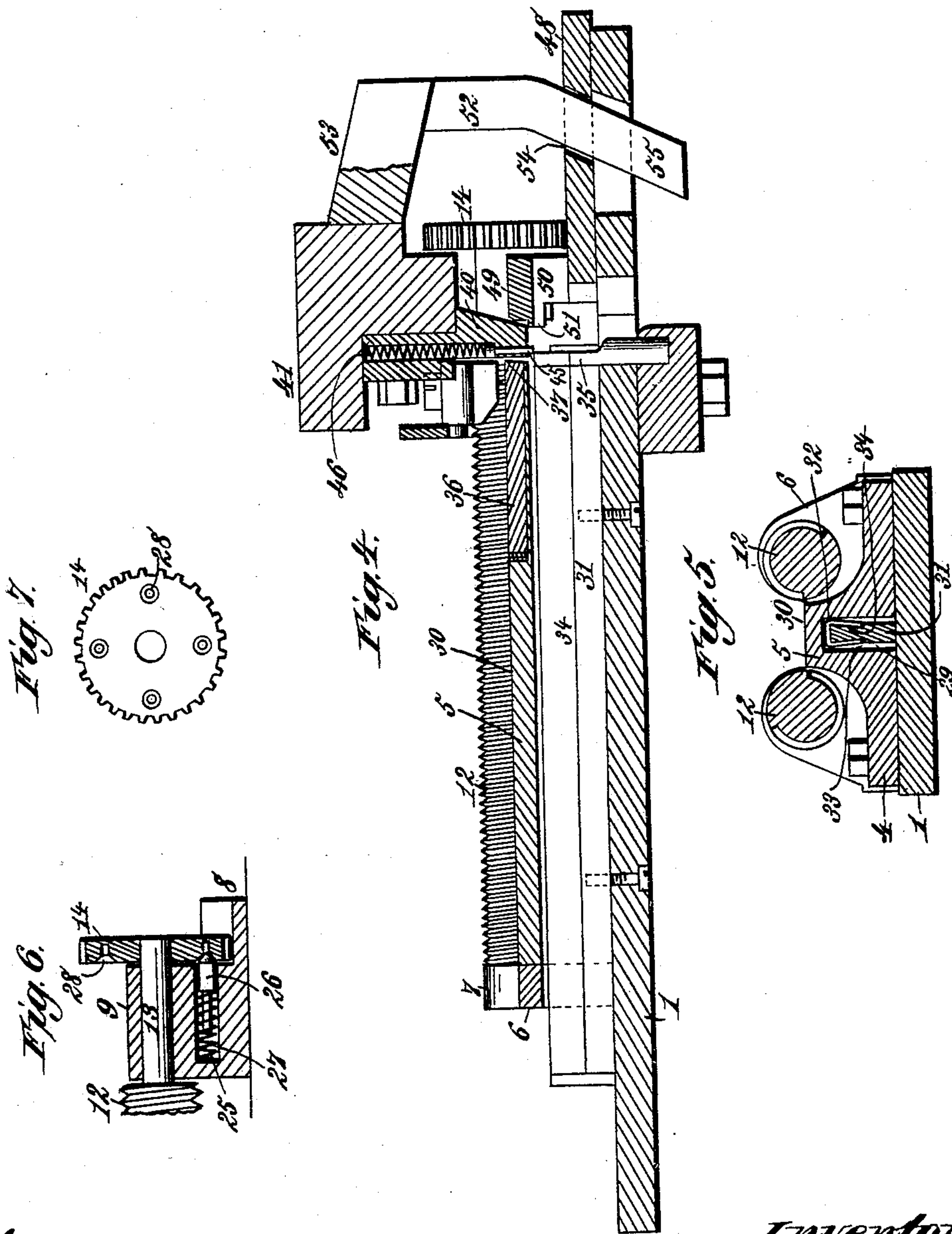
(No Model.)

4 Sheets—Sheet 3.

W. I. LUDLOW.  
MACHINE FOR MAKING STAPLES.

No. 439,077.

Patented Oct. 21, 1890.



Witnesses.  
Robert Emmett.  
J. A. Kitcherford.

Inventor  
Washington I. Ludlow.  
By  
James L. Norris.  
Atty.



(No Model.)

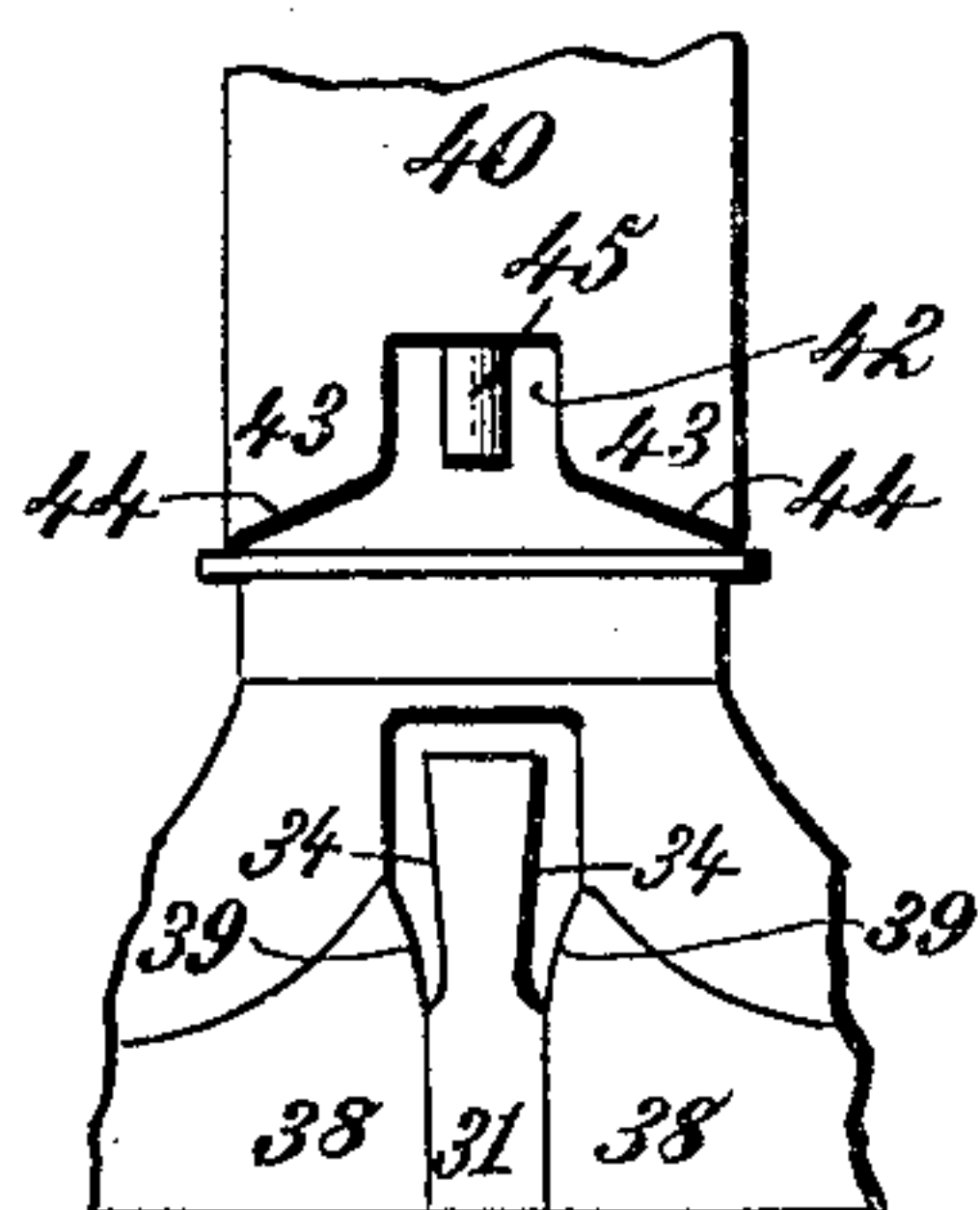
4 Sheets—Sheet 4.

W. I. LUDLOW.  
MACHINE FOR MAKING STAPLES.

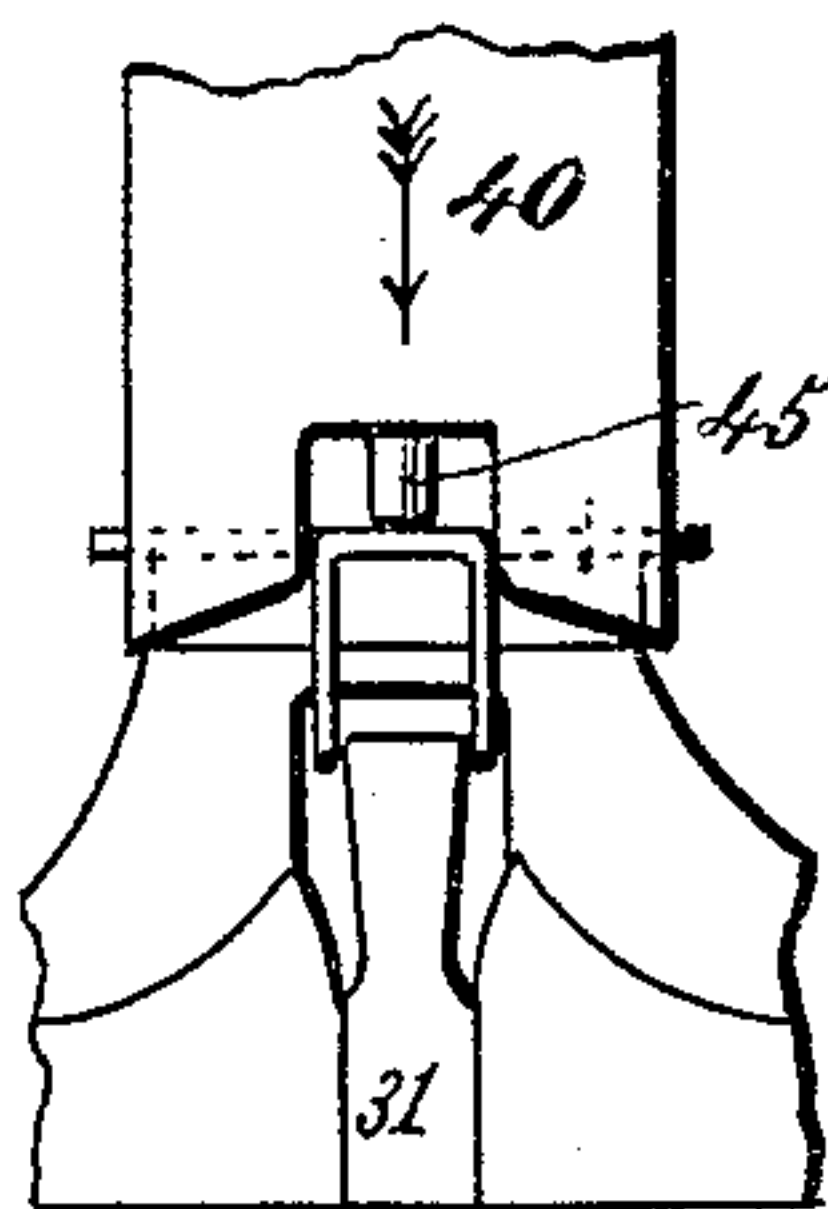
No. 439,077.

Patented Oct. 21, 1890.

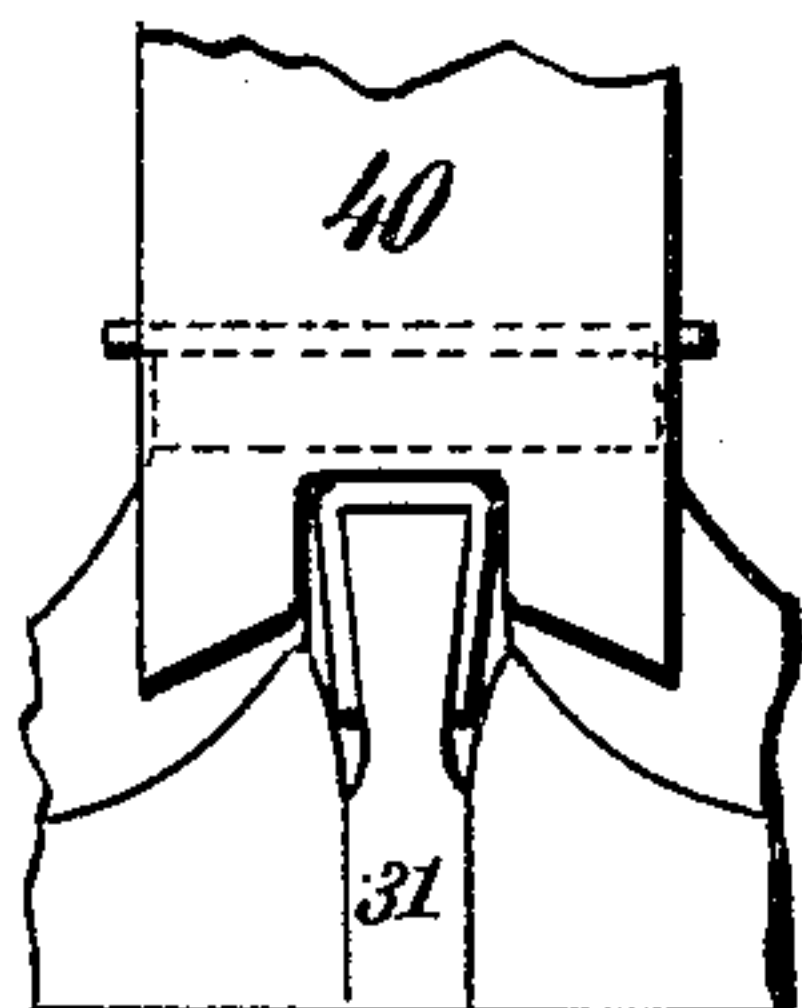
*Fig. 8.*



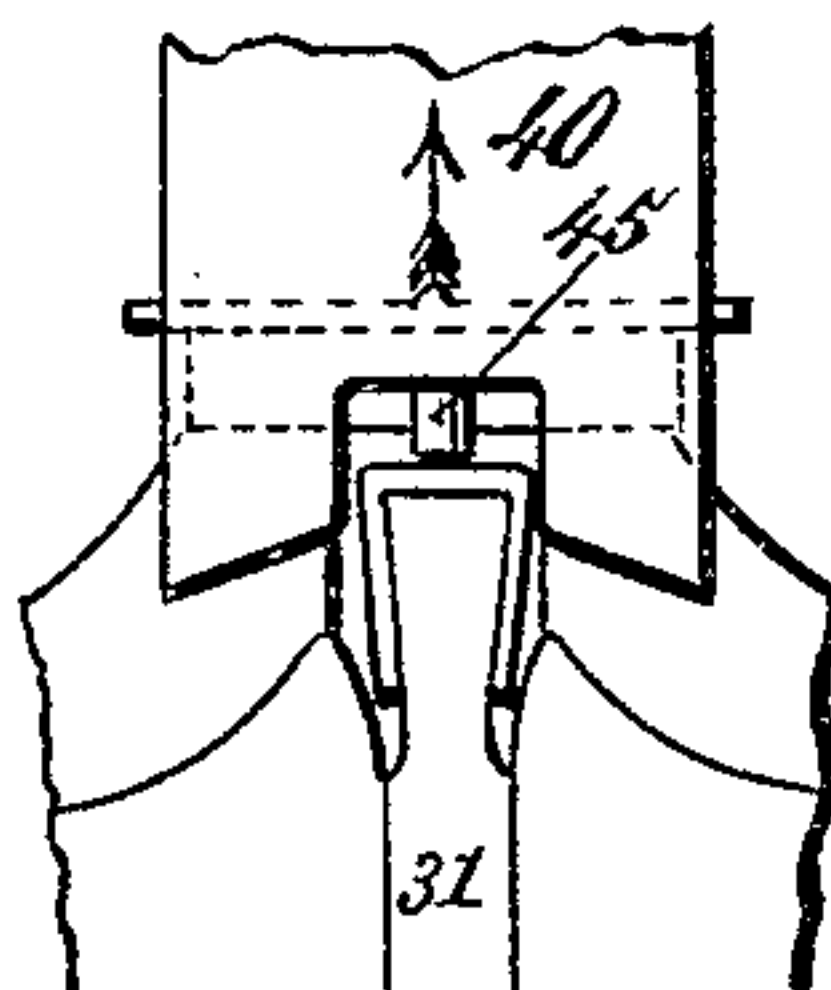
*Fig. 9.*



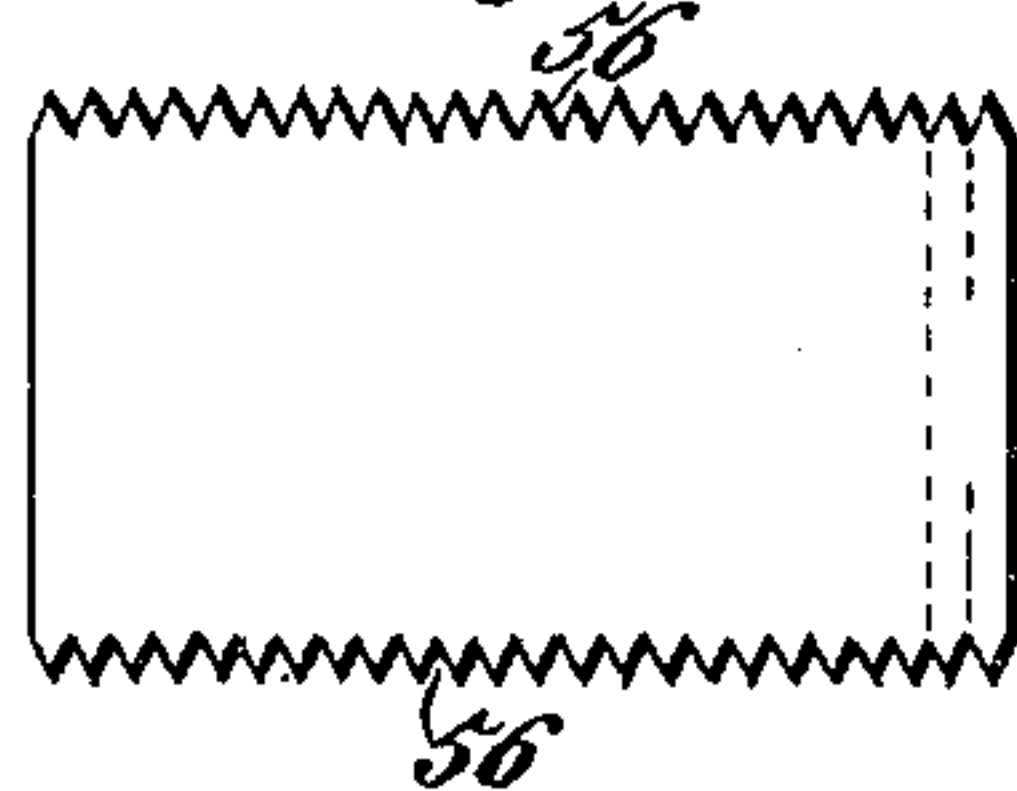
*Fig. 10.*



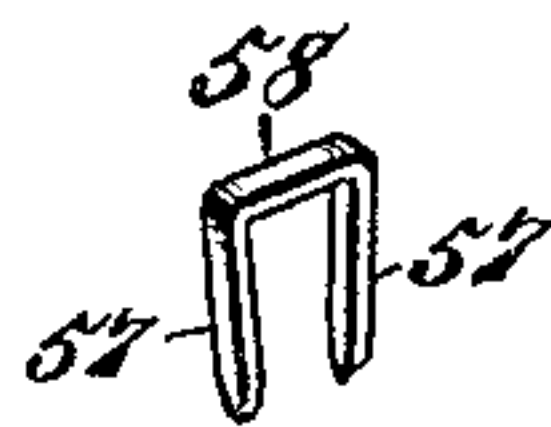
*Fig. 11.*



*Fig. 12.*



*Fig. 13.*



Witnesses,  
*Robert Emmett*

*J. A. Rutherford*

Inventor:  
*Washington I. Ludlow.*  
By

*James L. Norris.*  
Atty.

# UNITED STATES PATENT OFFICE.

WASHINGTON I. LUDLOW, OF CLEVELAND, OHIO, ASSIGNOR TO THE CLEVELAND WINDOW SHADE COMPANY, OF SAME PLACE.

## MACHINE FOR MAKING STAPLES.

SPECIFICATION forming part of Letters Patent No. 439,077, dated October 21, 1890.

Application filed January 27, 1890. Serial No. 338,268. (No model.)

*To all whom it may concern:*

Be it known that I, WASHINGTON I. LUDLOW, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Machines for Manufacturing Staples, of which the following is a specification.

This invention relates to the manufacture of staples, particularly that type used as carpet-tacks; and the objects of my invention are to provide novel means for rapidly and economically producing staples from comb-plates of sheet metal, to provide novel mechanism for the production of staples from strips of metal having parallel serrated edges, and to provide for manufacturing staples adapted to the tacker-stick used in the carpet-stretcher and tacker constituting the subject-matter of my application for Letters Patent filed September 6, 1889, Serial No. 323,191.

To accomplish all these objects my invention involves the features of construction, the combination or arrangement of parts, and the principles of operation, hereinafter described and claimed.

To enable others to understand and practice my said invention, I will describe the same in detail, reference being had to the accompanying drawings, which illustrate a form of mechanism suitable for carrying the invention into effect, and in which—

Figure 1 is a plan view of a machine embodying my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a transverse section on the line  $x x$ , Fig. 1. Fig. 4 is a central longitudinal vertical section upon the line  $y y$ , Fig. 1. Fig. 5 is a transverse vertical section upon the line  $z z$ , Fig. 1. Fig. 6 is a sectional view through the journal-bearing of one of the screw-shafts, showing the locking devices. Fig. 7 is a rear elevation of one of the gears by which the screw-shafts are rotated. Fig. 8 is a detail elevation showing the shearing and forming die about to begin its cutting and forming action upon the comb-plate. Fig. 9 is a similar view showing the further operation of the shearing-die and the action of the die-opening in turning the prongs. Fig. 10 is a similar view showing the completed action of the forming-die, the separa-

tion of the staple from the blank, and its insertion upon the die and holder. Fig. 11 is a further elevation showing the rise of the shearing and forming die and the means for discharging or clearing the staple from the die-openings. Fig. 12 is a view of the comb-plate from which the staples are formed. Fig. 13 is a perspective view of a completed staple.

In the said drawings, the reference-numeral 1 designates a base-plate of suitable size, having lateral extensions 2, which are provided with slots 3, to enable it to be placed upon and secured to the bed of an ordinary punching-press and adjusted thereon. Upon this base-plate is mounted a plate 4, bolted to the base and having a central rib or projection 5, the metal being cut away upon each side thereof to form concave recesses extending the entire length of the piece. At the rear end of this plate 4 is placed a transverse bearing-block 6, having journal-seats 7, and at the forward end are brackets 8, having journal boxes or bearings 9. In these brackets are mounted the journals 10, of oppositely-threaded screw-shafts 12, which lie in the concave recesses on each side of the central rib or projection 5, their forward ends having support in the bracket-bearings 9.

Upon the forward journals 13 of the screw-shafts, which project beyond the boxes in which they lie, are mounted gears 14 and 15, of equal diameter, and meshing with each other, said pinions being keyed to the shafts on which they are mounted. Upon the gear 15 is mounted a ratchet 16, having four equidistant teeth 17. Projecting from the face of this ratchet and concentric with it is a boss 18, having an arm 19, which projects radially and carries a strong pawl 20, meshing with the ratchet. Upon the boss 18 in front of the arm is a pinion 21, with which a rack-bar 22 makes engagement, said rack being arranged in a recess in a vertical block 23, by which it is held in mesh and guided in a vertical reciprocation effected by the press-head, to which it is coupled by a bar 24. At each reciprocation the pinion 21 is rotated through somewhat less than a circle, the pawl 20 being advanced thereby and caused to impart a revolution to the gears of one-fourth of



complete rotation. The reverse movement then retracts the pawl, which engages the succeeding tooth of the ratchet.

In order to secure accurate action and prevent backlash, I form one or more recesses 25 in one of the brackets 8, and insert a spindle or pin 26, which is pressed outward by a coiled spring 27. The point of this pin is conical, or nearly so, and it makes engagement at each quarter-revolution of the pinion with a concave seat 28, formed in the rear face of the pinion, thereby acting as a stop to arrest and hold the pinion from revolution. By the exertion of the proper force the pin will be driven out of the seat or socket 28 by the revolution of the gear; but it offers an ample resistance to the tendency to retrograde movement or backlash caused by the recovery of the pawl 20.

The central rib or projection 5 rises to bring its flat top surface into a horizontal plane, which is in or nearly in the axial line of the two screw-shafts 12. In the center of this piece is cut a longitudinal vertical channel or slot 29, opening upon the lower surface of the plate 4, and rising to a point a little below the flat surface 30 of the central rib. This slot or channel extends from end to end of the part in which it is formed, and it is a very little in excess in its width of the outside width of the staples to be formed.

Rising from the bed-plate is a straight narrow plate of metal 31, conforming in its general outline to the rectangular oblong shape of the slot, which it fills with the exception of a space 32 above or between the edge of the plate and the top of the slot and lateral spaces 33 between the vertical walls of the slot and the faces of the plate. The vertical surfaces of the latter are cut away slightly to form faces 34, extending from end to end of the plate, which converge very slightly from the upper edge or top of the plate downward, for a purpose presently to be shown. The plate projects from the rear extremity of the channel or slot 29 for any suitable distance.

At the forward end of the slot is a plate or block 35, which is the counterpart in cross-section of the plate 31, of which it practically forms part. This block is formed of hardened steel and constitutes the male die of the staple-press. It projects from the forward end of the slot 29 a distance equal to or a little greater than the width of one of the finished staples. A forward portion of the flat top of the rib or projection 5 is removed and in the recess thus formed is inserted a plate 36, of hardened steel, having its upper face flush with the flat top 30 of the rib 5. The forward end of this plate is cut square and slightly undercut to form a shearing-edge 37, which overhangs the forward end of the rib.

Upon each side of the plate or block 35, which projects from the channel 29, is a guide-block 38, screwed to the end of the rib 5 and provided with inner faces 39, which converge downward toward each other and

toward the vertical faces of said block or male die. The upper ends or edges of these guide-blocks drop below the top of the die 35 by a distance about equal to half the length of the finished staple, more or less, and the top or edge 37 of the plate 36 is arranged above the top of the die-block 35 a distance nearly equal to the length of the prongs of a finished staple.

The numeral 40 denotes the female die, which in this case is the movable die. It consists of a block of hardened steel mounted in any suitable manner upon a reciprocating head 41, which is reciprocated by the press-head. The die 40 hangs from its head, and is provided with a central die-opening 42, which is of a size and shape to exactly admit the head or central portion of one of the staples, while the die-block 35 is of such dimensions that it will fill the space between the legs or prongs of the same. Upon each side of this die-opening 42 are vertical blocks 43, the lower ends of which are beveled off in such manner as to form surfaces, which incline from the outer faces of the block upward at a small angle from the horizontal, said faces being also very slightly inclined to form shearing edges or angles 44, which cooperate with the shearing-edge 37 of the plate 36. In the die-opening 42, which has a depth of about one-half the length of a formed staple, is arranged a clearing-pin 45, set in a recess in the die-block and projected downward by a spring 46 of suitable strength.

Sliding in suitable guides 47 upon the bed-plate 1 is a feed-plate 48, having a feed-block 49 mounted on its rearward end. In this feed-block is formed a cavity or recess 50 of a size to admit the die-block 35 upon the rearward movement of the feed-block, and surrounding or partly surrounding said opening or recess is an edge or plate 51, projecting from the vertical rearward face of the feed-block and adapted at each rearward movement of the latter to enter the space between the die-plate 35 and the rib 5. The feed-plate and block are reciprocated in their guides or ways by means of a horn or arm 52, hanging from an arm 53 on the press-head and lying in a slot 54 in the feed-plate 48. The horn 52 is either angular or it is provided with an angular portion 55, which lies in the slot of the guide-plate, and at each vertical reciprocation of the press-head it effects a horizontal reciprocation of the feed-block, the arrangement being such that the rearward movement upon which the edge or plate 51 enters the space between the die-block 35 and the rib 5 shall take place during the rise of the press-head, at which instant, also, the quarter-revolution of the screw-shafts is accomplished by the means already described.

The staples are formed from strips or plates of sheet metal, which are cut to the proper width and of any suitable length and serrated upon their longer parallel edges to form double rows of teeth 56, which are the points of the finished staples. These serrations are



so formed that the teeth 56 are exactly opposite each other upon the opposite edges of the plate, whereby the transverse lines connecting the points intermediate of the serrations may form the lines of cut, separating one staple from another. The serrations of the parallel edges of these plates are so formed as to correspond substantially to the threading of the screw-shafts 12, and the latter are so arranged with relation to each other that when one or more of the serrated sheet-metal plates are laid flat upon the flat top 30 of the rib 5 their points or teeth will engage and lie in the threads of said shafts. It is evident that as the latter are rotated, their movement being toward the central line of the rib, their opposite threads will feed the serrated plate toward the forward end of the rib on which it rests. This doubly-serrated strip of sheet metal I term a "comb-plate," for convenience of designation. The pitch of the threads upon the screw-shafts 12 and the distance between the serrations of the comb-plate are so proportioned that on each quarter-turn of the screw-shafts the comb-plate shall be fed forward a distance equal to one of the serrations. As the end of the comb-plates projects beyond the forward end of the plate 36, the edge 37 thereof lies in the line separating one serration of the comb-plate from the succeeding serration. As the female or movable die descends, the inclining shearing-edges 44, in conjunction with the shearing-edge 37 of the plate 36, cut the comb-plate from its outer edges toward the center, and as the prongs or points 57 are separated from the body of the plate they are bent downward and inward toward each other until their points impinge upon the opposite vertical faces of the die-block 35, this action being caused by the die-opening 42. As the die-block descends still further, the upper horizontal edge of the die-opening shears the staple entirely from the plate, cutting, at one stroke, the horizontal connecting member 58 of the staple from the body of the plate. The further descent of the die now drives the staple down upon the die-block which it straddles, its ends passing between the vertical faces thereof and the guide-blocks 38. As the die rises, the clearing-pin 45 drives the formed staple out of the die-opening 42, leaving it upon the die-block, and during the upward movement of the die, also, the feed-block advances, driving the staple off the die-block and into the channel of slot 39 under the rib 5, while at the same time the quarter-revolution of the threaded shafts 12 feeds the comb-plate forward until the next succeeding oppositely-projecting points are projected beyond the shearing-edge 37, when the die again descends, repeating the operation described and forming another staple.

It will be seen that the string or series of staples may be discharged from the rear end of the plate on which they are straddled into a box or other receptacle; or they may be fed

upon a stick 59, adapted to be used in my carpet-tacker, already alluded to.

Instead of the oppositely-threaded and oppositely-revolving screw-shafts, I may use shafts threaded in and revolving in the same direction.

What I claim is—

1. The combination, in a machine for manufacturing staples, of a pair of intermittently-rotating screw-shafts geared together to travel at uniform speed, a comb-plate support located between the screw-shafts, and means for transversely severing the comb-plate and bending the severed parts into a staple, substantially as described.

2. The combination, in a machine for manufacturing staples, of a pair of parallel rotating screw-shafts geared together, a comb-plate support between the screw-shafts, means for transversely severing the comb-plate and bending the severed parts into staples, a staple-holder, and means for successively stringing the staples on the holder, substantially as described.

3. The combination, in a machine for manufacturing staples, of a pair of parallel rotating screw-shafts, a comb-plate support between the screw-shafts, a staple-holder located beneath the comb-plate support, and means for transversely severing the comb-plate, bending the severed portions into staples, and successively stringing the staples on the holder beneath the comb-plate support, substantially as described.

4. In a machine for manufacturing staples from sheet metal, the combination, with a pair of parallel screw-shafts arranged upon opposite sides of a flat rib having a shearing-plate, of a movable die having oppositely-inclined shearing-edges, and provided with a vertical die-opening, and a die-block arranged beyond the end of the rib and beneath the movable die, substantially as described.

5. In a machine for manufacturing staples, the combination, with a pair of rotary threads, of a comb-plate the points whereof engage the threads of the screws, a shearing and forming die, a die-block, a holder forming a continuation of said die-block, and a feed-block pushing the formed staples off the die-block upon the holder, substantially as described.

6. In a machine for manufacturing staples from sheet-metal blanks, the combination, with a pair of parallel simultaneously-revolving threaded shafts, of intermeshing gears mounted on said shafts, a reciprocating rack-bar coupled to the press-head and meshing with a pinion on one of the shafts, a pawl mounted on an arm on said shaft and engaging the teeth of a ratchet rigidly mounted on one of the gears, and one or more pins, each arranged in a recess in the bearing of said gears and projected outward by a spring to force its conical extremity into concave seats in the face of the gear to act as a stop, substantially as described.

7. In a machine for making staples, the com-



5 bination, with a pair of parallel threaded shafts arranged upon each side of a flat-topped rib having a shearing-plate, of a die-block arranged in and projecting from a slot in the rib, a movable die having a die-opening and provided with blocks on each side of said opening, having upwardly-inclined shearing-edges and provided with a spring-projected clearing-pin arranged in said spring,  
10 and a feed-block having a plate bent to the

form of the staple, said block being reciprocated by a horn on the press-head moving in an opening in the plate carrying the feed-block, substantially as described.

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

WASHINGTON I. LUDLOW.

Witnesses:

EDWARD J. MAGUIRE,  
WM. G. TAYLOR.