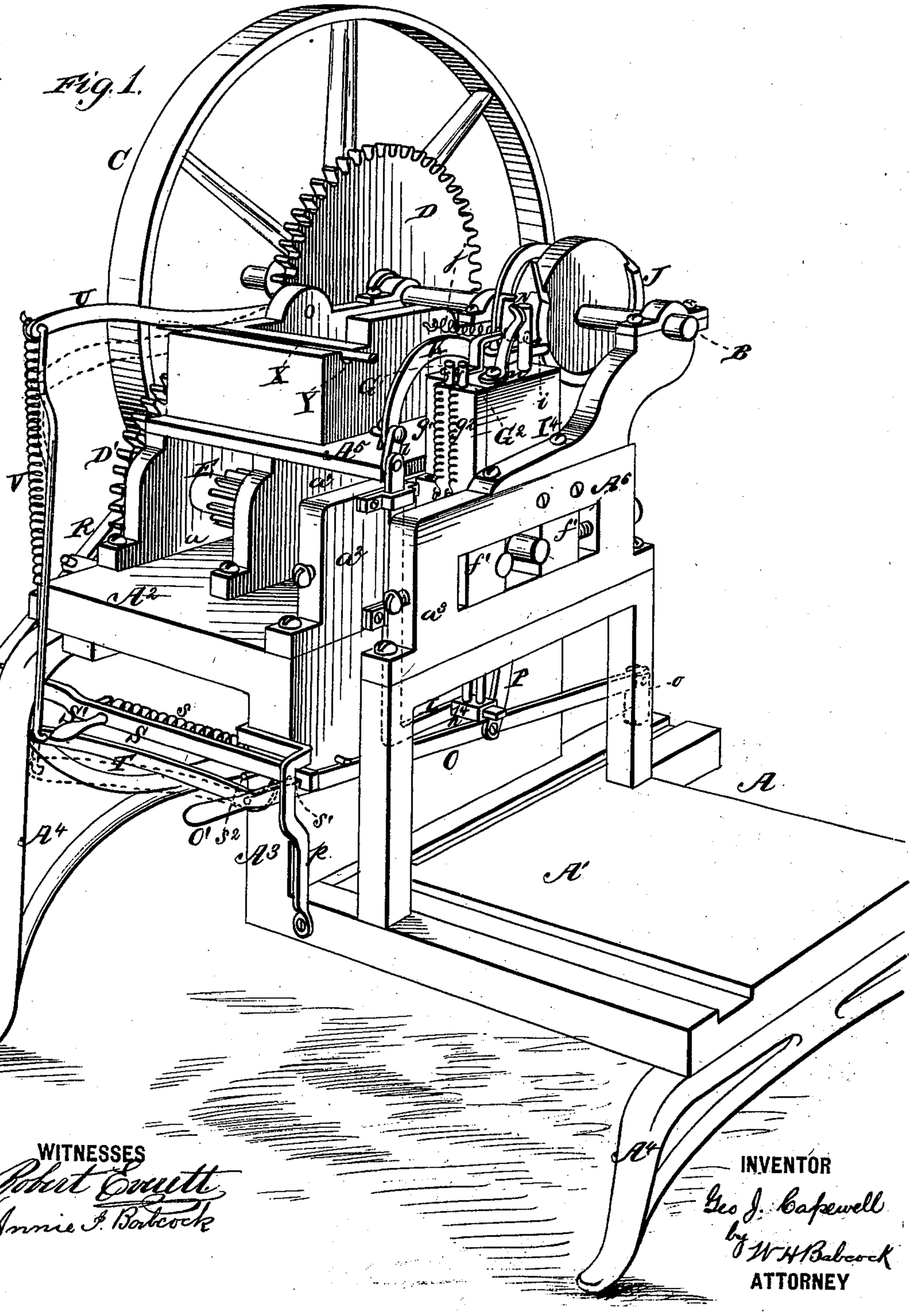
3 Sheets—Sheet 1.

G. J. CAPEWELL.

Roller-Die Machine for the Manufacture of Articles from Metal.

No. 227,611. **Patented May 18, 1880.**

Fig. 1.



N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

3 Sheets—Sheet 2.

G. J. CAPEWELL.

Roller-Die Machine for the Manufacture of Articles from Metal.

No. 227,611. **Patented May 18, 1880.**

Fig. 4.

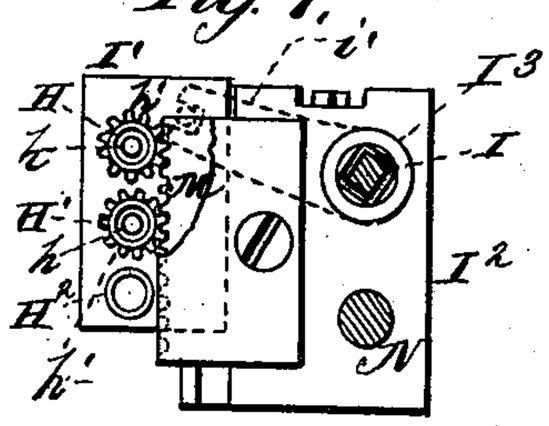


Fig. 5.

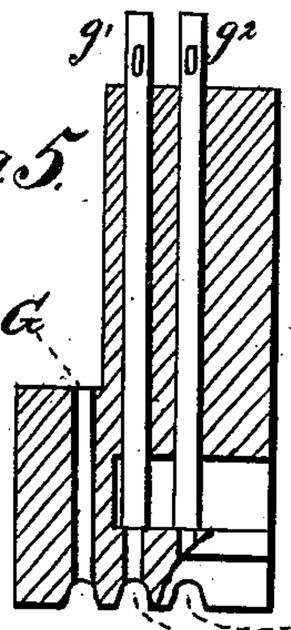


Fig. 6.

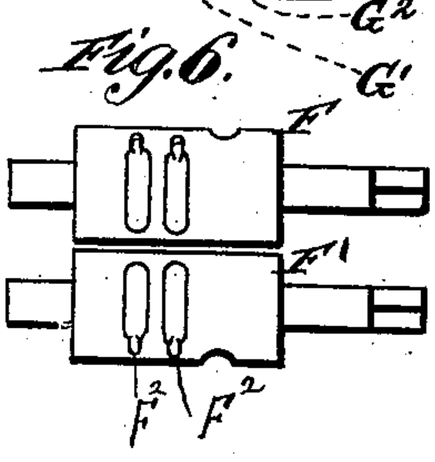


Fig. 3.

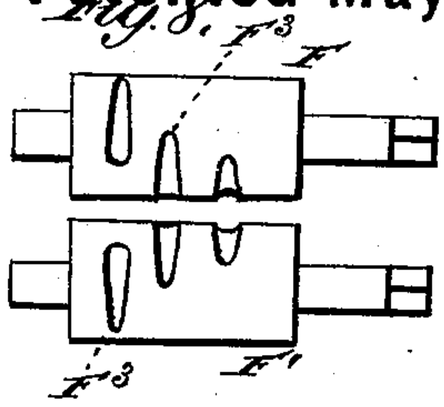


Fig. 2.

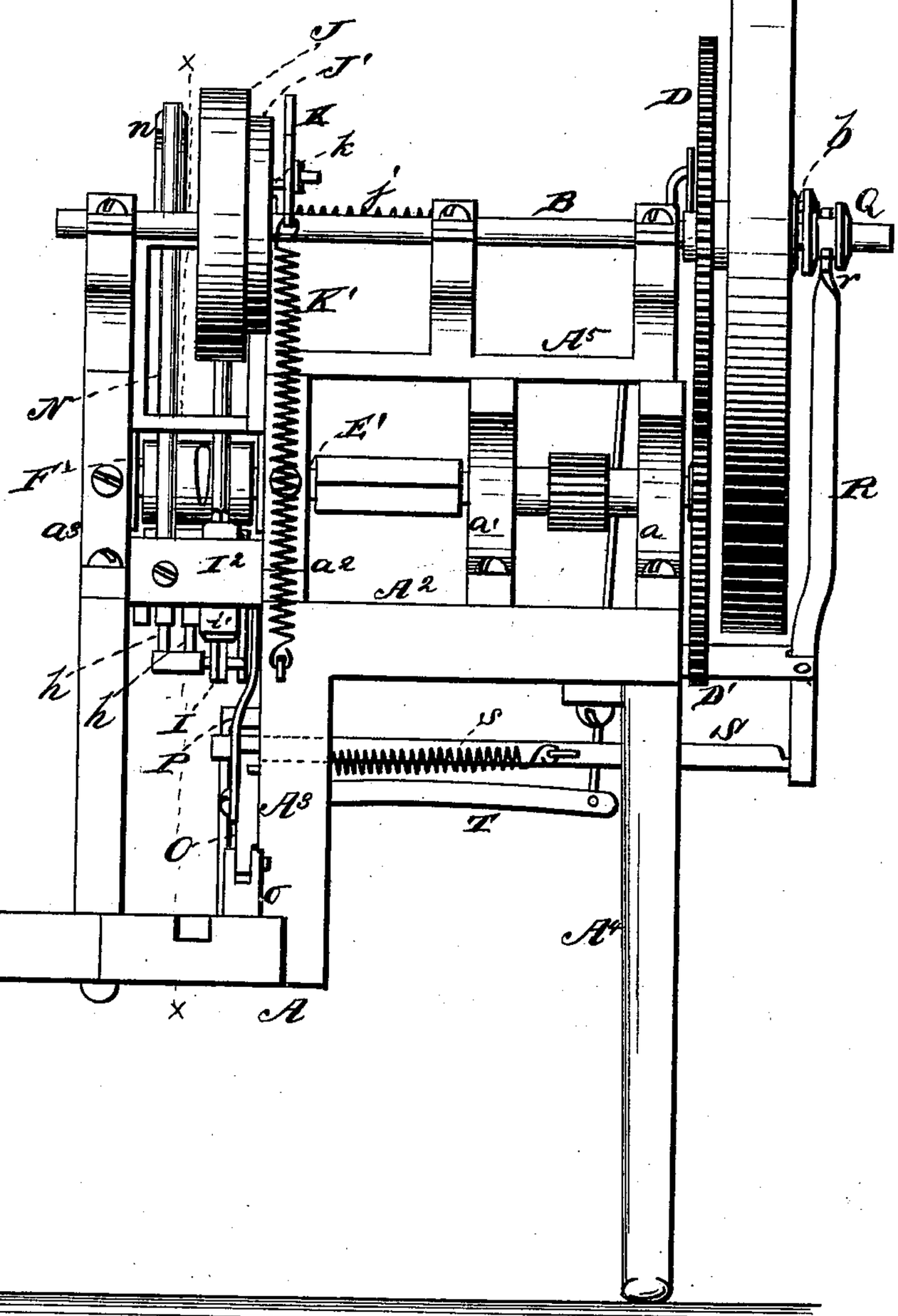
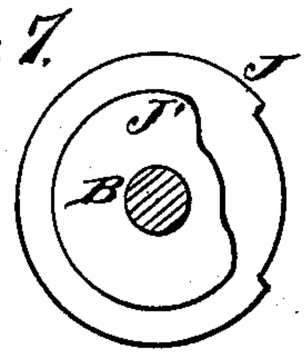


Fig. 7.



WITNESSES

Robert Everett

Annie A. Babcock

INVENTOR

George J. Capewell

by

W. H. Babcock

ATTORNEY

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

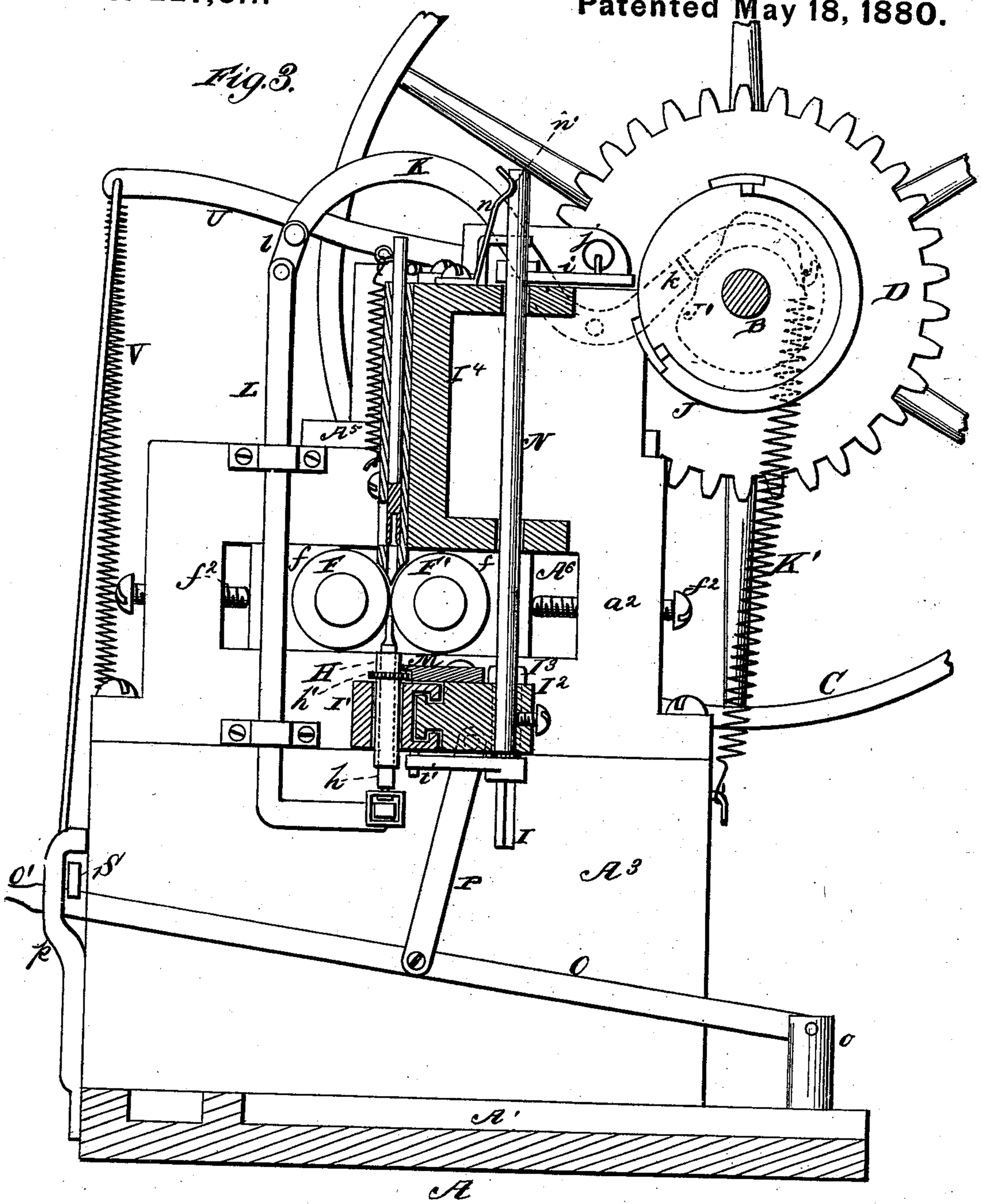
3 Sheets—Sheet 3.

G. J. CAPEWELL.

Roller-Die Machine for the Manufacture of Articles from Metal.

No. 227,611. Patented May 18, 1880.

Fig. 3.



WITNESSES

Robert Ewart

Annie F. Babcock

INVENTOR

George J. Capewell

by

W. H. Babcock

ATTORNEY

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GEORGE J. CAPEWELL, OF CHESHIRE, CONNECTICUT.

ROLLER-DIE MACHINE FOR THE MANUFACTURE OF ARTICLES FROM METAL.

SPECIFICATION forming part of Letters Patent No. 227,611, dated May 18, 1880.

Application filed January 24, 1880.

To all whom it may concern:

Be it known that I, GEORGE J. CAPEWELL, of Cheshire, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Roller-Die Machines for the Manufacture of Articles from Metal; 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to that class of machines for compressing and shaping blanks of metal in which rolls are employed, said rolls being provided with registering die-grooves arranged in series, so that a single pair of pressure-rolls will suffice for a machine.

The shape of the blanks produced by the operation of my improvements, hereinafter described, will depend upon that of the die-grooves. Those in the accompanying drawings are adapted to give the blanks an elongated pointed shape, greatly reduced in cross-section, and in condition to be readily converted, either by hand or additional machinery, into a finished nail, awl, or any one of the many other articles of use or wear. My improvements do the heavier part of the work, and leave the blank in such condition that very little additional labor will put it into the shape desired, which may be almost any elongated and pointed one. The blanks thus produced may be sold as a distinct article of manufacture, or they may be immediately submitted to the action of other shaping mechanism.

One of my chief objects in the said invention is to provide for the instantaneous automatic stopping of the machine when the end of a bar of metal fed thereto is reached. Another is to cause automatically the same stoppage whenever a blank is presented in an improper position to the guide tubes or rolls. Another is to allow the convenient withdrawal of the guide-tubes, or of a portion of them, for the purpose of inspection or clearing. Another is to provide means for giving the blanks a partial turn while in transit from one pair of die-grooves to another without requiring the guide-tubes to be twisted in shape. Another is to provide new and superior means for shifting the blanks from one pair of die-grooves to another pair thereof. Another is to provide means for automatically clearing a portion of the guide-tubes and keeping the blanks in their proper position therein. There are other objects, which need not here be specially stated.

My invention consists in the various contrivances and devices employed to accomplish these results, and which are hereinafter fully set forth, and particularly pointed out in the appended claims.

As my machine does not depend upon gravity for its operation, its position may be horizontal instead of vertical, or the said machine may occupy any intermediate position. For convenience of description, however, I have concluded to refer to it as vertical throughout this specification, and to illustrate it as vertical in the appended drawings. In said drawings the guide-tubes, plungers, walls, and several of the rods, springs, and levers are all shown in a vertical position. These constitute the greater part of the machine; hence the machine as a whole is said to be shown in a vertical position, although the rolls, shaft, and some other parts of it are shown as horizontal.

Figure 1 of said drawings represents a perspective front view of a machine embodying the said invention. Fig. 2 represents a rear view of the same. Fig. 3 represents a vertical cross-section through the guide-tubes and adjacent parts, taken on line *x x* of Fig. 2. Fig. 4 represents a detail view of the sliding block, showing the devices for turning the lower guide-tubes. Fig. 5 represents a detail sectional view of the upper guide-tubes and plungers. Fig. 6 represents a detail view of the rolls, showing the channel-grooves. Fig. 7 represents a detail view of one of the actuating-cams. Fig. 8 represents a detail view of the rolls, showing the die-grooves.

No mechanism for feeding metal to my machine is shown in this application, as I do not now claim any improvement therein. The feeding devices used in my patent on machine for reducing bars of metal, granted May 27, 1879, No. 215,719, are preferably employed; but any feeding mechanism will suffice which

is suited to the purpose and operation of the machine.

In the annexed drawings, A designates the bed of my machine, and consists of a lower platform, A′, an upper platform, A^2, and a vertical intermediate wall, A^3, all supported on legs or standards A^4. On said upper platform, A^2, are three upright walls or standards, *a a′ a²*, which support a supplementary platform, A^5, that forms the bed for the feeding devices. The wall a^2 is on the end of said platform A^2 away from the driving-wheel, and directly opposite to its outer face is a similar wall, a^3, upheld by standards rising from the lower platform, A′. In the space between these walls a^2 and a^3 the compressing and guiding devices are placed.

B designates the driving-shaft of the machine, which is journaled in bearings supported by platform A^5 and wall a^3, or any other suitable fixed part of the machine. This shaft is provided with a balance-wheel, C, and a gear-wheel, D, the latter engaging with a similar gear-wheel, D′, on the driving-roll spindle E. The roll-spindles E E′ are constructed with couplings such as have been described in my previous patent above mentioned, or any suitable form of construction may be employed. They are journaled in walls *a a′*, and carry rolls F F′, the gudgeons of which turn in bearing-blocks *f f′* in walls a^2 a^3. These walls are provided with transverse slots or guideways A^6, in which these pairs of bearing-blocks are adjustable by means of screws f^2, so as to move the rolls apart or together at will. The joints of the inner roll-gudgeons, with the spindle-couplings, may be made to yield to this adjustment; or the said inner gudgeons may be attached removably to said couplings, and the adjustable bearings may be used merely as means for allowing their detachment therefrom at will. The said pressure-rolls F F′ are provided with die-grooves F^3, arranged in series, as in the aforesaid patent, each one overlapping one of the others. Each roll also has a set of channel-grooves, F^2, Fig. 6, one less in number than the die-grooves. These channel-grooves F^2 are made larger at the forward end, (in the direction of rotation,) so that a blank may be forced up through them, but cannot return through the small end. After each compression by a pair of die-grooves each blank is carried by one of a set of traveling tubes, hereinafter described, to a position beneath the next pair of channel-grooves, F^2, and forced up through them by one of a set of pointed reciprocating plungers. This plunger supports the blank until the said channel-grooves do not present space for the head of the blank to pass downward into said grooves. The plunger then recedes. When the grooves have entirely passed, the smooth surface of the rolls supports the blanks until the die-grooves are in position to receive them. One pair of die-grooves is in line (in the direction of rotation) with each pair of channel-grooves.

The feature of returning the blanks through the rolls is believed to be new, and obviously makes the machine less bulky.

Various forms of mechanism, differing more or less from those shown, may be employed to effect the feeding and returning of the blanks through the pressure-rolls. I prefer, however, to use a fixed receiving series of tubes, G G′ G^2, and an oscillating series of returning and discharging tubes, H H′ H^2. The said tubes are all shown as vertical, and the former series are arranged above the rolls, while the latter series are arranged below the same. The oscillation of the lower series is longitudinal and of sufficient length to carry each blank from one pair of die-grooves to another and to return for another blank from each upper tube. This oscillation is effected by means of a rock-shaft, I, which is operated by means of a spring and a suitable cam, J, carried by the driving-shaft B. This cam acts on an arm, *i*, of said rock-shaft, and its working is opposed by a retracting-spring, *j*. The alternating motions communicated to said shaft by these devices are transferred by another arm thereof, *i′*, to a block, I′, which carries said tubes H H′ H^2. Thus said block receives the required oscillation, above described.

The first upper tube, G, which receives the blanks as they come from the feeding devices that supply the machine, is left quite open. Its only function is to direct the blanks to the first and largest pair of die-grooves in the rolls. The other upper tubes, G′ G^2, however, are provided with plungers *g′* g^2, one to each tube, which plungers are forced downward to the lower parts of the tubes by the action of springs *g*. Weights may be employed instead of said springs. The lower end of each of these plungers is provided with a conical or conoidal hollow, which receives the pointed end of the blank and holds it in proper position to be presented to the next pair of die-grooves.

The last of the lower tubes, H^2, is unobstructed, and serves only to guide the blanks, as they are discharged from the rolls, into any suitable receptacle or channel. The other lower tubes, H and H′, are provided with longitudinally-reciprocating pointed plungers *h*, one to each tube, which thrust the blanks upward through the rolls to the upper or receiving tubes. The longitudinal reciprocating movement of these plungers *h* may obviously be caused by a variety of well-known methods. I prefer to employ an oscillating lever of the first kind, operated mediately or immediately by a cam on the driving-shaft and a retracting-spring, which alternates with the action of said cam.

In the accompanying drawings the lever L, which is doubly bent at its lower end, is connected at its upper end by a link, *l*, to a W-shaped lever of the first kind, K, which has a supplemental arm, *k*, arranged to engage a cam, J′, of suitable shape, carried by shaft B. This cam is preferably formed on the same

disk or collar as cam J, as shown in detail in Fig. 7, and acts at right angles to the action thereof. Spring K′ retracts lever L.

As it is desirable to turn the blanks partly round (in order to insure equal pressure on all sides) in their passage from one pair of die-grooves to another, the lower tubes, H H′ H², are made capable of rotation within the block which carries them, and are provided at their upper ends with gear-wheels *h′*, which engage with a fixed rack, M, Fig. 4, whereby they receive a quarter-rotation at each of the hereinbefore-described oscillations of the series. The last lower tube, H², need not be provided with a gear-wheel. Friction devices may be substituted for the rack and gears. Pawls of suitable construction may be substituted for the rack. Other changes may be made without departing from the spirit of this part of my invention; but I prefer the construction first above described.

It often becomes desirable to withdraw the lower tubes from contact with the rolls for inspection or clearing. To effect this I suspend the block I², which carries the aforesaid rack, by means of a vertical rod, N, which is held up by a yielding spring, *n*, that sets into a recess, *n′*, in the upper part of said rod. The arm *i′*, already referred to as connecting the lower end of rock-shaft I with block I′, extends across under a part of block I², (through which latter block rock-shaft I passes,) so that any downward movement of block I² necessarily compels a downward movement of block I′, which has no other support. To avoid needless longitudinal movement of said rock-shaft I, and to provide for the convenient replacement of said blocks I′ and I² in their original position, the arm *i′* is not directly attached to rock-shaft I, but to a tube, I³, which is prismatically sleeved upon said rock-shaft. This tube extends through block I², and turns freely therein with said rock-shaft, as though said shaft-tube and arm *i′* were in one piece; but said tube is not free to pass longitudinally out of said block I². Hence when said block I² is raised the said tube slides longitudinally on said rock-shaft, meeting with no obstruction to such motion. The upward and downward motions of said block are effected by means of a lever, O, which is pivoted at one end to a standard, *o*, on bed A, and provided at the other end with a handle, O′. A link-bar, P, connects the middle part of this lever O to the block I². Lever O is guided and held in proper position by a plate or bar, *p*, (shown in Figs. 1 and 3,) near its handle end.

There are circumstances when it becomes very desirable to automatically stop the machine. These are chiefly when one of the blanks has been improperly presented or when the end of a bar of metal has been reached. To provide for these contingencies, I use a clutch-collar, Q, which is feathered on the driving-shaft B, and provided with a recess that is adapted to receive a pin, *b*, on the outer face of balance-wheel C. Said wheel is sleeved cylindrically upon the driving-shaft B, and therefore will turn independently of said shaft and without operating the machine, except when in engagement with said clutch-collar. By throwing said collar out of engagement the machine is therefore suddenly stopped. This disengagement is effected through the medium of a lever, R, of the first kind, pivoted to a fixed attachment of the machine bed or frame, and operating by a forked upper end, *r*, on clutch-collar Q, so as to throw it outward or inward along the line of the axis of shaft B. This lever is pivotally connected at its lower end to one end of a sliding bar, S, which is provided with a spring, *s*, that tends to draw it away from the end of the machine where the balance-wheel C is stationed. The result of this action is necessarily to throw the clutch-collar Q away from the said balance-wheel, and thereby disengage the latter. To prevent this action under ordinary circumstances, the bar S is provided with a recess, *s′*, (or other convenient form of catch,) which engages with lever O, hereinbefore described. This lever is ordinarily held in engagement with said bar S by the action of spring *n* on rod N; but whenever the block I′ is forced downward by a pressure sufficient to overcome the resistance of spring *n*, the lever O is disengaged from sliding bar S, and the action of spring *s* disengages the balance-wheel, as stated, and stops the machine. This excessive pressure takes place whenever a blank is by any accident presented to the rolls in an improper position by any of the upper tubes, G G′ G². In such case the pressure of the rolls on said blank produces fins or irregular formations on the sides thereof, and when the rolls deliver the said blank to the tube below it is of such shape that it cannot enter said tube. As a result the block I′ is forced downward, overcoming the resistance of spring *n*. The guard plate or bar *p* protects and guides sliding bar S. This sliding bar is provided with a handle, S′, so that it can be readjusted in its normal position.

To effect the stoppage of the machine whenever the end of a bar is reached I employ, in addition to the devices above described, a pivoted lifting-lever, T, provided with a short curved end and arranged so that when the longer end is depressed this short end will lift bar S out of engagement with lever O. The long end of this lifting-lever is linked by a long vertical rod to the movable end of a lever, U, the other end of which is pivoted to a fixed part of the machine, while the middle part of said lever U rests upon the bar which is being fed forward to the machine. A spring, V, draws down the movable end of said lever U. When the rear end of the bar of metal under said lever is reached said levers U and the long end of T are drawn downward by said spring V, and the short end of lever T is thrown upward, with the result before stated. The changed positions of some parts of the machine when

it is thus stopped are indicated in Fig. 1 by dotted lines.

The terms "upward" and "downward," "vertical," &c., used herein, of course do not apply when the machine is arranged horizontally; but its action is the same, as all its movements depend either on spring-draft or positive action of some kind.

The lower ends of the lower plungers are connected by a guide plate or sleeve, h^4. A suitable stop, s^2, limits the downward motion of bar S. A metal block or frame, I^4, affords bearings for rock-shaft I and guides for rod N, and a guideway, X, is employed to direct into the machine the bar Y, on which said machine operates. These auxiliary parts, as well as most of the more important ones, may be modified in many ways without departing from the spirit of my invention.

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

1. In combination with sliding rod S, lever O, acting as a stop, engaging therewith, spring *s*, which retracts rod S, lever U, resting against the fed bar, spring V, operating said lever U when the bar passes, and a connecting rod or rods, whereby the action of lever U releases bar S, and thus shifts said clutch to stop the machine, substantially as and for the purpose set forth.

2. The movable set of tubes H H′ H^2, provided with a yielding attachment to the machine and a handle, O′, whereby the operator may withdraw said tubes from the rolls for inspection without separating them from the rest of the machine.

3. In combination with block I′ and the set of tubes carried thereby, a yielding support or attachment for said block, a lever operated by the movement of said block away from the rolls, and a bar which is operated to unship the balance-wheel clutch, substantially as set forth.

4. In combination with a pair of pressure-rolls having die-grooves and independent channel-grooves, a set of plungers which return the blanks through said channel-grooves, substantially as set forth.

5. In a roller-die machine for manufacturing articles from metal, a pair of pressure-rolls having die-grooves for compressing and shaping the blanks and channel-grooves for allowing the return of the blanks through the rolls after each compression, substantially as and for the purpose described.

6. In a roller-die machine for manufacturing articles from metal, a pair of pressure-rolls, F, having channel-grooves F^2, which are made larger at one end than at the other, in order that the blanks may be returned through the said channel-grooves and retained after such return on the receiving side of the rolls until the channel-grooves have passed.

7. In combination with a pair of rolls having channel-grooves and independent die-grooves and plungers for forcing the blanks in both directions through the same, a set of vibrating tubes moving from one pair of die-grooves to another and suitable actuating devices for causing such vibration, substantially as set forth.

8. In combination with the vibrating set of tubes H H′ H^2 and the rolls provided with die-grooves and channel-grooves, as stated, the relatively-fixed rack engaging with the gear-wheels on said tubes, and actuating devices which give vibration to said series of tubes, whereby each tube is caused to make a quarter-turn during each vibration, substantially as and for the purpose set forth.

9. The combination of plungers *h*, tubes H H′ H^2, the block I, having said tubes arranged loosely within it, and mechanism, substantially as described, for imparting to said tubes an independent rotation, though the block and tubes may be raised and lowered together, substantially as set forth.

10. The combination of rolls F F′, having channel-grooves F^3, the lower plungers, *h h*, working up through said channel-grooves, and the upper spring-pressed conically-recessed plungers *g′* g^2, which force the blanks into the die-grooves in properly-centered position, substantially as set forth.

11. In combination with blocks I′ I^2, carrying the oscillating tubes and rack, the rod N, spring *n*, rock-shaft I, and the tube I^3, carrying arm *i′*, below said block I^2, said rock-shaft and tube being constructed and arranged to operate substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 12th day of January, 1880.

GEORGE J. CAPEWELL.

Witnesses:

CORNELIA A. CORNWALL,

EMMA B. CORNWALL.