(No Model.)

3 Sheets—Sheet 1.

F. M. LEAVITT.

MACHINE FOR WORKING SHEET METAL.

No. 604,057. Patented May 17, 1898.

FIG. 1.

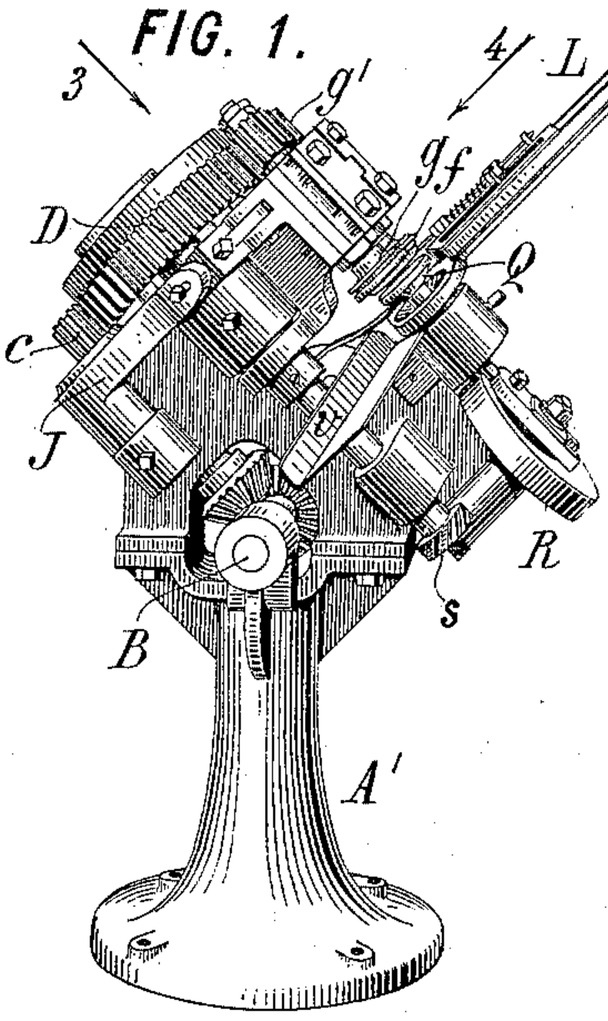


FIG. 3.

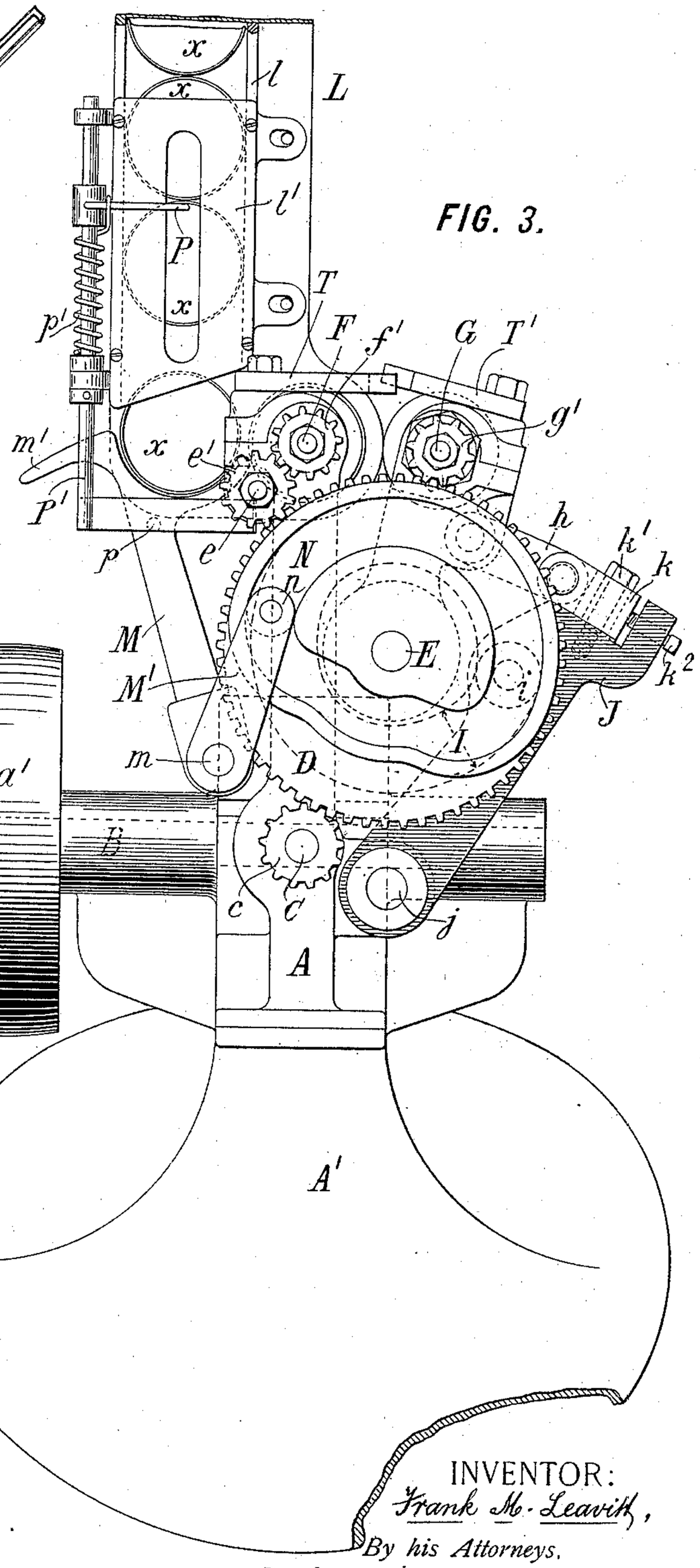
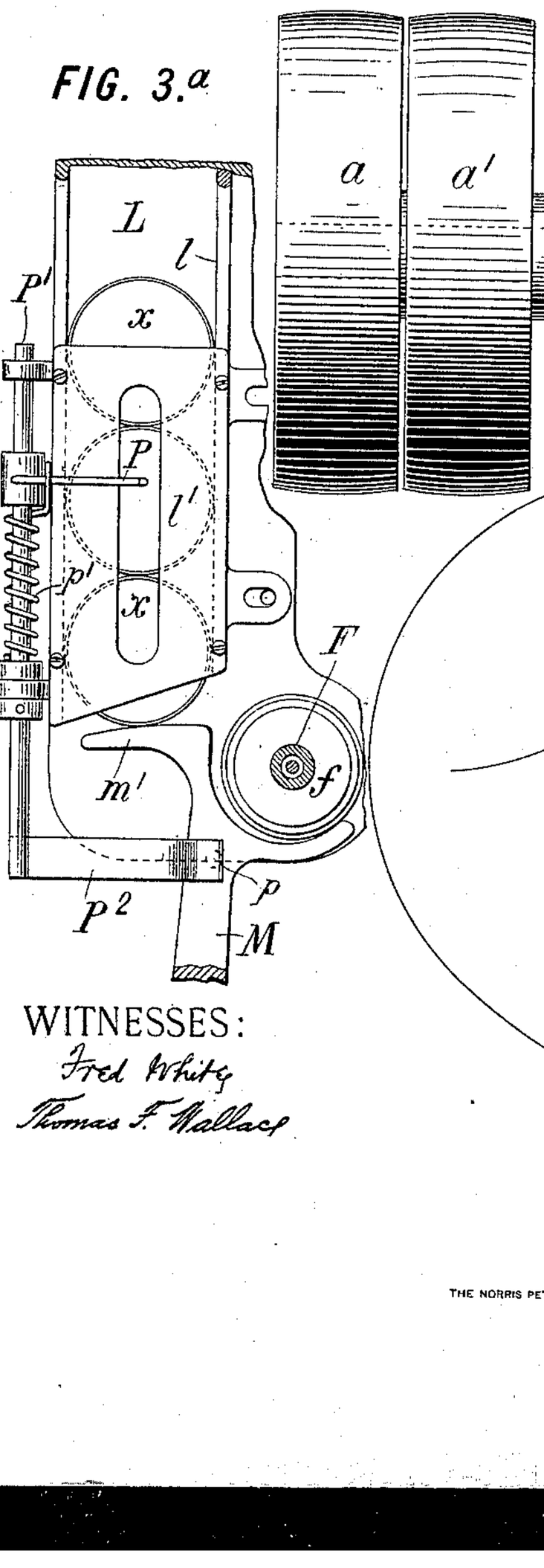


FIG. 3.a



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(No Model.)

3 Sheets—Sheet 2.

F. M. LEAVITT.

MACHINE FOR WORKING SHEET METAL.

No. 604,057. Patented May 17, 1898.

FIG. 2.

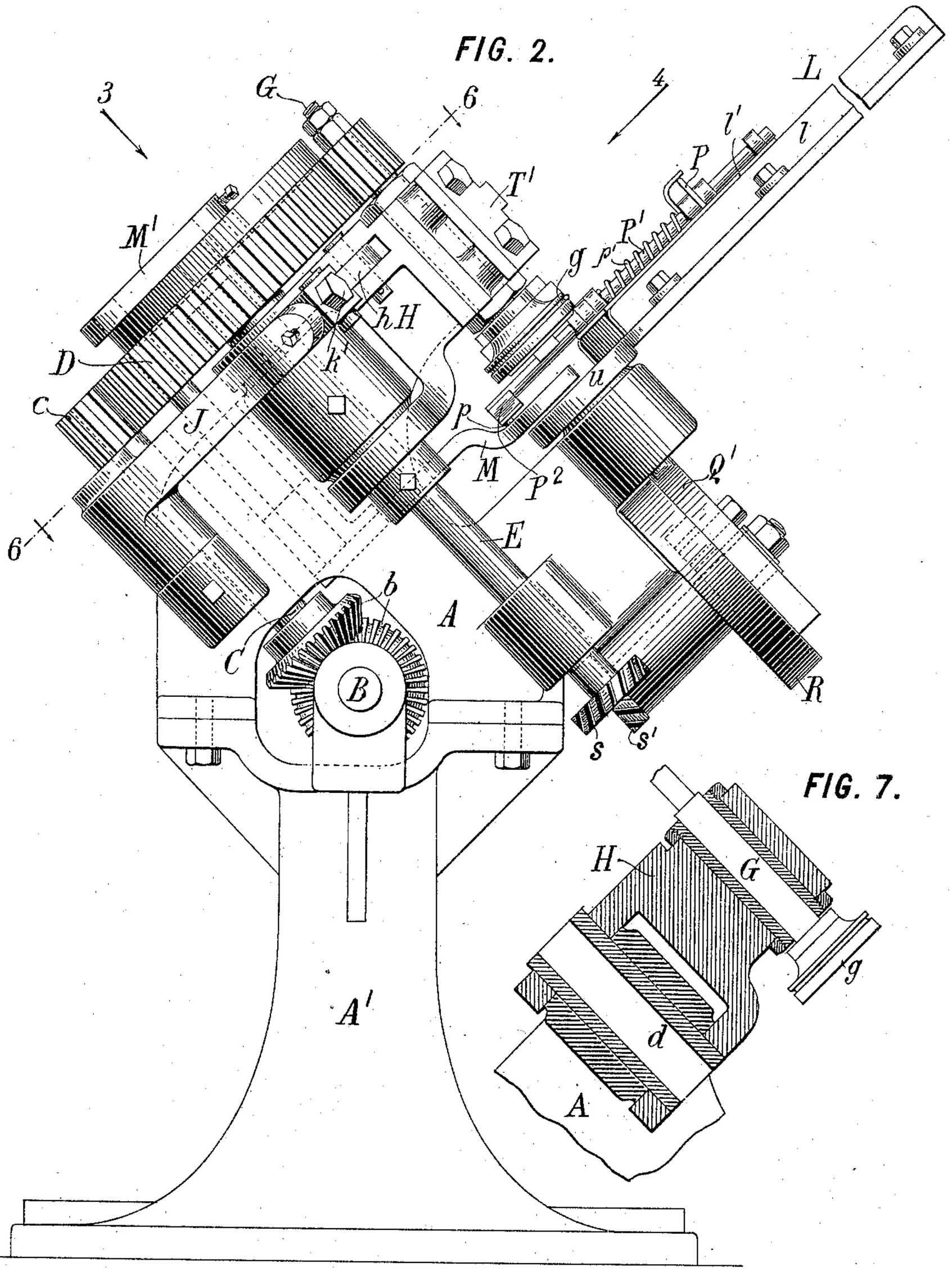

FIG. 7.

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(No Model.) 3 Sheets—Sheet 3.

F. M. LEAVITT.

MACHINE FOR WORKING SHEET METAL.

No. 604,057. Patented May 17, 1898.

FIG. 4.

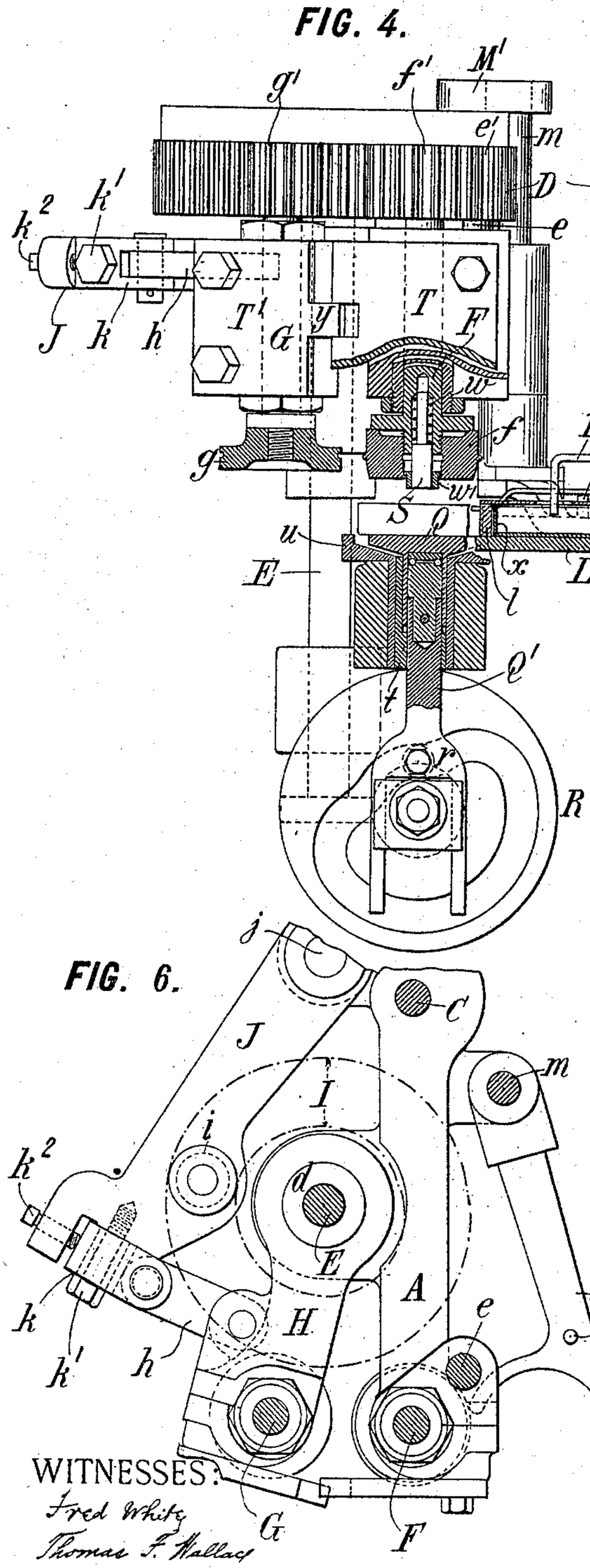

FIG. 5.

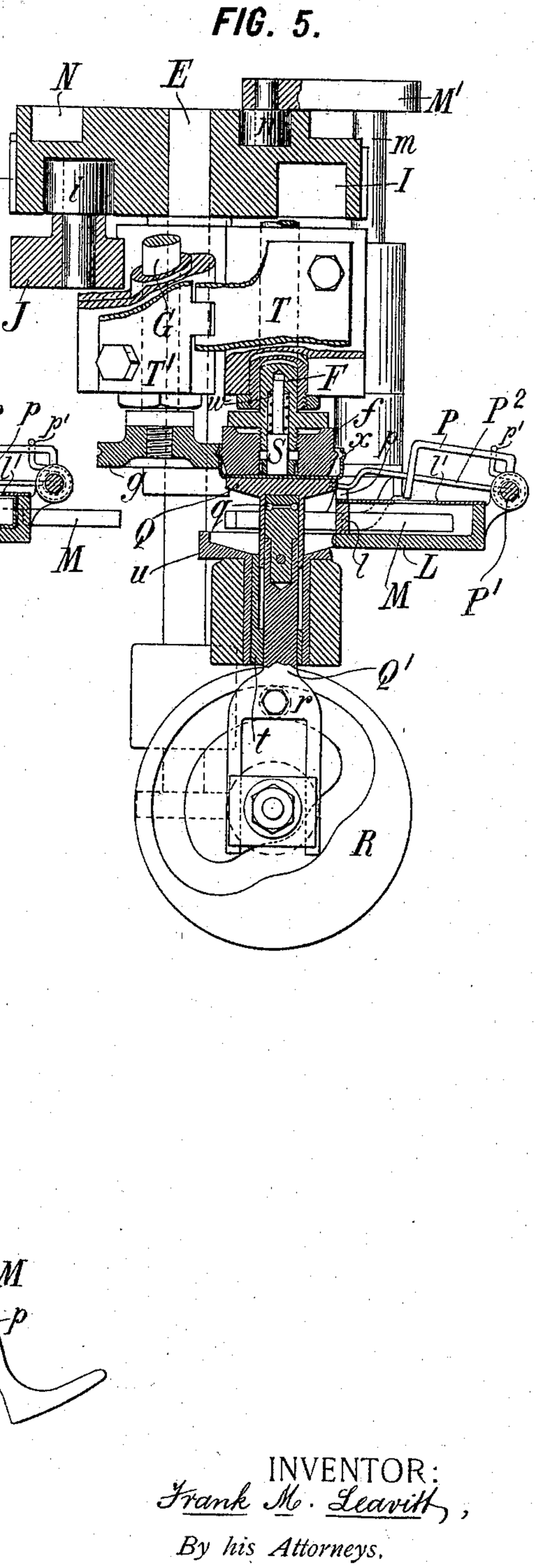

FIG. 6.

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UNITED STATES PATENT OFFICE.

FRANK M. LEAVITT, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE E. W. BLISS COMPANY, OF SAME PLACE.

MACHINE FOR WORKING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 604,057, dated May 17, 1898.

Application filed June 29, 1897. Serial No. 642,794. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. LEAVITT, a citizen of the United States, residing in Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Machines for Working Sheet Metal, of which the following is a specification.

This invention provides a machine for use in the manufacture of sheet-metal covers, caps, cups, &c., being adapted to act upon the metal blank after it has already been drawn into cup form in order to perform any desired operations upon the upturned portion or rim thereof, such as beading, crimping, screw-threading, embossing, trimming, seaming, flanging, &c. One of the important uses of such a machine is for embossing the screw-threads on the tops or caps of Mason fruit-jars and such like articles. In the accompanying drawings, however, I have shown it as adapted for the beading of sheet-metal can-covers or shallow boxes.

Figure 1 of the drawings is a perspective view, on a reduced scale, of the entire machine. Fig. 2 is a side elevation of the machine, the delivery-chute being omitted. Fig. 3 is an oblique elevation in the direction of the arrows 3 in Figs. 1 and 2. Fig. 3^a is a fragment of Fig. 3, showing the parts in a different position. Figs. 4 and 5 are oblique elevations, partly in section, looking in the direction of arrows 4 in Figs. 1 and 2, these two views showing the parts in different positions. Fig. 6 is a section taken in the plane of the line 6 6 in Fig. 2 and looking in the direction of the arrow. Fig. 7 is a fragmentary vertical mid-section.

I will proceed to describe the preferred construction of this machine as it is shown in the drawings, remarking that the mechanical details may be greatly varied.

On a suitable base or pedestal A′ is mounted the main frame A, which forms bearings for the working parts. Power is applied by means of fast and loose pulleys *a a′* to a power-shaft B, which, by means of miter-gears *b*, communicates motion to a counter-shaft C, on the outer end of which is fixed a pinion *c*. This pinion meshes with a large gear-wheel D, fixed on a main shaft E. Parallel with this shaft are the two die-spindles F and G, carrying the respective rotary dies *f* and *g*. The spindle F has fixed bearings in the main frame A. The spindle G has bearings in a vibratory frame H, (shown separately in Fig. 7,) which swings around the axis of the shaft E, being preferably constructed to turn upon a fixed bushing *d*, within which the shaft E turns. Both spindles F and G are driven from the gear-wheel D, but in contrary directions. The wheel D drives an idler-pinion *e′*, turning on a fixed stud *e*, which in turn drives a pinion *f′* on the spindle F. The gear D meshes directly with a pinion *g′*, fixed on the spindle G.

For moving the dies *f* and *g* toward and from each other, although either or both might be movable, yet in the construction shown I have made the die *g* alone move, being mounted on the spindle G, which, as described, is carried by the swing-frame H. For swinging this frame I have provided a cam I, which for compactness is made integral with the gear D, being in the form of a groove on the under side of this gear, as shown in Fig. 5, the outlines of the groove being shown in dotted lines at I in Figs. 3 and 6. In this groove works a roller *i*, Figs. 5 and 6, (shown in dotted lines in Fig. 3,) which is carried on an arm or lever J, fulcrumed on a stud *j*, fixed in the main frame and having its outer end connected by a link *h* to the swing-frame H. In order to adjust the extent to which the spindles G and F approach, I provide the lever J with an adjustable block *k*, to which the link *h* is pivoted, this block being held to the lever by a set-screw *k′*, passing through a slot in the block, an adjusting-screw k^2 being provided for setting up the block. By means of the cam I and intermediary parts the spindle G is caused to approach and recede from the spindle F once in each revolution of the gear-wheel D and main shaft E, the cam being so shaped that the spindle G shall remain in its position of closest approach to the spindle F during a period of at least one revolution of the spindles, which both revolve at the same speed.

I will now describe how the blanks are fed to the dies. I provide an inclined feeding trough or chute L of any suitable length, one

side wall *l* thereof being adjustable to fit the width of the blanks to be fed. These blanks are simply shallow cups of sheet metal, the rims of which are to be beaded, screw-threaded, or otherwise embossed. These blanks are fed by hand into the trough L with their rims turned upwardly, and they slide down the trough by their own weight. The blanks are designated *x x* in the drawings. The lowermost blank falls into the hollow of a feeder or feeding-arm M, as shown in Fig. 3, while the next one above it is caught by a stop-finger P, as shown in the same figure, this finger being at this instant in the position shown in Fig. 4. The feed-arm M is mounted on an oscillatory shaft *m* and swings from the position shown in Fig. 3 to that shown in Fig. 3ª, thereby moving the blank to a position nearly in line with the die *f*, over which it is to be thrust. I will call this die the "master-die" and the other the "counter-die." The arm M is vibrated by a cam N on the main shaft E, this cam being for the sake of compactness constructed in one piece with the gear D, a cam-groove being formed in the upper part of this gear, as shown in the section Fig. 5. The roller *n*, which works in this groove, is carried on the end of an arm M′, fixed on one end of the shaft *m*, the feed-arm M being fixed on the other end thereof.

The arm M has, in addition to the hollow by which the blank is received and fed, a raised extension *m′*, which in this position closes the bottom of the trough, as shown in Fig. 3ª. As the lever swings to this position the finger P is raised, thereby permitting the blanks to slide down until the lowermost one strikes the extension *m′*, as shown in Fig. 3ª. As the arm M swings back to its first position the finger P drops again into engagement with the blanks, so that as the lowermost one falls into the hollow of the feed-arm the next one falls only until its rim is arrested by the finger P. The movements of the finger may be variously accomplished; but I prefer the means shown, wherein this finger is mounted as an arm fixed on an oscillating shaft P′, hung in suitable bearings and having on its lower end an arm P^2, the end of which is bent, as shown in Figs. 4 and 5, so as to constitute a cam, which is acted upon by a pin *p*, carried on the arm M, so that as the arm M moves to the right its pin lifts the arm P^2 and thereby oscillates the shaft, so as to lift the finger P, and on the return movement of the arm M the shaft P′ and its finger and arm are returned by the tension of a spring *p′*. To prevent accidental displacement of the blanks, a plate *l′* is fastened over the upper side of the trough near its lower end, as shown in Figs. 3 and 3ª, this plate having a slot within which the finger P can act. The finger P may be mounted to be adjusted up or down to suit different-sized blanks in case there should be such a diversity in the diameters of the blanks acted upon as to necessitate such adjustment.

The blank having been fed from the trough L into approximate alinement with the master-die, as described, it then becomes necessary to push it onto the master-die. For this purpose I provide a feeding disk or pad Q. This pad is in effect a plunger, which when retracted stands in the position shown in Fig. 4, and in this position the arm M carries the blank across its face and into coincidence with it, and thereupon the pad quickly rises to the position shown in Fig. 5, thereby pushing the blank onto the master-die *f*, whereupon the counter-die *g* moves against the blank until it is crimped, beaded, or otherwise embossed between the two dies while being firmly held against the master-die by the pad Q, as shown in Fig. 5. For this purpose it is preferable that the pad Q should revolve with the master-die and blank. To this end it is rotatively mounted on the reciprocating stem or plunger Q′, which carries it, the pad being formed with an extended hub or sleeve embracing the cylindrical plunger, and the latter being fitted with a hardened end having a groove or ball-race for receiving a circle of balls *q*, in order to constitute an antifriction ball-bearing adapted to permit the pad to turn easily while under the pressure with which it holds the blank against the die. The plunger Q′ slides freely through a bushing in the frame A and is reciprocated by means of a cam R, which revolves at the same speed as the main shaft E, so as to preserve synchronous relation with the cam I. The projecting end of the plunger is forked or otherwise constructed to form a guide and carries a cam-roller *r*, which works in the cam-groove. The cam R is fixed on a shaft having bearings in the main frame A and which is driven by any suitable gearing from the shaft E, the simplest arrangement being by means of two skew bevel or miter gears *s s′*. The axis of the pad Q is arranged preferably slightly eccentric to that of the die *f* in order that the pad may be concentric with the blank, which necessarily is larger than the die in order that it may be discharged therefrom. This eccentric position of the pad is preferably effected by mounting the plunger Q′ to slide in an eccentric bushing *t*, which is seated in a socket in the main frame A concentric with the axis of the spindle F, so that the bearings for both may be bored out in line. Preferably the pad Q, when retracted, sets flush into the recess in a disk *u*, which is fastened to the frame, preferably by being formed with a neck or bushing which is seated within the bore of the frame, and it is within this bushing that the eccentric bushing *t* is placed.

The main frame A of the machine is mounted obliquely upon the standard A′ in the manner best shown in Fig. 1, so that the trough L is pitched at a proper slope for holding the blanks and causing them to slide down to the feed and so that the axes of the die-spindles stand obliquely in order that the blank has to be elevated in pushing it onto the master-

die, and hence when the dies separate and the pad Q retracts the weight of the blank will cause it to drop off from the master-die, following the pad Q in its oblique downward movement until freed from the die, whereupon it will slide off obliquely and be caught in an inclined trough or discharge-chute *v*, (shown only in Fig. 1,) by which it is directed out of the machine.

To facilitate the expulsion of the finished work from the master-die in case it shall stick thereon, I provide a push-out pin or plunger S, consisting of a pin sliding in a recess centrally bored out in the spindle F, with a spiral spring *w* coiled around it and pressing it outward and with a stop for limiting its outward movement, consisting of a collar *w'*, shrunk or otherwise fixed upon the head of the pusher-pin and having an outward flange engaged by an inward flange formed in the die *f*, as shown in Fig. 4.

The dies *f g* shown in the drawings are for beading. I have not shown dies for other purposes, such as screw-threading, crimping, corrugating, embossing, and the like, as such dies are well known in the art and form no part of my invention. To change the dies, it is only necessary to unscrew or otherwise detach the dies *g f* and screw on or attach in their places other dies counterparts of them, except for the change in the shape of their working faces according to the kind of work that they are to perform on the blank. For trimming the blanks as they come from the drawing-press the dies will be the usual rotary trimming dies or shears.

In order to insure that the dies shall come together in exact coincidence notwithstanding that wear may occur in the bearings of the frame H, I may provide a pair of interengaging guiding jaws or plates T T', as shown best in Figs. 4 and 5. These are fastened, respectively, upon the main frame above the bearing for the spindle F and upon the swing-frame H above the bearing for the spindle G, and the one guide has a notch or socket with parallel sides, in which works a projection *y* on the other. These guiding-plates may, however, be modified in construction or be entirely omitted, being required only where great accuracy in engagement of of the dies is demanded.

It must not be inferred from the particularity of detail with which I have described my invention that it is necessarily limited to the detailed construction set forth, as in fact my invention is susceptible of considerable modification without departing from its essential features. It will be understood that either of the dies may be movable toward or from the other, it being only essential that there shall be reciprocal movement by which they may approach to grasp the work and recede to free it. It is preferable, however, that the master-die should be on an immovable axis, as this axis should maintain a fixed relation to the axis of the pad. It is obvious that a very different arrangement of the mechanical parts might be adopted, it not being essential, for example, that the gear D and the cams N and I should all be made in one piece. The mechanical movements which I have shown for communicating motion to the different parts are believed to be those best adapted to the purpose; but they may be substituted, if desired, by any other suitable mechanical movements. The feeder M need not be an arm swinging around a pivotal axis, but may be any suitable part having a lateral movement and adapted to carry the lowermost blank sidewise out of the trough into position to be thrust upon the master-die. The finger P might be omitted, although its use is preferable. If an automatically-fed machine is not desired, the entire blank-feed mechanism might be omitted and the blanks be fed by hand onto the pad Q, being arrested by any suitable stop or gage.

It is apparent that my invention may be applied in connection with any machine for working sheet metal requiring reciprocal rotary dies.

I claim as my invention the following-defined novel features, substantially as hereinbefore specified, namely:

1. The combination of a supporting-frame adapted to rest on a horizontal support and formed with inclined spindle-bearings, inclined spindles in said bearings, reciprocal rotary dies on the lower ends of said spindles, inclined mechanism mounted on said frame for automatically feeding the blank by an oblique upward movement onto one of said dies, and automatic mechanism for subsequently moving the dies together to act on the blank, and then separating them to release the blank, whereby the latter is discharged by gravity.

2. The combination of a stationary supporting-frame having non-rotative spindle-bearings, rotary spindles in said bearings carrying reciprocal rotary dies on their lower ends, a pad beneath the master-die, adapted to feed the blank onto the latter, and to hold it thereon during the operation, and positively-acting cam mechanisms for first advancing said pad, then moving the dies together to act on the blank while the latter is held by the stationary pad, and finally separating the dies and retracting the pad to permit the discharge of the blank by gravity.

3. The combination of a supporting-frame having stationary spindle-bearings, rotary spindles F G therein carrying reciprocal dies *f g*, a pad Q, a reciprocating plunger Q' therefor, a revolving cam R for reciprocating said plunger with a positive movement in both directions, one of said spindles being mounted to be movable toward and from the other, a revolving cam and connecting mechanism for so moving it, and driving mechanism for said spindles and cams adapted to turn the cams coincidently to the effect specified.

4. The combination of rotary spindles F G

carrying reciprocal dies *f g*, a revolving gear D, pinions on said spindles, one of them meshing directly with said gear, and an idler-pinion for connecting the other to said gear, a swing-frame carrying one of said spindles and turning on the same axis as said gear D, and a cam for moving said swing-frame to bring the spindles and dies toward and from each other.

5. The combination of rotary spindles F G carrying reciprocal dies, and provided with pinions, a gear D driving said pinions, a swing-frame H carrying one of said spindles and turning on the same axis as said gear, a cam I rotating with said gear, and a lever J driven by said cam and mechanically connected with said swing-frame for communicating the movement imparted by said cam to move the dies toward and from each other.

6. The combination of rotary spindles F G carrying reciprocal dies, and provided with pinions, a gear D driving said pinions, a swing-frame H carrying one of said spindles and turning on the same axis as said gear, a cam I rotating with said gear, a lever J driven by said cam, a link *h* connecting said lever with the swing-frame, and an adjustable block *k* for varying said connection, whereby to adjust the relative approach of the dies.

7. The combination of reciprocal rotary dies, a pad adapted to feed the blank onto the master-die, and an automatic feed for the blanks comprising a trough down which they may gravitate, and a laterally-reciprocating feeder at the bottom of said trough having a recess adapted to receive one blank at a time, and movable to carry said blank onto said pad, and having a lateral extension adapted when so moved to receive the next gravitating blank and form a temporary bottom for the trough until the return movement of said feeder.

8. The combination of a main supporting-frame having stationary inclined spindle-bearings, rotary spindles in said bearings carrying reciprocal rotary dies on their lower ends, a pad beneath the master-die, movable obliquely upward in direction approximately parallel to the axis of said die, to feed the blank onto said die, and mechanism for feeding the blanks into position between said pad and die, comprising an inclined trough down which the blanks may gravitate, in a plane approximately perpendicular to the axis of said die, and a reciprocating feeder at the bottom of said trough having a recess to receive the lowermost blank, movable laterally to deliver it onto said pad, and having means for preventing the fall of the blanks to the bottom of the trough until the return movement of the blank, with automatic driving mechanism for alternately moving said feeder and pad to the effect specified.

9. A blank-feed mechanism comprising an inclined trough L down which the blanks may gravitate, a feeder M at the bottom of said trough having a recess to receive the lowermost blank, movable laterally to deliver said blank out of the trough, and having an extension *m'* to arrest the next blank and hold it until the return movement, and a finger P adapted to engage the next to the lowermost blank and hold it off said feeder, with means for lifting said finger at each movement of the feeder to drop the blanks against said extension.

10. A blank-feed mechanism comprising an inclined trough L down which the blanks may gravitate, and a feeder M at the bottom of said trough having a recess to receive the lowermost blank, movable laterally to deliver said blank out of the trough, and having an extension *m'* to arrest the next blank and hold it until the return movement, and a finger P adapted to engage the next to the lowermost blank and hold it off said feeder, a shaft P' carrying said finger, a cam-arm on said shaft, and a cam projection on said feeder adapted to coact with said cam-arm to oscillate said shaft and lift said finger at each feed movement of the feeder.

11. The combination of reciprocal rotary dies, spindles F G carrying them and having pinions, gear D driving said pinions, feed-trough L, feeder M formed as a swinging arm carried on a shaft *m*, and a cam N turning with said gear D and mechanically connected to said feeder-arm for vibrating the same at intervals, whereby to carry a blank from the bottom of said trough into alinement with one of said dies.

12. The combination of rotary spindles F G carrying reciprocal dies, means for revolving them, a fixed frame carrying one spindle, a swing-frame carrying the other, and guide-plates for insuring accurate coincidence of the dies, fixed to said frames adjacent to the bearings for said spindles, the one formed with a projection entering a recess in the other.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. LEAVITT.

Witnesses:
THOMAS F. WALLACE,
FRED WHITE.