

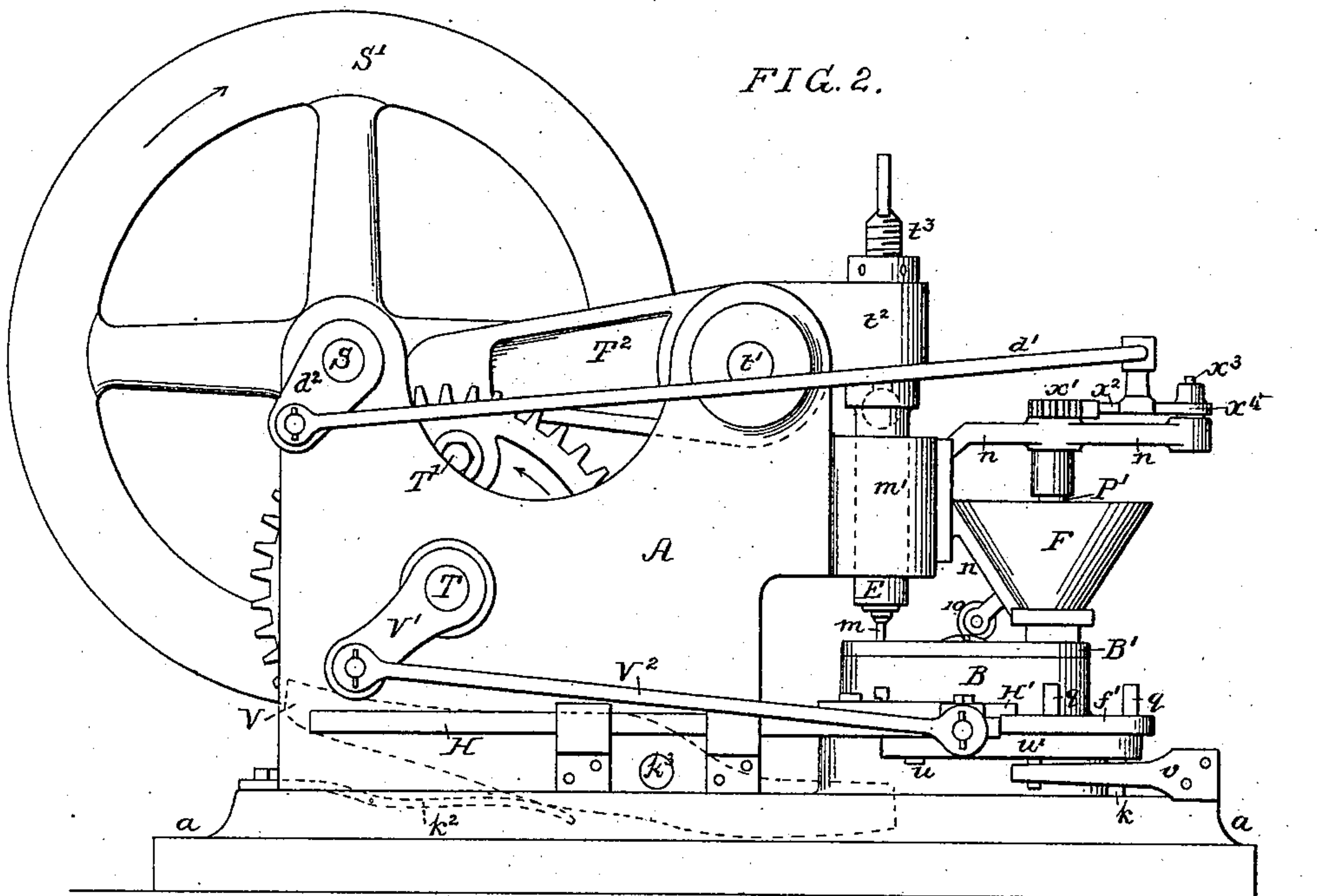
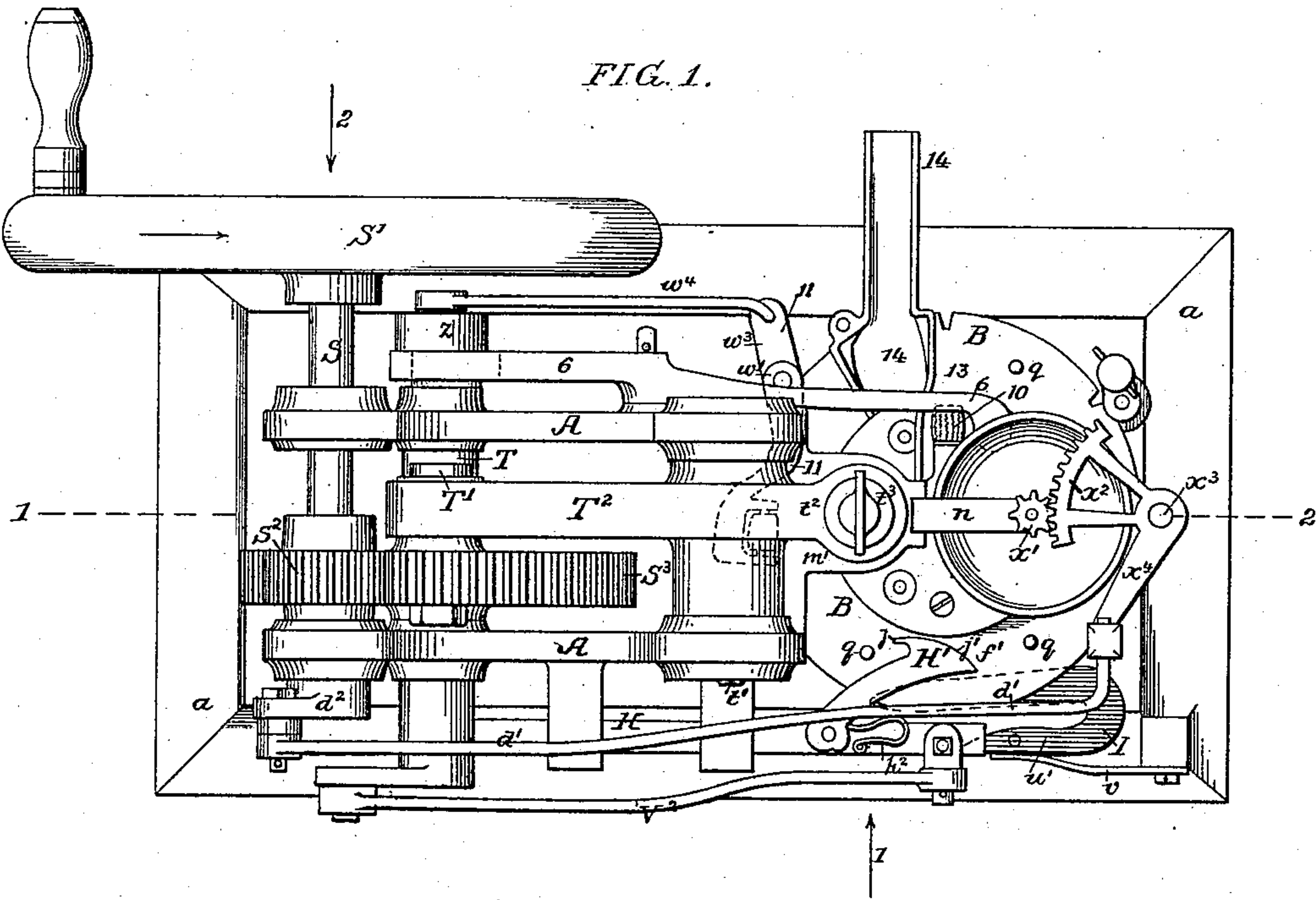
(No Model.)

4 Sheets—Sheet 1.

J. A. McFERRAN.
MACHINE FOR MAKING PILLS.

No. 308,508.

Patented Nov. 25, 1884.



WITNESSES:

Harry Drury
John M. Clayton

INVENTOR:

Joseph A. McFerran
by his Attorneys
Howen and Co.

(No Model.)

4 Sheets—Sheet 2.

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FIG. 3.

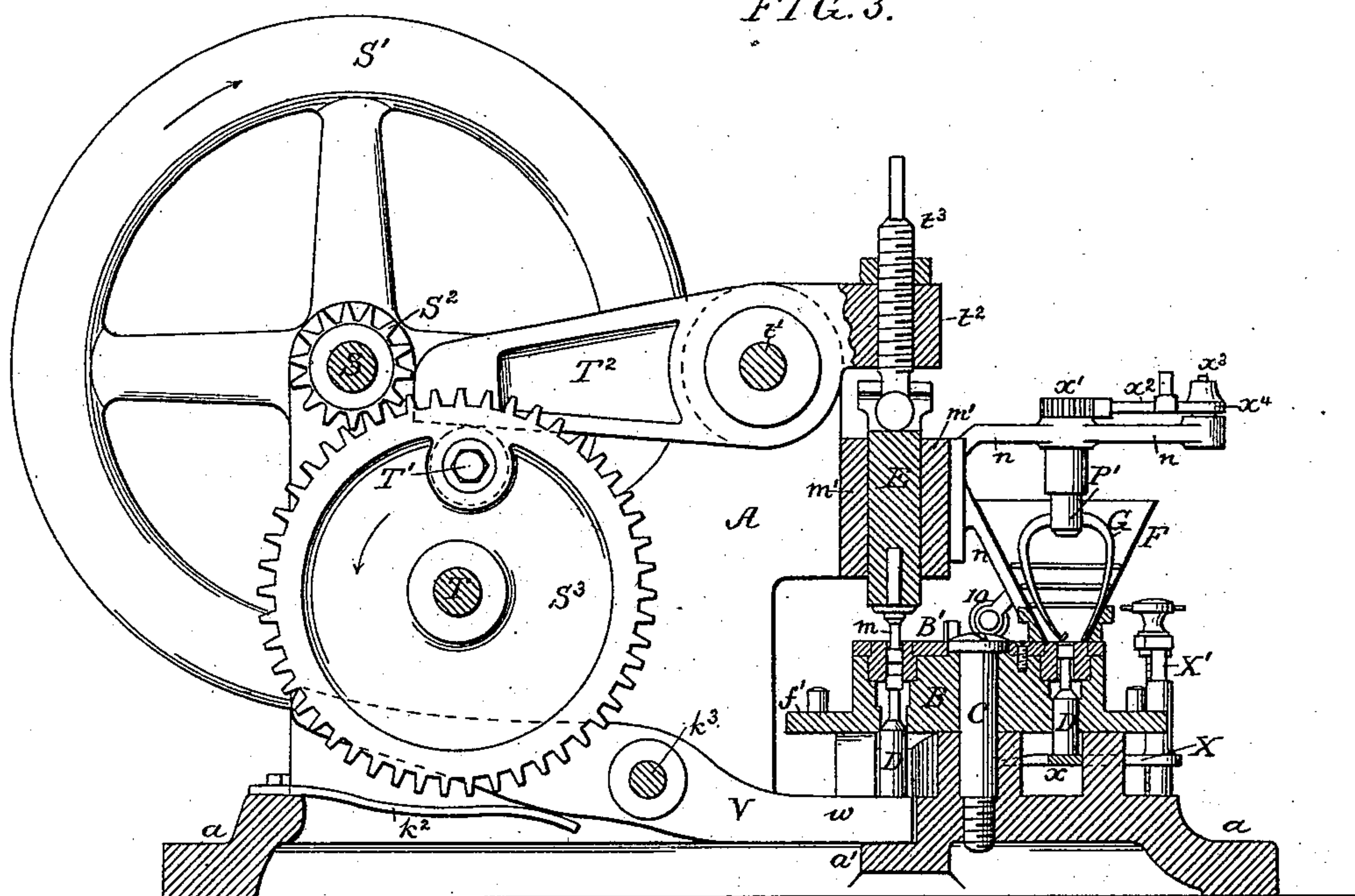
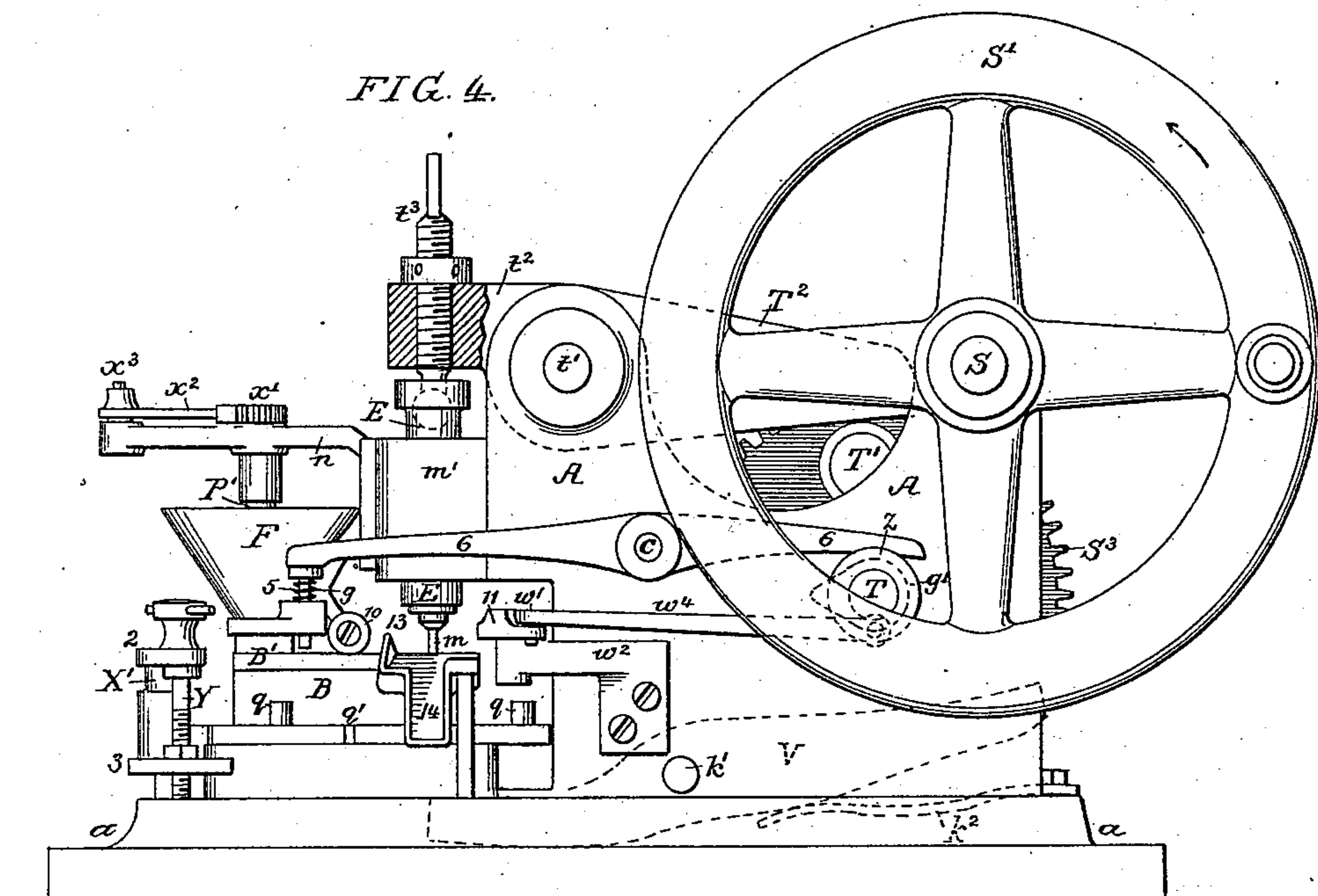


FIG. 4.



WITNESSES:

Harry Drury
John M. Clayton

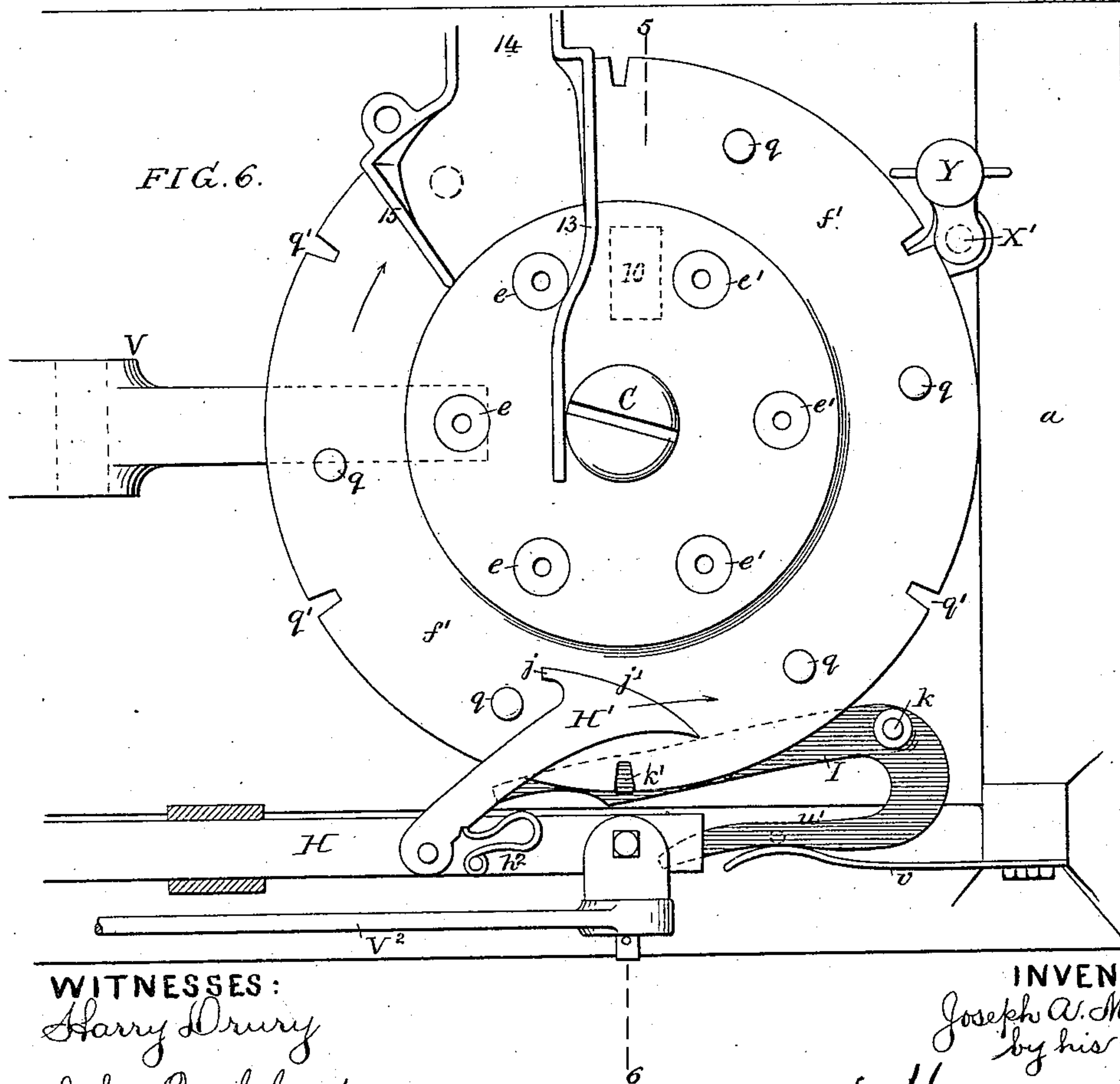
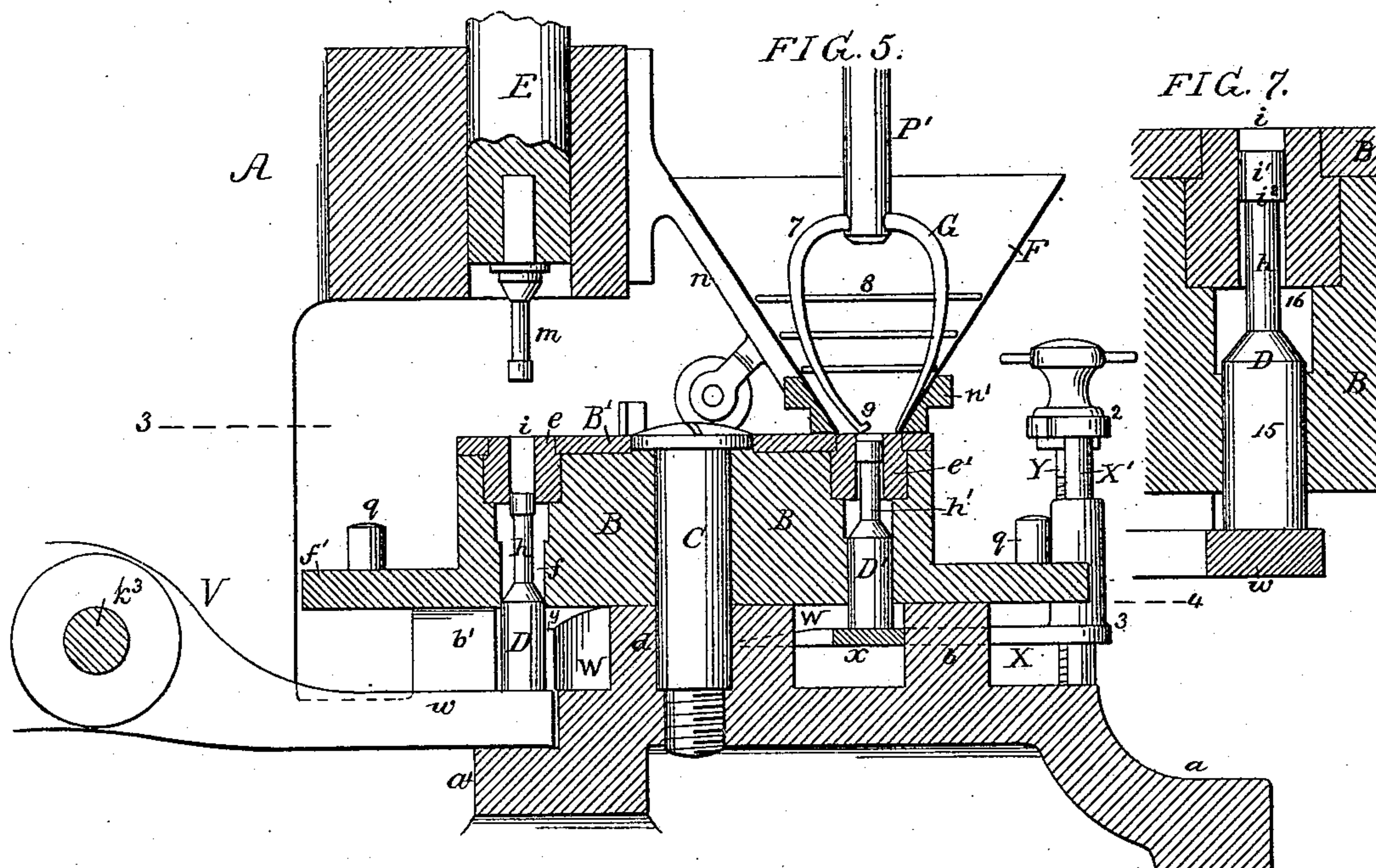
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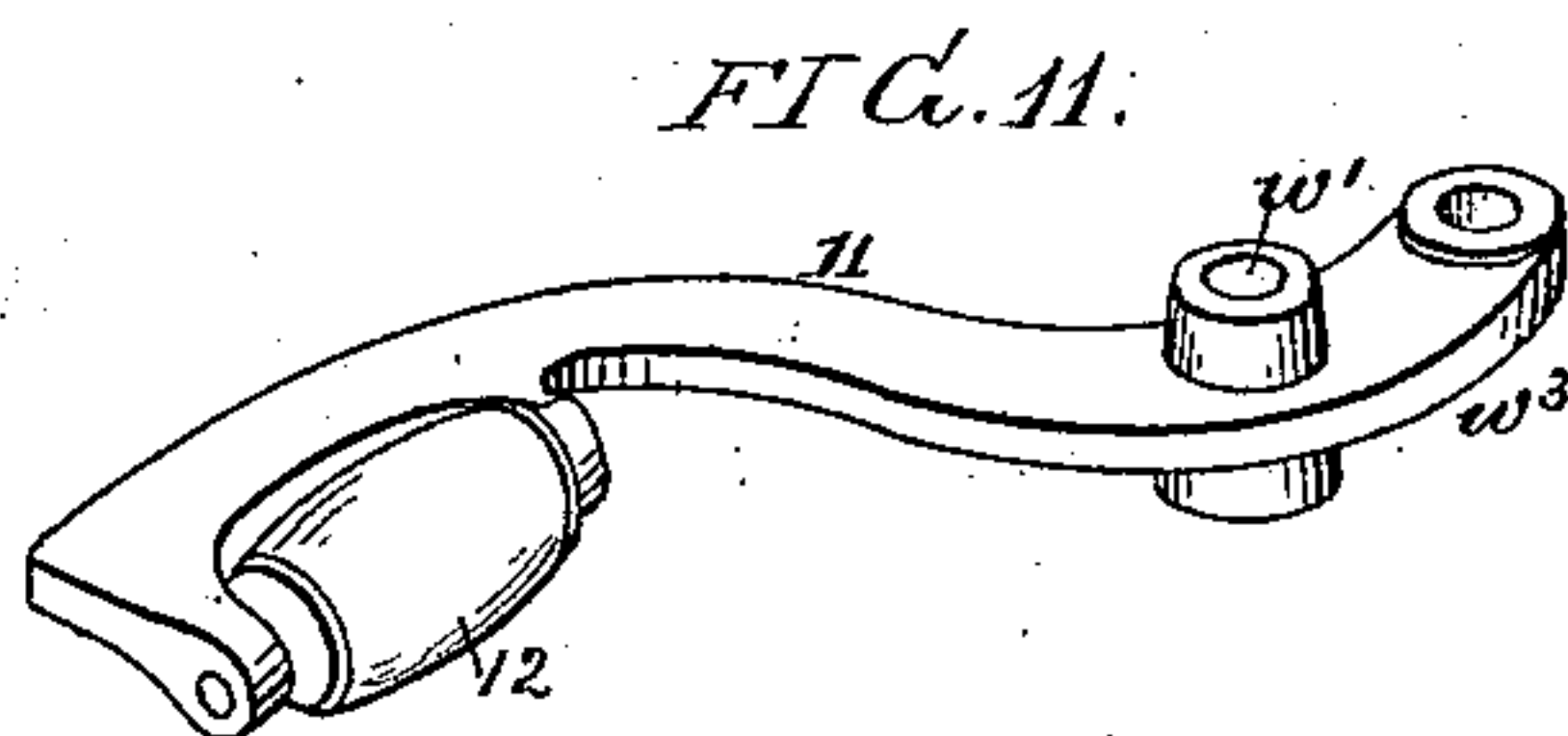
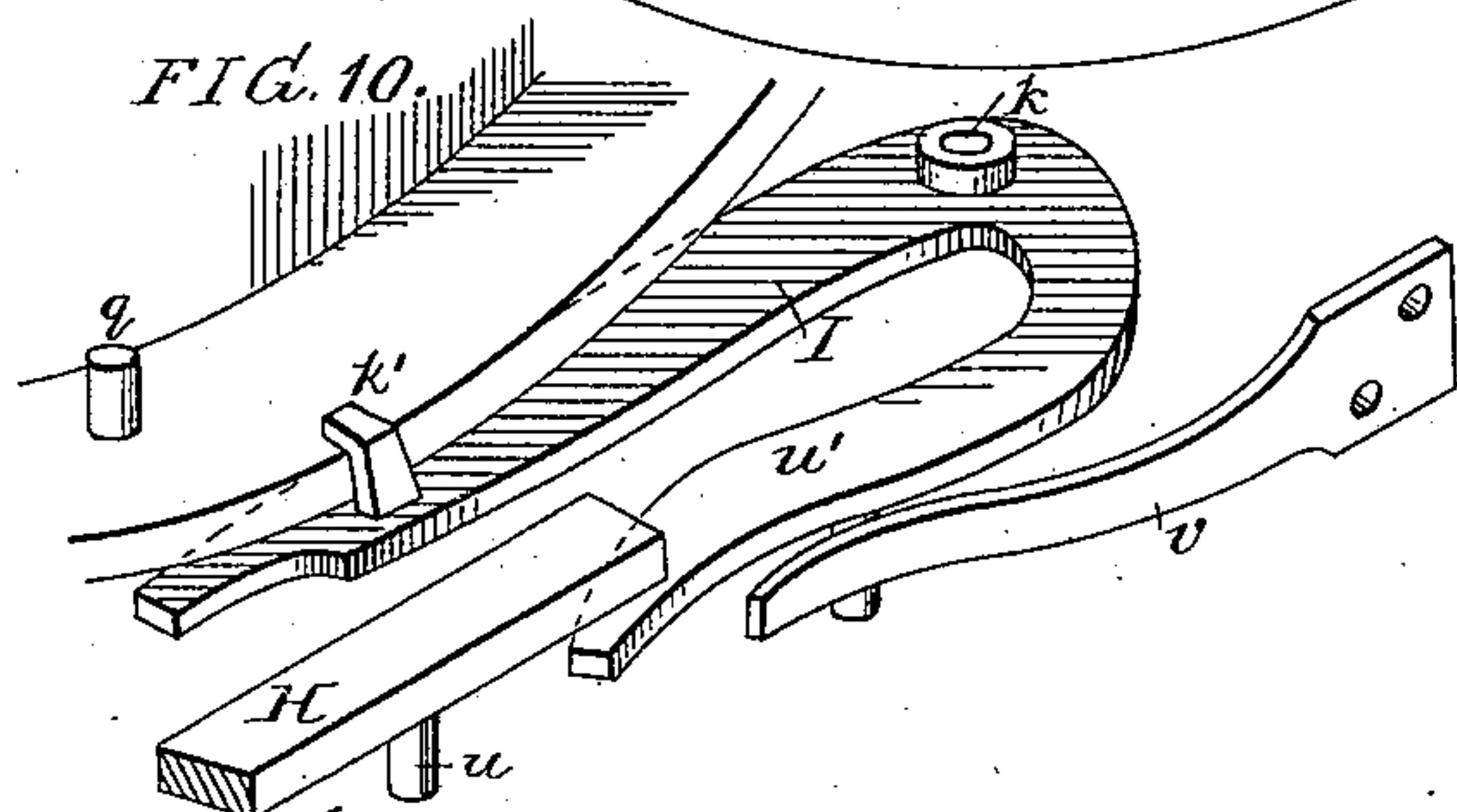
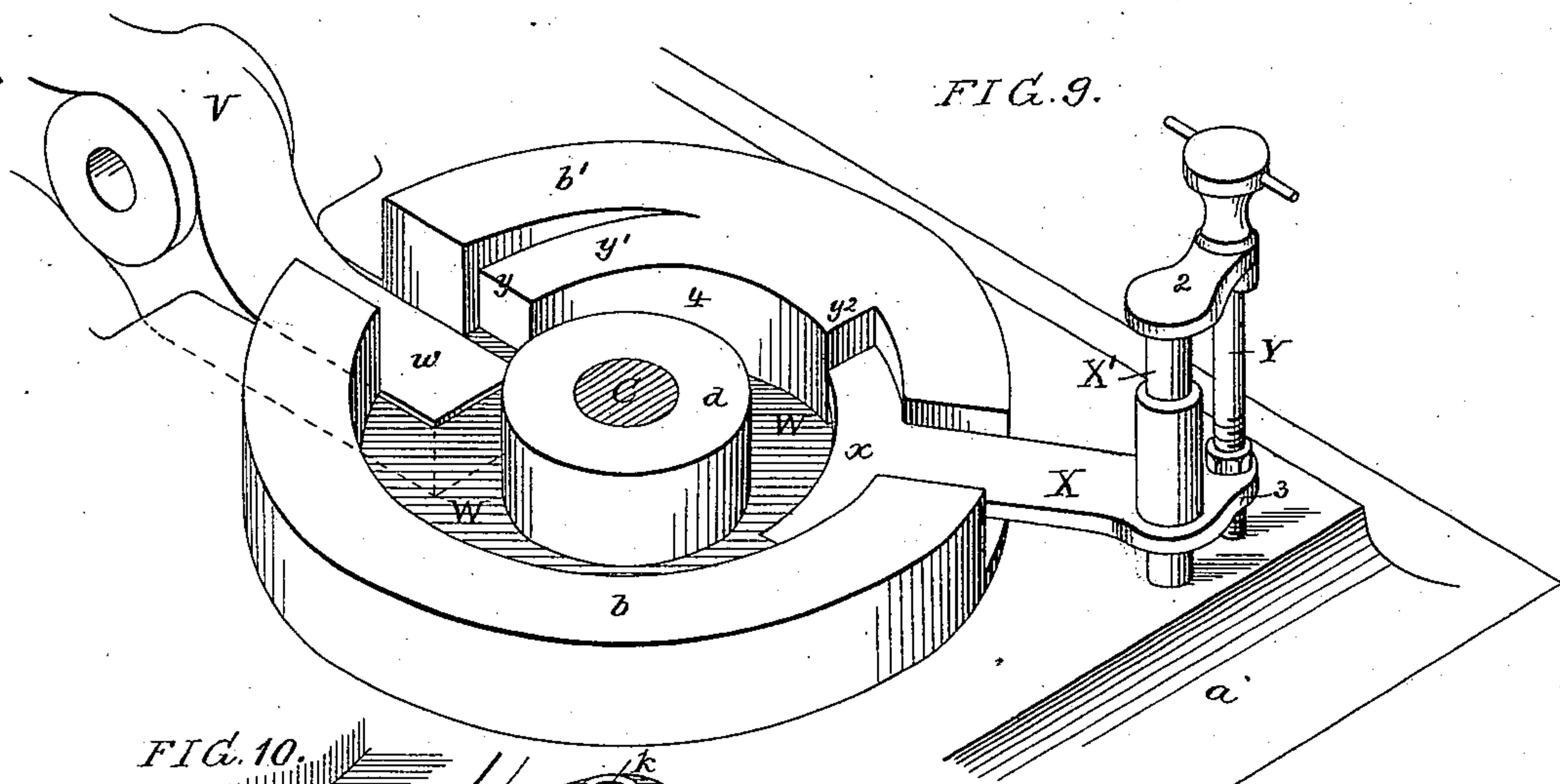
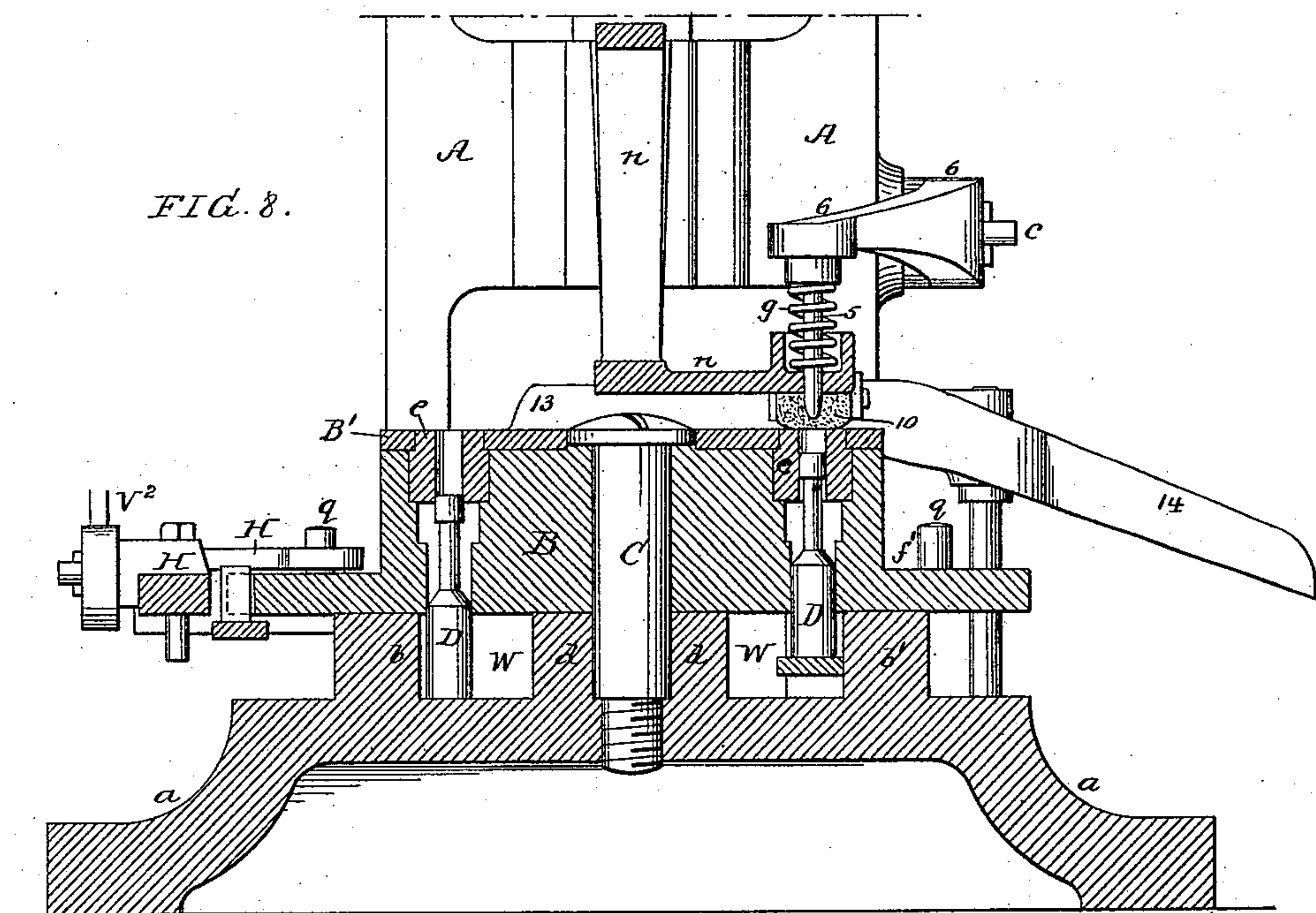
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4 Sheets—Sheet 4.

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WITNESSES:

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UNITED STATES PATENT OFFICE.

JOSEPH A. McFERRAN, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR MAKING PILLS.

SPECIFICATION forming part of Letters Patent No. 308,508, dated November 25, 1884.

Application filed July 24, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH A. McFERRAN, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Machines for Making Pills, of which the following is a specification.

My invention consists of certain mechanism, fully described and claimed hereinafter, for making that class of pills which consist of pulverized drugs reduced to the desired shape under pressure by dies.

In the accompanying drawings, Figure 1, Sheet 1, is a general plan view of my improved pill-making machine; Fig. 2, a side view looking in the direction of the arrow 1, Fig. 1; Fig. 3, Sheet 2, a sectional elevation on the line 1 2, Fig. 1; Fig. 4, a side view looking in the direction of the arrow 2, Fig. 1; Fig. 5, Sheet 3, part of Fig. 3 drawn to an enlarged scale; Fig. 6, a plan on the line 3 4, Fig. 5; Fig. 7, a view drawn to a still larger scale of part of Fig. 5; Fig. 8, Sheet 4, a transverse vertical section on the line 5 6, Fig. 6; Figs. 9, 10, and 11, detached perspective views of different parts of the machine.

It will be well in the first instance to describe the construction and operation of the important parts of the machine without regard to the mechanism by which the movements of such parts are effected.

Referring to Figs. 5, 6, 8, and 9, Sheets 3 and 4, A represents part of the frame of the machine, and *a* the base of the said frame.

B is the intermittently-reciprocated die-holder consisting of a metal disk bearing on the segmental ribs *b b'* of the base *a*, and on the central projection, *d*, of the same, the die-holder being pivoted to the base by the pin *c*. This form of bearing for the die-holder is important, for while an extended surface is presented for the steady support of the said holder there is a cavity, W, shown most clearly in Fig. 9, between the segments and central projection for the free play both vertically and circumferentially of substantial ejectors, as will appear hereinafter. In recesses in the holder are fitted a number of dies, six in the present instance, two only of these dies *e e'* appearing in Fig. 5. A detachable plate, B', is secured to the holder B, and bearing on shoulders of the dies serves to maintain the

latter in place, the upper surface of the plate being flush with the tops of the dies. For each of these dies there is an ejector, two only of which, D D', appear in Fig. 5, the former appertaining to the die *e* and the latter to the die *e'*. The enlarged portion of each ejector fits snugly but slides freely in an opening, *f*, in the holder, the upper reduced portion, *h*, of each ejector extending into the orifice of its die and never leaving the said orifice during the operation of the machine.

To a plunger, E, adapted to reciprocate in a projection of the frame, is fitted the upper die, *m*, which under the circumstances explained hereinafter enters the orifice *i* of each lower die, E, in succession, and co-operates therewith to convert pulverized drugs into the desired condensed pills. A hopper, F, is carried by a bracket, *n*, secured to the frame A of the machine, the lower end, *n'*, of this bracket being a socket for receiving the lower portion of the hopper, and the under side of this socket being as near to the upper surface of the plate B of the carrier and the upper surfaces of its dies *e* as the prevention of undue friction of the said carrier and its dies against the socket will permit. Within the hopper is an oscillating agitator, G, which will be more particularly referred to hereinafter. The six lower dies, *e e'*, &c., are at equal distances from the axis of the pivot-pin C, and at equal distances from each other, and on the flange *f'* of the die-carrier are six pins, *q*, also at equal distances apart and from the axis of the pivot-pin, and on the edge of this flange *f'* are six wedge-shaped notches, *q'*, arranged at equal distances apart.

To a guided and reciprocated rod, H, most clearly shown in Fig. 6, is pivoted a pawl, H', acted on by a spring, *h²*, and the hooked end *j* of this pawl is arranged to catch each pin *q* in succession, and to turn the die-carrier around to the extent of one-sixth of a revolution during every complete reciprocation of the said bar. The end *j'* of the pawl H' is rounded or beveled, so that after having acted on one pin and imparted one movement to the die-carrier it will on returning in the direction of the arrow, Fig. 6, strike the next pin, the pawl then turning on its pivot prior to the seizure of the said pin by the hooked end *j*.

In order to retain the die-holder in a determined position during the intervals between its movements, I use a detent-lever, I, pivoted at *k* to the base of the machine, one arm of this lever having a wedge-shaped projection, *k'*, adapted to notches *q'* in the flange F of the carrier, as shown most clearly in the detached perspective view, Fig. 10. When a pin, *u*, on the bar H strikes and moves in contact with the inner edge of the curved arm *u'* of the lever I, the projection *k'* of the same will be withdrawn from a notch, and will permit the carrier to be moved one-sixth of a revolution; but when the bar H has retreated, as shown in Fig. 10, a spring, *v*, acting on a pin on the lever, will cause the projection *k'* to enter another notch of the die-carrier, the latter having in the meanwhile turned to the extent of one-sixth of a revolution.

Turning to Figs. 8 and 9, it will be seen that an arm, *w*, of a lever, V, projects into the above-mentioned cavity W in the base of the machine. This arm *w* I will term a "support" and "lifter," as it has to perform these duties; and although this support and lifter is in the present instance part of a lever, V, it is not essential that this should always be the case. It may, for instance, be part of a vertically and intermittently reciprocated rod. In the same cavity W is also a segment, *x*, forming part of an arm, X, which is adjustable on the pillar X', secured to the base of the machine, the adjustment being effected in the present instance by a threaded rod, Y, having its bearing in the end of an arm, 2, on the pillar X', the threaded portion of the rod screwing into an arm, 3, projecting from the said arm X. In the said cavity W is a fixed segmental rib, 4, part of which is of the same depth as the said cavity, but from about the middle of the rib to the end *y* of the same it presents an inclined plane, *y'*.

As shown in Fig. 5, the die-carrier has just completed one of its movements in the direction of the arrow, Fig. 6, one die, *e*, and its ejector D being immediately below the plunger E and the upper die, *m*, the said ejector resting on the support and lifter *w*, the upper surface of which is flush with the bottom of the cavity W, the support and lifter bearing on the base of the machine, so that there is a solid foundation to resist the action of the plunger E and its die *m*. The opposite ejector, D', rests on the above-mentioned segment or adjustable support *x* of the arm X.

Before there is another partial revolution of the die-carrier the following will take place: The pulverized material will be lodged in the die *e'* above the portion *h'* of the ejector D'. Meanwhile the die *m* will descend into the orifice *i* of the die *e*, and will compress into the desired pill the pulverized material already contained in that die. The support and lifter *w* now raises the ejector D, which forces the compressed pill upward, but not entirely from the orifice of the die, the ejector at the

same time forcing the upper die, *m*, and its plunger upward, for, if the said upper die moved away from the compressed pill more rapidly than the ejector D pushes it from the die, the pill would be liable to be disintegrated; but by causing the ejector D, the pill, and the die *m* to ascend simultaneously, the pill being confined between the said die and the plunger, no disintegration can take place. As soon as the under end of the upper die, *m*, reaches the upper surface of the die *e* and die-carrier, the plunger E and its die will ascend rapidly from the pill, as explained hereinafter.

In further explanation of this feature of my invention it may be stated that after the pulverized drugs have been compressed into the form of a pill and the lever T² has been released, a partial vacuum in the die prevents the heavy arm of the lever from falling and the upper die from rising without the aid of the ejector; but as soon as the lower end of the upper die reaches the top of the die-holder and is exposed to the air the influence of the partial vacuum ceases and the lever falls, owing to the weight of its long arm, thereby completing the upward movement of the upper die, leaving the pill on the die-holder. The ejector D is now in such a position that the top of the pill above it is about on the level of the plate B', so that it is not yet fully ejected from the die. At this juncture the die-carrier B commences to make a movement in the direction of the arrow, Fig. 6, and during the first part of this movement the ejector D will be carried away from the lifter and support *x*, and will take its place on the lowest portion, *y*, of the inclined plane *y'* on the rib 4, Fig. 9, and as the movement of the die-carrier in the direction of the arrow, Fig. 6, is continued the lower end of the ejector D must traverse the said inclined plane *y'*, and the pill will thus be entirely ejected. While this is going on the ejector D' passes from its support *x* into the bottom of the cavity W. The die-carrier having completed its one-sixth of a revolution, there is another die charged with pulverized drugs to take the place first occupied by the die *e* beneath the elevated upper die, *m*, and another die to take the place of the die *e'* and receive a charge of pulverized drugs from the hopper F. A repetition of the above-described operation will now take place. It will be well to follow the progress of the ejector D after it has traversed the inclined plane *y'*. After traversing the top of the rib 4 a short distance it will fall from the end, *y'*, of the rib onto the support *x* of the arm X. In order to insure this descent of the ejector I use a pin, 5, Fig. 8, operated on by the end of an arm, 6, this pin being depressed, as described hereinafter, when the ejector and die are immediately beneath it, as shown in Fig. 8. The ejector D, now resting on the support *x*, finally reaches the position formerly occupied by the ejector D', Fig. 5, while the

ejector D' is in the position formerly occupied by the ejector D. I prefer to incline the support x downward to that end which is nearest the end y^2 of the rib 4, Fig. 8, so that when the pin passes from the control of the rib 4 and is forced down by the pin 5 it will be lower than is absolutely necessary; but before the ejector reaches a position directly underneath the hopper it will ascend the inclination of the support x and finally reach its proper position.

I have found in practice that precision in the position of the ejector is assured by thus causing it to fall lower than is required and then to climb the inclination of the support.

The amount of pulverized drugs introduced into each die e will depend upon the adjustment of the support x , on which the ejector rests while the die is being fed from the hopper, and any required adjustment can be readily effected by turning the threaded rod Y above referred to.

As regards the agitator G, it may be constructed in different ways. In the present instance it consists of a bent wire, 7, and cross-wires 8; but however the agitator may be constructed in other respects, I prefer to so make one portion of it—the part 9 in the present instance—that it will be as near as possible to the edge of the orifice in the die which is receiving a supply of pulverized drugs, so that the cavity in the die may be properly filled.

I find in practice that it is best to slightly lubricate the under side of the upper die and the top of the ejector, so that there may be no adhesion of either to the compressed pill.

For lubricating the tops of the ejectors I use a small roller, 10, Fig. 8, of absorbent material, the position of this roller being indicated by dotted lines in Fig. 6, and more fully explained hereinafter. It will suffice to remark here, therefore, that the tops of the ejectors, before the latter fall onto the adjustable support x , come in contact with the roller, and are lubricated by cosmoline or other available material, with which the said roller is impregnated.

As regards the lubrication of the bottom of the upper die, I use a pivoted arm, 11, carrying a small lubricating-roller, 12, as shown in the detached view, Fig. 11. The manner of operating this arm so as to move the roller in contact with the upper die and clear the same will be explained hereinafter.

As regards the disposal of the pills after they have been discharged from the dies, they are carried around with the die-carrier until they reach an arm, 13, forming part of a spout, 14, Figs. 6 and 8, secured to the frame of the machine, the said arm being near the upper surface of the carrier without being in absolute contact therewith.

I will now proceed to describe the mechanism by which I prefer to operate the above-described parts, reference being had to Figs. 1, 2, 3, and 4.

In bearings in the frame A is a shaft, S, which may be furnished with a handled fly-wheel, S', and, if desired, with a pulley for receiving a driving-belt. A pinion, S², on this shaft gears into a cog-wheel, S³, on a shaft, T, which also has its bearings in the frame of the machine, and this wheel has a crank-pin, T', provided with an anti-friction roller for operating the lever T², which is pivoted by a pin, t' , to the frame of the machine.

Through the short arm t^2 of the lever T² is screwed the threaded rod t^3 , the lower end of which is connected by a ball-and-socket joint to the above-mentioned plunger E, which carries the upper die, m , the plunger being guided by a projection, m' , of the frame.

By manipulating the screw the depth of penetration of the upper die into the lower die, and consequently the thickness of the pill, may be varied at pleasure. The long arm of the lever T² is so much heavier than the short arm that when it is free from the control of the crank-pin T' it will fall and the plunger will be elevated, not at once, however, as the first part of the raising of the plunger E must be through the medium of the ejector, for the reason given above. When the upper die, m , however, reaches the surface of the die-carrier, the plunger E will be controlled by the heavy long arm of the lever T², and the upper die will complete its upward movement by the falling of the long arm of the lever.

The above-mentioned guided bar H, which carries the pawl H', is reciprocated by a crank, V', on the shaft T, the pin of the crank being connected to a pin on the bar by a rod, V², as shown in Fig. 2.

The above-mentioned agitator G is attached to a spindle, P', which has its bearing in the above-mentioned bracket n , secured to the frame of the machine. A pinion, x' , on the spindle P' gears into a segment, x^2 , which is pivoted to the bracket n at x^3 , and which has an arm, x^4 , connected by a rod, d' , to the pin of a crank, d^2 , on the driving-shaft S.

The lever V, above referred to, is pivoted to the frame at k^3 , a spring, k^2 , secured to the base of the machine, tending to depress the short arm of the lever when it is not raised by the action of the anti-friction roller of the pin T' on the wheel S³. The shape of the long arm of this lever is such that it will remain depressed long enough to permit each ejector in succession to pass from the short arm w of the lever, or, as I have termed it, the "support and lifter," onto the inclined portion y' of the rib 4.

The pin 5, for depressing the ejectors, and referred to in connection with Fig. 8 as being acted on by the lever 6, is also shown, together with the lever, in Figs. 1 and 4, the pin passing through a projection on the bracket n , between which and the head of the pin intervenes a spiral spring, g . This lever 6 is pivoted to the frame of the machine at c , and the above-mentioned spring acting on one arm of

the lever causes the other arm to bear on a cam, g' , on the shaft T, as shown by dotted lines in Fig. 4, so that as the shaft T revolves there must be at the proper intervals a downward movement of the pin 5 to depress the ejector.

The above-mentioned lever 11, carrying the lubricating-roller 12, (shown in Fig. 11,) is pivoted at w' to a bracket, w'' , on the frame of the machine, Figs. 1 and 4, and the short arm w^3 of the lever 11 is connected by a rod, w^4 , to a pin on a crank, z , on the shaft T, so that at the proper time the lubricating-roller will be carried beneath and in contact with the upper die.

Referring to Fig. 7, it will be observed that the ejector D has an enlarged cylindrical lower portion, 15, which fits snugly but so as to slide freely in the die-holder, the upper portion, h , of the ejector being reduced in diameter, but the extreme upper portion, i' , is slightly enlarged to fit snugly and slide freely in the die. By making the lower portion, 15, of the ejector large in diameter it is better able to resist the strains to which it is subjected than if made throughout of the same diameter as the orifice i in the die. The slight enlargement i' in the extreme upper end of the ejector has this advantage, as it presents a shoulder, i'' , which scrapes away any particles which may adhere to the sides of the orifice in the die, and below the latter is a chamber, 16, larger in diameter than the lower part of the ejector, for receiving any matter that may be scraped away.

I claim as my invention—

1. The combination, in a pill-machine, of the die e , the intermittently-elevated ejector D, and the intermittently-depressed plunger E, part of the upward movement of which is dependent upon the simultaneous ascent with the upward movement of the ejector, substantially as set forth.

2. The combination of the lower die, e , of a pill-machine, and the ejector D, with the plunger E, carrying the upper die, and the lever T^2 , adjustably connected to the said plunger, all being combined and operating substantially as specified.

3. The combination of the lever T^2 , the threaded rod t^3 , passing through and adjustable in the short arm of the lever, and the plunger E, connected to the lower end of the adjustable rod, substantially as specified.

4. The combination of the plunger E, carrying the upper die of the pill-machine, with the lever T^2 , having a short arm connected to the said plunger, and with a crank-pin, T' , carried around with the shaft T, and acting on the under side only of the said lever, which is free from control of said crank-pin during the greater portion of the revolution of the latter, substantially as specified.

5. The combination, in a pill-machine, of the plunger E, carrying the upper die, m , and a lever, T^2 , having its short arm connected to

the said plunger, with the lower die, e , ejector D, and lever V, and with the shaft T, and crank-pin T' , carried around with the said shaft, whereby the said levers are operated, the lever T^2 to depress the plunger, and the lever V to raise both the ejector and plunger, substantially as specified.

6. The combination, in a pill-machine carrying a number of dies and an ejector, of the intermittently-operated support and lifter w , and a bearing on which it rests during the intermission of its movement and during the downward movement of the upper die, substantially as specified.

7. The combination, in a pill-machine having an upper die, m , of the intermittently-rotated die-holder having a number of dies, and each die having an ejector, with a support and lifter, w , substantially as set forth.

8. The combination, in a pill-machine, of the intermittently-rotated die-holder and its ejectors, and an intermittently-operated lever for supporting each ejector in succession and for imparting part of the upward movement to each ejector, with a fixed incline plane, y' , for completing the upward movement of each ejector in succession during each successive movement of the die-holder, substantially as set forth.

9. The combination, in a pill-machine, of an intermittently-rotated die-holder carrying a number of dies, and an ejector for each die, with a vertically-adjustable support, x , onto which the ejectors fall in succession, with a hopper situated above the said adjustable support for feeding into the die the drug to be compressed, substantially as specified.

10. The combination, in a pill-machine, of a lower die, e , and an ejector therefor, with a hopper, F, and an agitator, G, a portion, 9, of which extends to or nearly to the edge of the orifice in said die, substantially as set forth.

11. The combination, in a pill-machine, of an intermittently-rotated die-holder having a series of dies, and an ejector for each die, with a fixed rib, 4, in contact with which each ejector must traverse, and an adjustable support, x , onto which each ejector in succession must fall as the machine operates, substantially as specified.

12. The combination, in a pill-machine, of the intermittently-rotated die-holder B and its series of dies, each having an ejector, with the fixed rib 4, and an adjustable support, x , having an inclination, t^2 , substantially as specified.

13. The combination of the intermittently-rotated die-holder of a pill-machine, its dies and ejectors, and the support x , with a reciprocated rod, 5, for depressing each ejector in succession, substantially as set forth.

14. The combination, in a pill-machine, of the following elements, namely: first, an upper reciprocating die; second, an intermittently-rotated die-holder having a series of lower dies and an ejector for each die; third,

a support and lifter, *w*, forming a foundation for each ejector in succession during the descent of the upper die and for lifting each ejector in succession; fourth, a fixed rib, 4, having an inclined plane, *y'*, for receiving each lifted ejector in succession; and, fifth, a support, *x*, onto which each ejector in succession falls from the rib 4, all substantially as set forth.

10 15. The combination of the intermittently-rotated die-holder of a pill-machine and its series of dies and ejectors with a lubricating-roller, 10, substantially as specified.

15 16. The combination of the plunger E and the upper die, *m*, with a lubricating-roller, 12, carried by a vibrated arm, 11, substantially as described.

20 17. The combination of the intermittently-rotated die-holder B of a pill-machine and its series of dies and ejectors with the spout 14, and arm 13, projecting from the spout over

and above the face of the die-holder, substantially as set forth.

18. The combination of a die-holder and its dies *e* and ejectors D, each ejector having a cylindrical enlargement, 15, arranged to slide in and to be guided by the opening of the die-holder, substantially as specified. 25

19. The combination of the die-carrier, its dies and ejectors, each of which has at the top a slight enlargement, *i'*, presenting a shoulder, *i''*, substantially as set forth. 30

20. The combination of the die-holder, its dies and ejectors, with a chamber, 16, for each die, substantially as specified. 35

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH A. McFERRAN.

Witnesses:

JOHN M. CLAYTON,
HARRY SMITH.