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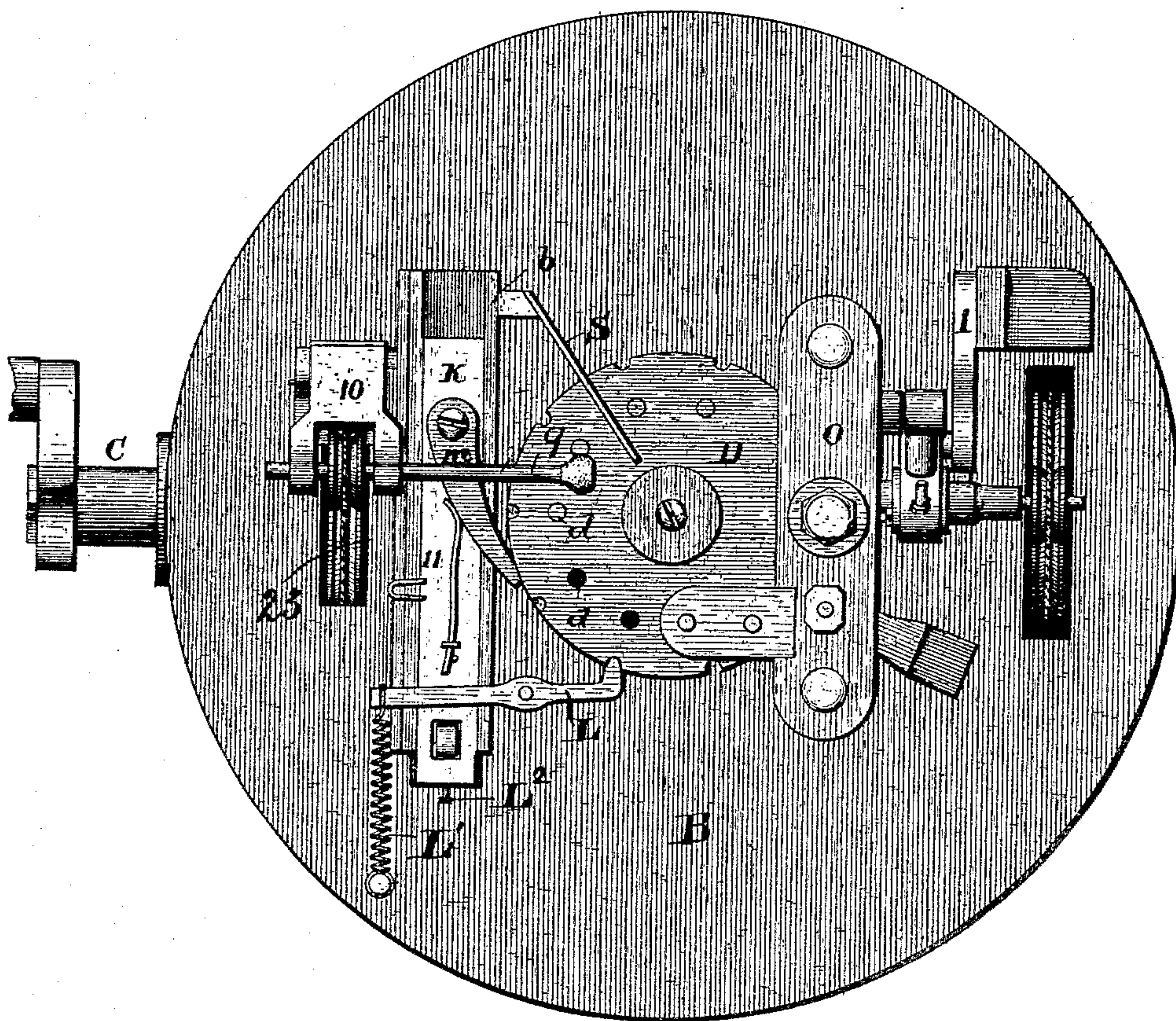
J. LUSBY.

PILL MAKING MACHINE.

No. 323,349.

Patented July 28, 1885.

FIG. 1.



ATTEST.

J. Henry Kaiser.
Harry L. Amer.

INVENTOR.

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By *Savistman.*

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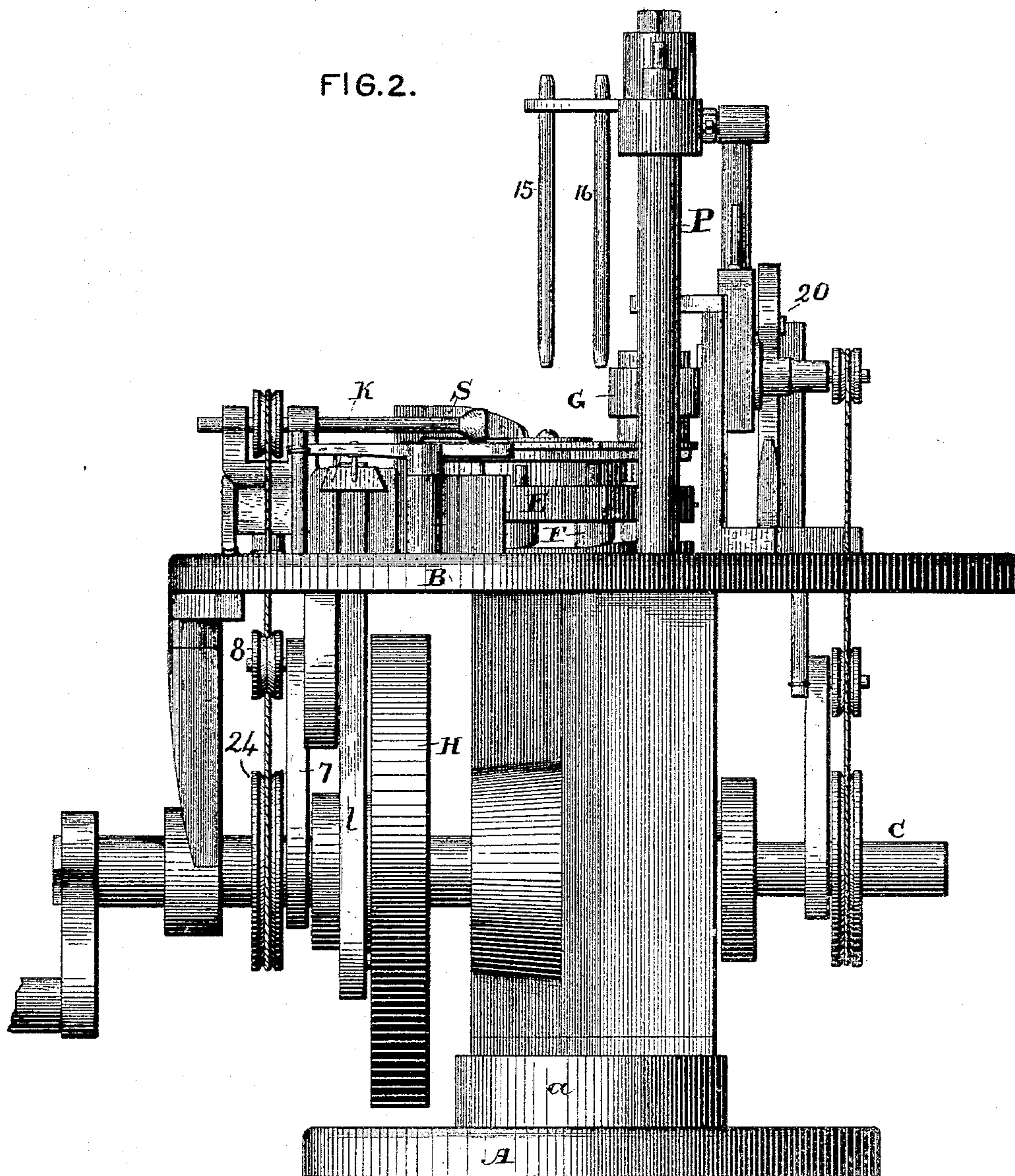
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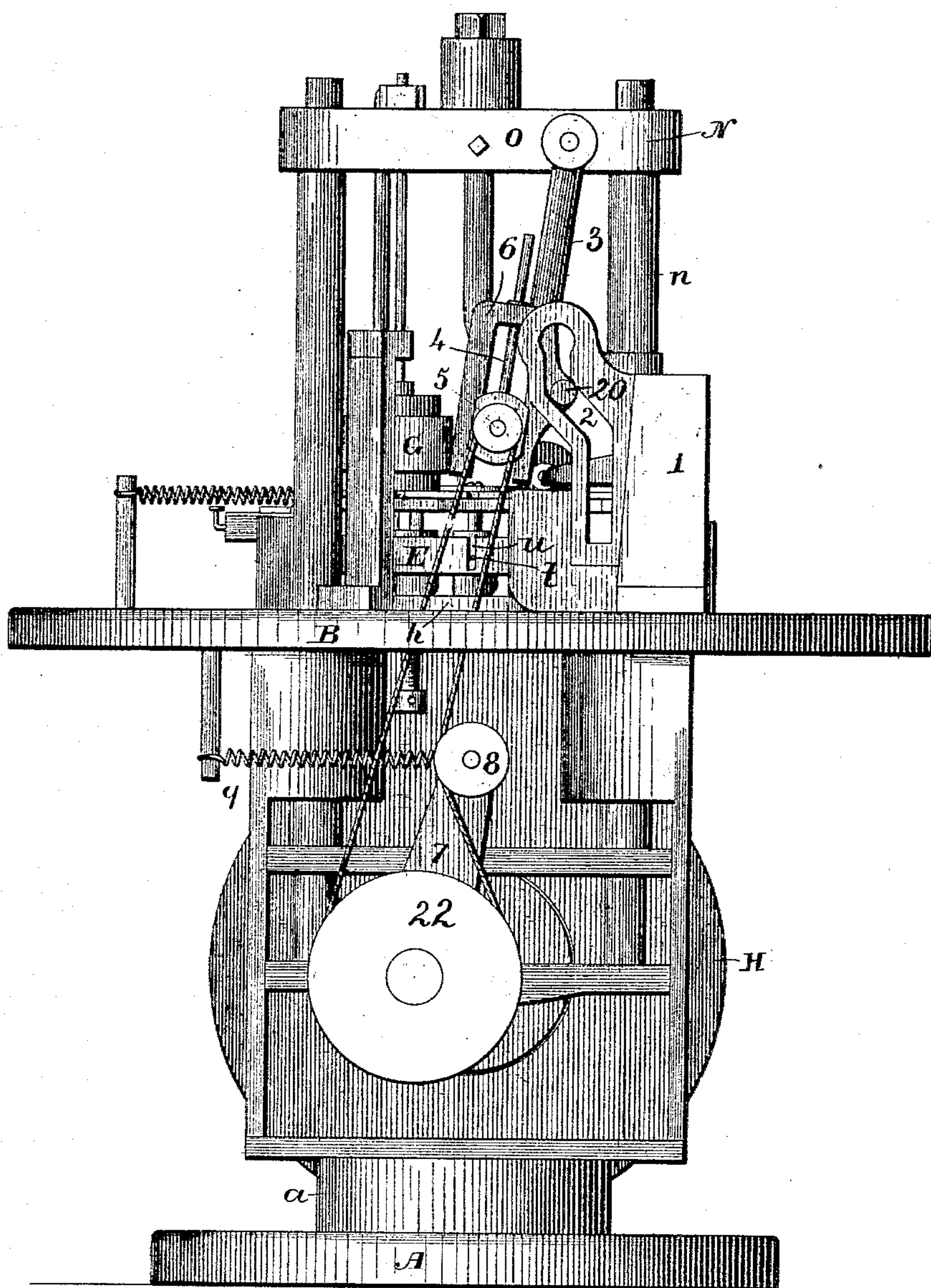
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FIG. 3.



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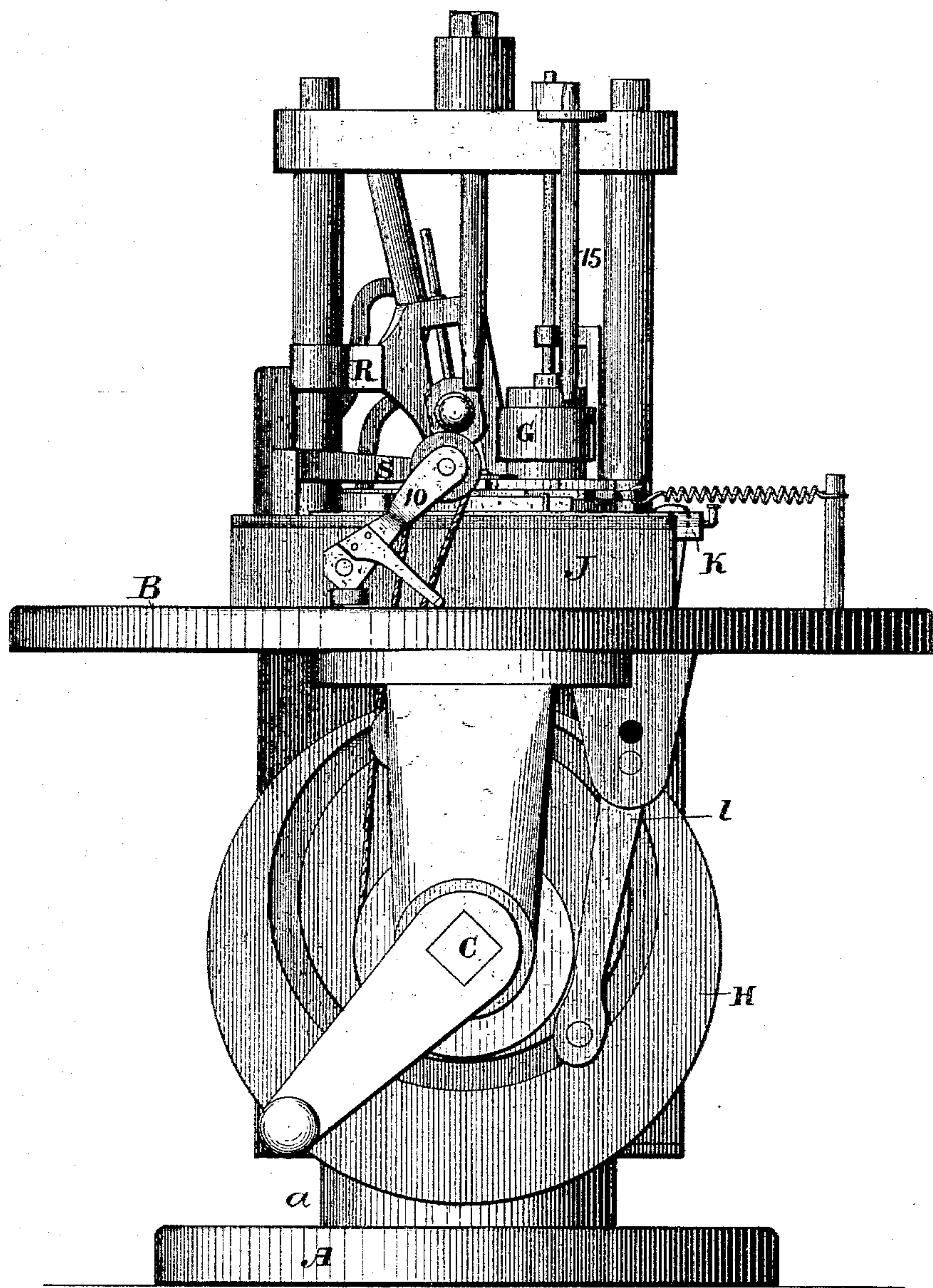
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FIG. 4.



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5 Sheets—Sheet 5.

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FIG. 5.

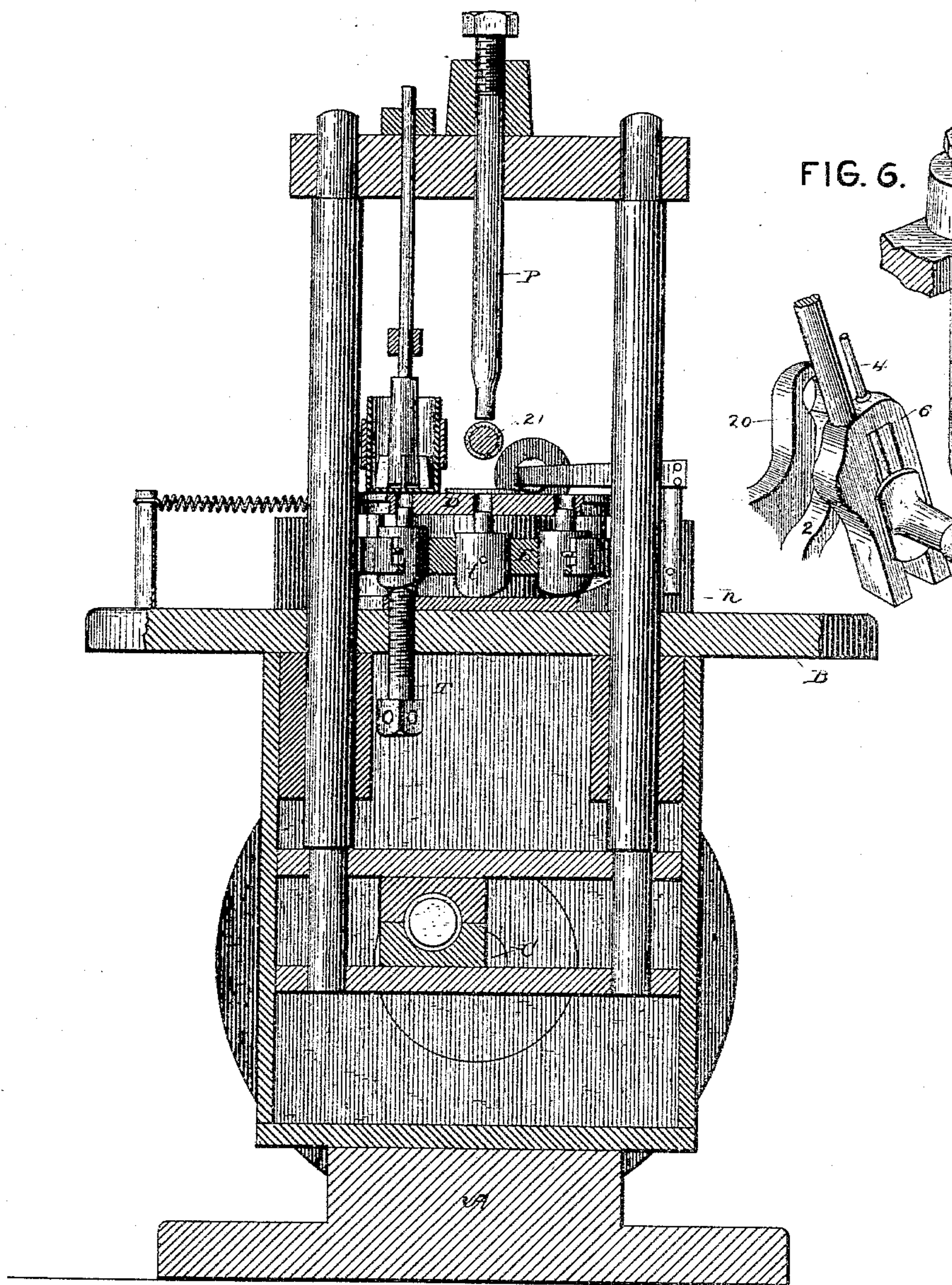
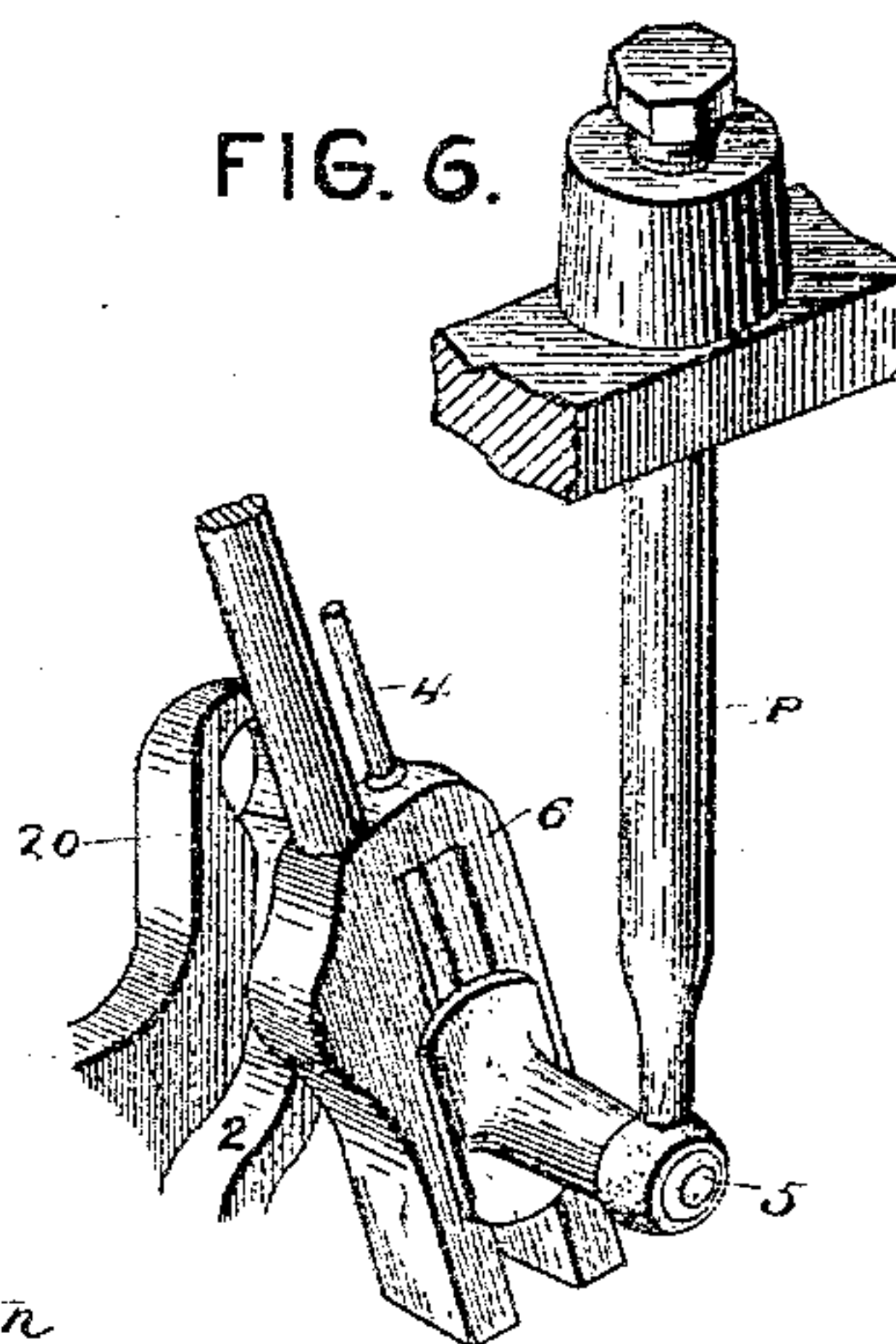


FIG. 6.



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UNITED STATES PATENT OFFICE.

JOHN LUSBY, OF PHILADELPHIA, PENNSYLVANIA.

PILL-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 323,349, dated July 28, 1885.

Application filed November 20, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN LUSBY, a citizen of the United States, residing at Philadelphia, Pennsylvania, have invented new and useful
5 Improvements in Pill-Making Machines, of which the following is a specification.

My invention relates to certain new and useful improvements in pill making machines, in which pulverulent material is automatically
10 fed to a machine consisting, essentially, of a revolving plate or disk carrying a series of molds, into which the powder is fed, a plunger entering the mold and compressing the material into the desired form, and means for re-
15 moving the completed pill. Heretofore in devices of this kind great difficulty has been experienced when adhesive powder has been used, arising from the tendency of such powder to adhere to the plunger, and result in
20 making imperfectly-formed pills. The means usually employed for removing the completed pills from the molds is by the entrance of an independent plunger, and great inconvenience arises from its use, for the reason that the
25 pills are very liable to become broken by the action of this extractor, which necessitates a larger amount of unnecessary machinery to operate it.

The object of my invention is to produce a
30 pill-making machine in which any desired pulverized drug may be formed into pills or tablets and removed from the molds in which they are formed without danger of breaking.

With these objects in view my invention
35 consists of a pill-making machine of the class referred to, in which the plungers between which the pills are formed are cleaned by means of rotating cleaners, which are brought
40 into contact with the contact-faces of the plungers when they are removed from the compressed pill.

Secondly, the invention consists of a revolving carrier-disk provided with a series of
45 openings for the reception of the powder to be pressed, the bottoms of these molds being formed by the upper ends of a series of vertically-reciprocating plungers, the lower ends of which bear upon a stationary cam, the form of which cam is such as to hold the plungers
50 in the required position to regulate the size of the opening into which the powder is deposited and in which it is compressed, and finally

to elevate them sufficiently to eject the completed pill.

The invention further consists in various
55 details of construction, whereby the quantity of powder deposited in the molds is regulated, the amount of pressure imposed upon the pill determined, and the several operations of the organism accomplished.

In order that those skilled in the art may know how to make and use my improved machine, I will now proceed to describe the preferred construction and arrangement of parts,
60 in connection with the accompanying drawings, in which—

Figure 1 is a plan view of the machine. Fig. 2 is a rear elevation. Fig. 3 is a side elevation showing the device by which the lower
65 face of the upper plunger is cleaned and the mechanism employed for bringing the said cleaner into operative position, and Fig. 4 is a side elevation showing the means for giving
70 the carrier-disk a rotary motion and retaining it in position to allow the reciprocating plunger to enter the mold which may be brought
75 under it. Fig. 5 is a side elevation, partly in section, and Fig. 6 is a detail of the compressing-plunger and the cleaner and means by which the cleaner is brought under the plunger.

80 In these drawings, A represents the main casting or base of the machine, which has formed integral therewith the upright standard *a*, to the upper end of which is placed the disk B, which forms a means for supporting the
85 principal operative portions of the machine.

C represents the main driving-shaft, which is mounted in suitable bearings carried by the upright portion of the main casting.

The molds *d*, into which the powder is fed,
90 and in which it is retained during the time when it receives pressure to solidify it, are formed in a disk, D, preferably of hardened steel, which is mounted upon the supporting-table in a manner to be rotated to bring any
95 one of the molds under a reciprocating plunger mounted in a suitable position. Beneath this disk D is situated another disk, E, of the same diameter, and mounted upon the same shaft, so as to move simultaneously there-
100 with. The bottom of each mold is formed by a plunger, F, which extends a suitable distance into the said mold, and the size of the mold is regulated by the vertical position of

this plunger. Each plunger is provided with a lateral pin, *t*, which is received by a slot, *u*, in the disk *E*, by which it is allowed a limited vertical movement, and in this way the plungers are rendered incapable of revolving upon their own axes. The lower end of these plungers bear upon a stationary cam, *h*, placed upon the table, and by the form of this cam the vertical position of the plungers, and consequently the size of the molds, is regulated.

G represents the reservoir into which the powder is placed and kept in an agitated condition by means of a stirrer operated by any convenient connection with the reciprocating frame carrying the plunger. The bottom of this reservoir is provided with an opening of a diameter equal to that of the molds, which are successively brought to register with such opening to receive their charge of powder before being brought into position under the plunger by which the powder is compressed.

In order to form a convenient means for regulating the amount of powder to be used in each pill, I provide a set-screw, *T*, which extends through the stationary cam and the table, with its end in an easily-accessible position beneath the table, and its upper end in the path of the plungers, and in such a position that the particular plunger regulating the size of the mold about to be filled rests. Thus it will be seen that by moving the said screw up or down the amount of powder used in each pill can be easily regulated.

The mechanism by which the carrier disk is intermittently rotated and held in position during the compression of the powder will now be described.

H represents a disk keyed to the main driving-shaft, and provided on its face with a cam-groove into which extends a projection from a pivoted lever, *l*, having its bearing in a hanger depending from the under face of the table. The upper end of this lever passes up through a slot in the table, and moves back and forth in this slot when the cam is rotated. Upon the surface of the table, adjacent to the carrier-disk, is a block, *J*, having in its upper part a dovetailed groove, which receives a bar, *K*, to one end of which is attached the upper end of the vibrating lever *l*, through which medium the bar receives a reciprocating motion. This reciprocating bar carries a pawl, *m*, which engages with teeth on the carrier-disk, which pawl is held against the said disk by means of a spring.

Mounted in suitable bearing between the reciprocating bar and the carrier-disk is a lever, *L*, extending over the said bar at right angles thereto, one end of which lever engages with notches in the upper portion of the periphery of the carrier-disk, and the other end is attached to a spring, *L'*, the tendency of which is to keep the lever in contact with the disk. The rear end of the reciprocating bar is provided with an upright pin, *L²*, which engages with the lever *L* at the moment when

the pawl engages with one of the teeth upon the lower portion of the periphery of the disk preparatory to revolving the said disk, and disengages the said lever from the notch in which it rested. As the bar moves rearward, the lever is released and slides over the periphery of the disk until it arrives at the next notch intended for its reception, which it enters, and serves to hold the disk against turning during the operation of compressing the powder by the entrance of the plunger.

N represents a frame consisting of two uprights, *n n*, and cross pieces *o*, connecting the opposite ends of the said uprights. This frame is held in position by sleeves *O*, formed with the main casting, in which sleeves it is free to reciprocate. Motion is given to this frame through the medium of a cam or any equivalent device connected to the main shaft.

To the cross-head *o* of the frame is secured the depending plunger *P*, which is adjustable vertically in the said cross-head, in order that the amount of pressure imposed upon the powder in the mold may be regulated, and the movement of the reciprocating frame is so timed as to bring the plunger down at the moment one of the filled molds is brought into proper position beneath it.

When adhesive powder is used, it has been found necessary to clean the compressing plungers after every operation. This cleaning has heretofore been done by hand, and it has necessitated the employment of one attendant to each machine.

In my improved machine I have provided cleaners which effectually remove any of the powder which may adhere to the plungers or dies by means of continuously-rotating scrubbers, which are brought into contact with the dies immediately after they are removed from contact with the compressed pill.

The upper die or plunger is cleaned by means of a rotating scrubber, which may be a brush, or the like; but I prefer to use a shaft having that portion which comes in contact with the plunger covered with felt. This cleaner is brought into contact with the end of the plunger when the latter is at the limit of its upper movement, and remains in contact during the time consumed in turning the carrier-disk to bring a new mold beneath the plunger.

Any suitable mechanism may be employed for bringing this cleaner into operative position; but I prefer that shown, which will now be described.

Situated upon the table adjacent to the reciprocating frame carrying the plunger is a vertical plate, *1*, in which is cut a groove, *2*, into which extends a projection, *20*, from a frame depending from and pivotally secured to the cross-head of the frame. This depending arm *3* is provided with a vertical groove, *4*, in which is supported a bearing for the shaft *5*, upon the inner end of which is mounted the cleaner *21*, which is brought into contact with the plunger to remove any powder which may adhere thereto after the pill

has been compressed. The outer end of the shaft 5 is provided with a pulley, which bears a belt passing over a suitable drum, 22, on the main driving-shaft, by which means the said shaft 5 is given a rotary motion, continuing as long as the machine is in operation. The form of the groove in the frame 1 is such that as the reciprocating frame ascends, carrying with it the plunger and the depending frame 6, the latter is carried toward the said plunger by means of the projection which slides in the groove 2. The distance from the cross-head to the cleaner is equal to the distance from the said head to the extreme end of the plunger, so that when the cleaner is carried over a sufficient distance the cleaner will come in contact with the lower or bearing surface of the plunger.

In order to take up the slack of the belt which transmits power from the driving-shaft to the shaft carrying the cleaner, I provide the arm 7, mounted loosely upon the driving-shaft C and carrying the pulley 8, which is brought against the belt by means of the spring 9 with sufficient force to take up the slack in the said belt when the cleaner is in the lowest position assumed by it.

Upon the opposite side of the table from that upon which the device for cleaning the plunger is situated I arrange a simple mechanism for cleaning the upper ends of the plungers which are carried by the molds. These plungers are carried for a short distance in the position they assume in forcing the completed pill out of the mold—that is, with their ends projecting a short distance above the carrier disk—and while they are in this position they are operated upon by a cleaner similar to that used upon the plunger. This cleaner consists of a shaft, 9, carrying upon its end a cleaner consisting of felt mounted in bearings in the upper bifurcated end of an arm, 10, which is pivotally secured to the table. The shaft upon which the cleaner is mounted receives motion through the medium of a belt, 23, passing over a pulley, 24, upon the main shaft, like the cleaner situated on the opposite side of the table, and, like that cleaner, has its driving-belt provided with a device for taking up the slack of the belt. In its normal position the shaft 9 has its inner end, which carries the cleaner, resting upon the surface of the carrier-disk or the end of the plunger which may be in position for cleaning. In order to provide a convenient means for raising this cleaner from the surface of the disk during the rotation thereof, I provide the sliding bar K with a projection, 11, which engages with the inclined arm upon which the shaft 9 is mounted when the said bar is being drawn back to bring the pawl into contact with a tooth of the carrier-disk, for the purpose of revolving that disk. The projection 11 carries the end of the arm 10 backward a short distance, thereby raising the cleaner from the disk, in which position it remains until the disk is turned and a plunger which has been

relieved of its pill is brought into position to be cleaned.

In the operation of the machine it has been found necessary to clean the molds every time they have been used, and it has also been found advantageous to coat the interior of the mold with a lubricant in order to facilitate the removal of the completed pill intact, and to guard against the adhesion of any powder. In order to accomplish this cleaning and lubricating, I have provided two depending arms supported upon an extension from the cross-head o, and arranged in such a position that each will enter one of the molds when the carrier-disk is in a stationary position and ready for the plunger to enter the mold which has just been filled with a powdered drug. The arm 15 is provided at its lower end with a ball of cloth, felt, or the like, which is forced into the mold for the purpose of removing any powder which may have adhered to the mold. The arm 16 is provided at its lower end with a porous material, which holds oil, grease, or the like which may be used to lubricate the mold. The arrangement of these arms 15 and 16 is such that the mold which is cleaned by one operation is lubricated by the next, so that it is in proper condition for the reception of the lubricant.

The completed pills are removed from the molds by the rising of the plungers in the same, and this rising is regulated by the form of the stationary cam h. The lowest point in this cam is beneath the cleaners, which allows the plungers to be entirely out of the mold when the cleaner and lubricator enter. From this point the cam increases slightly in height until it arrives at the point where the powder is received, from which point it is of a uniform height until the point where the impact of the plunger P is received, after which the height increases sufficiently to force the plungers out of the mold, and thereby discharge the compressed pill. The cam is of the same height from the point where the pill is discharged until the place where the cleaner for operating upon the lower plungers is passed, when it decreases suddenly to bring the plungers in suitable position for the entrance of the cleaning and lubricating cylinders.

As a simple and convenient means of removing the pills from the top of the carrier-disk after they have been discharged by the action of the plungers, I provide the scraper S, which extends a suitable distance over the said disk into the line of motion of the disk and scrapes the pills off into a suitable receptacle.

Should any of the operations of the machine fail, or occur at any time other than the correct one, injury to the machine by the impact of the plunger against the carrier-disk, or any other equally injurious movement, I provide a projection, R, extending from one of the uprights of the frame n a, which, in the proper operation of the machine, passes through one of the notches entered by the retaining-lever

L at each descent of the plunger; but should any of the operations fail, no passage in the plate would be in proper position for its passage, and it would press upon the surface of the disk and prevent further movement.

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

1. A pill-making machine comprising a series of molds brought successively beneath a compressing plunger or die, means for feeding the material to said molds and removing the completed pills therefrom, and a cleaner moving into contact with the operating-surface of the plunger or die after each operation.

2. A pill-making machine comprising a series of molds moving successively beneath a compressing plunger or die, means for feeding the material to said molds and removing the completed pill therefrom, and a revolving cleaner brought into contact with the operative surface of said die after each operation.

3. As a means for cleaning the reciprocating plunger of a pill-making machine of the kind described, a continuously-revolving cleaner carried by the frame which supports the plunger, and moving into contact with such plunger after each operation compressing the material.

4. A cleaner adapted to remove adhesive material from the contact end of the plunger of a pill-making machine of the kind described, the said cleaner receiving rotary motion from the main driving-shaft of the machine and moving into contact with the said plunger after each operation.

5. As a means of removing the powder from the plunger in a pill-making machine of the kind described, a cleaner mounted upon a shaft having its bearings in a hanger depending from the frame carrying the said plunger, the said hanger having a projection running in a guide in an upright attached, the form of which guide is such as to carry the cleaner into contact with the end of the plunger.

6. In a pill making machine, a carrier-disk having a series of molds therein, and a series of plungers fitting in said molds and having their lower ends bearing upon a cam, whereby the position of the plunger is determined and the size of the mold regulated.

7. In a pill-making machine, a carrier-disk having a series of molds, a series of plungers having laterally-projecting pins fitting into the said molds, a disk of equal diameter to that of the carrier-disk situated beneath the said carrier-disk, provided with openings for the reception of the plungers and slots for the reception of the projecting pins, and a stationary cam situated beneath the said plungers, whereby the positions of the plungers are controlled.

8. In a pill-making machine, a disk or plate carrier carrying a series of molds, a plunger adapted to enter the molds successively, a series of plungers forming the bottom of the

molds, means for raising the plungers in the molds, and a cleaner adapted to act upon the upper ends of the molds when they are in an elevated position.

9. In a pill-making machine, the carrier-disk carrying a series of molds, the bottoms of which are formed by a series of vertically-movable plungers, a cam situated beneath said plungers, and a rotary cleaner situated above the carrier-disk, and coming into contact with the ends of the plungers when they are raised by the cam.

10. In combination with the plungers F, the continuously-rotating shaft 9, carrying a cleaner at its end, which cleaner is in line with the ends of the plungers when they are raised from the molds.

11. In a pill-making machine, the carrier-disk having the series of plungers regulated by the cam, and the shaft 9, mounted in vertically-moving bearings, whereby it is adapted to be removed from the carrier disk during the turning thereof.

12. In a pill-making machine, a disk carrying a series of molds, and having an intermittently-rotary motion to bring the molds beneath a compressing-plunger, and a plunger carried upon a reciprocating frame, the said frame being also provided with a depending plunger which enters a mold from which the pill has been removed as the frame descends and removes any powder that may adhere to the walls of said mold.

13. In a pill-making machine, a disk carrying a series of molds, and having an intermittently-rotary motion to bring the molds beneath a compressing-plunger, and a plunger carrying a lubricant and entering the mold from which the pill has been removed, for the purpose of facilitating the removal of the pill to be formed in the said mold.

14. In a pill-making machine, an intermittently-rotating carrier-disk carrying a series of molds, a reciprocating plunger adapted to enter the molds successively, and two depending-plungers adapted to enter the molds after the pills are removed, one of said plungers carrying a cleaner and the other lubricating material.

15. In a pill-making machine, a carrier-disk having notches in its periphery for the reception of a pawl by which it is given an intermittently-rotary motion, a reciprocating frame carrying a plunger and adapted to enter the molds successively, and a projection from said frame adapted to pass through the notches in the plate when the frame descends, if the several parts of the machine operate properly, and bearing upon the carrier-disk when any of the parts fail, for the purpose set forth.

16. In a pill-making machine, a carrier-disk containing a series of molds the bottoms of which are formed by plungers which bear upon a cam situated beneath the said disk, and by which the plungers are raised to expel the completed pills, and a scraper extending

partially across the disk for the purpose of removing the completed pill.

17. In combination with the carrier-disk having the vertically-moving plungers, and the continuously-rotating shaft 9, carried in movable bearing, reciprocating bar K carrying a projection adapted to come into contact with the said movable bearing and carry the cleaner from the surface of the disk during the turning thereof.

18. As a means for cleaning the molds and dies in a pill making machine of the kind described, a continuously-rotating cleaner brought periodically into contact with the plunger by which the material is compressed, a similar cleaner brought into contact with the upper ends of the plungers forming the bottoms of the molds, and plungers depending from the frame carrying the compressing-

plunger adapted to enter the molds in which the pills are formed.

19. In a pill-making machine, a carrier/disk carrying a series of molds the bottoms of which are formed by vertically-movable plungers, a cam situated beneath and in contact with the lower ends of the plungers, and set-screw passing through the said cam at the point at which the mold receives its charge of powder, whereby the size of the mold, and consequently the quantity of powder placed in the mold, is regulated.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN LUSBY.

Witnesses:

C. A. DOUGHERTY,
W. W. DOUGHERTY.