E. L. RICHARDS.

TABLET MACHINE.

APPLICATION FILED APR. 23, 1907.

900,957.

Patented Oct. 13, 1908.

6 SHEETS—SHEET 1.

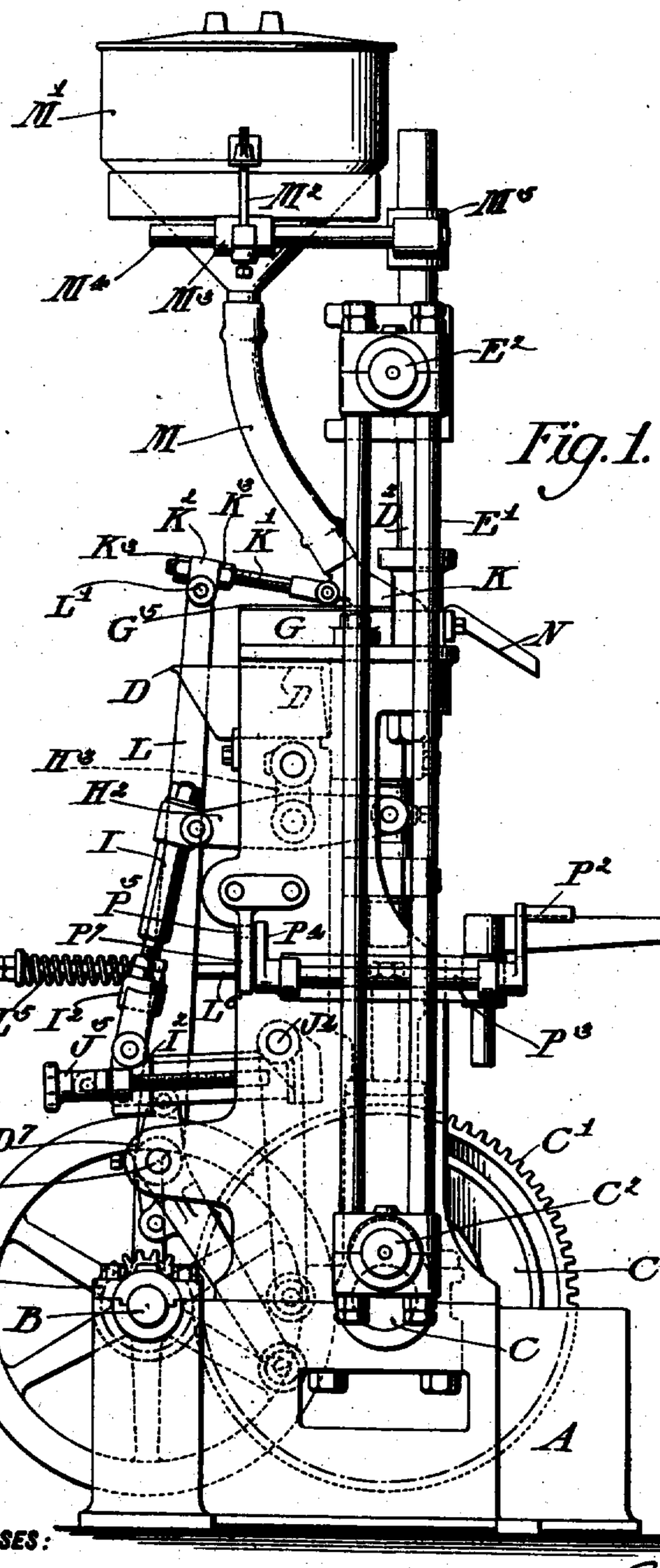

Fig. 1.

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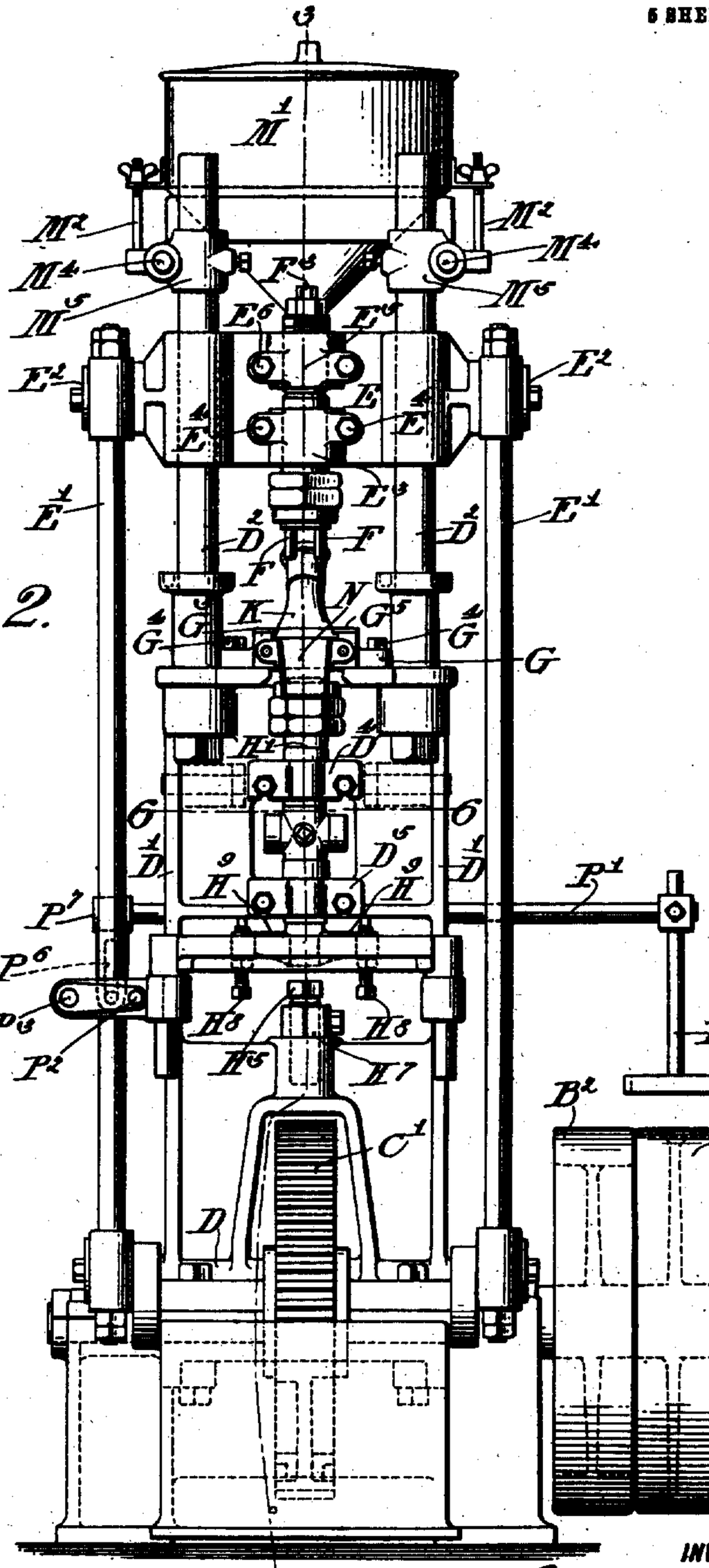
5 SHEETS—SHEET 2.

Fig. 2.



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5 SHEETS—SHEET 3.

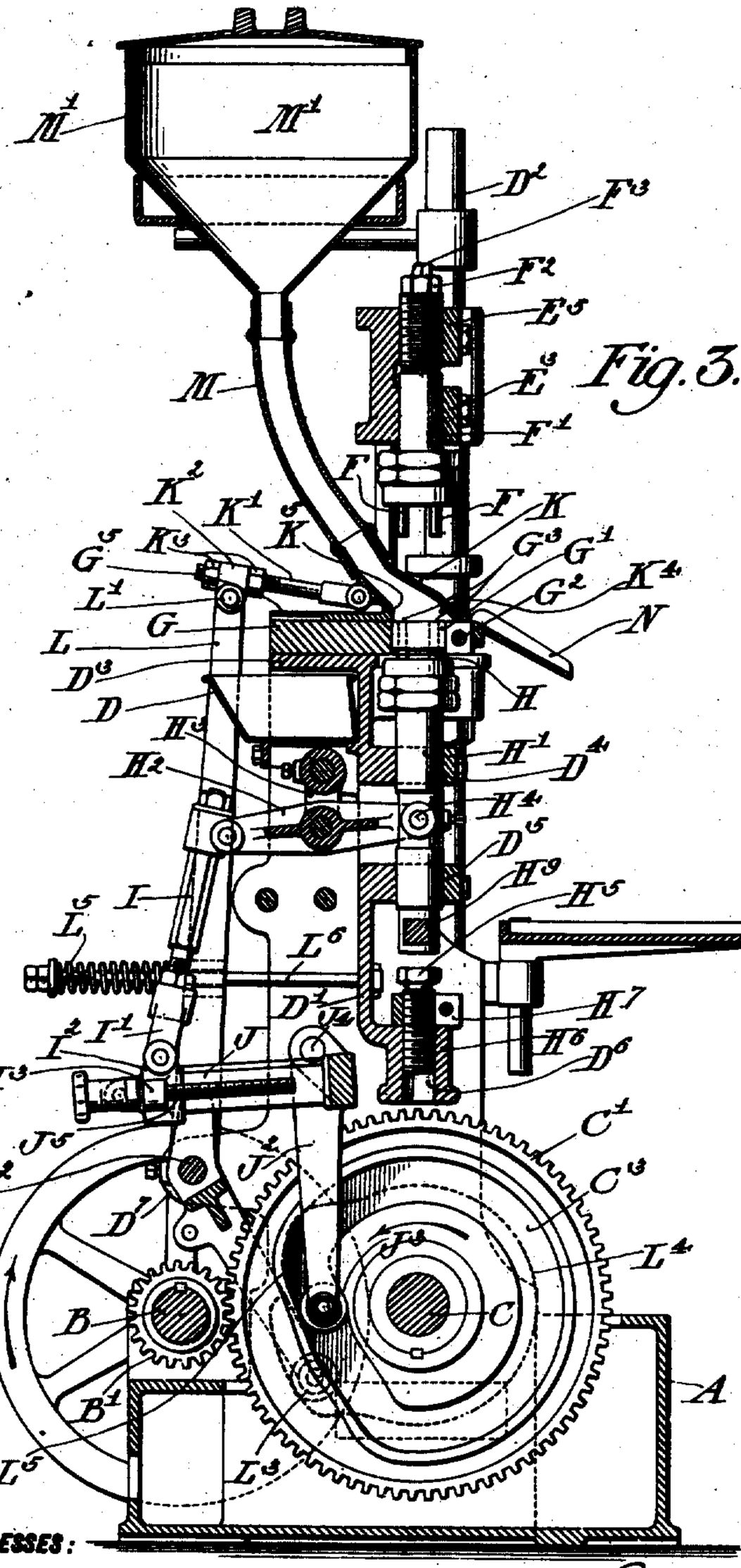

Fig. 3.

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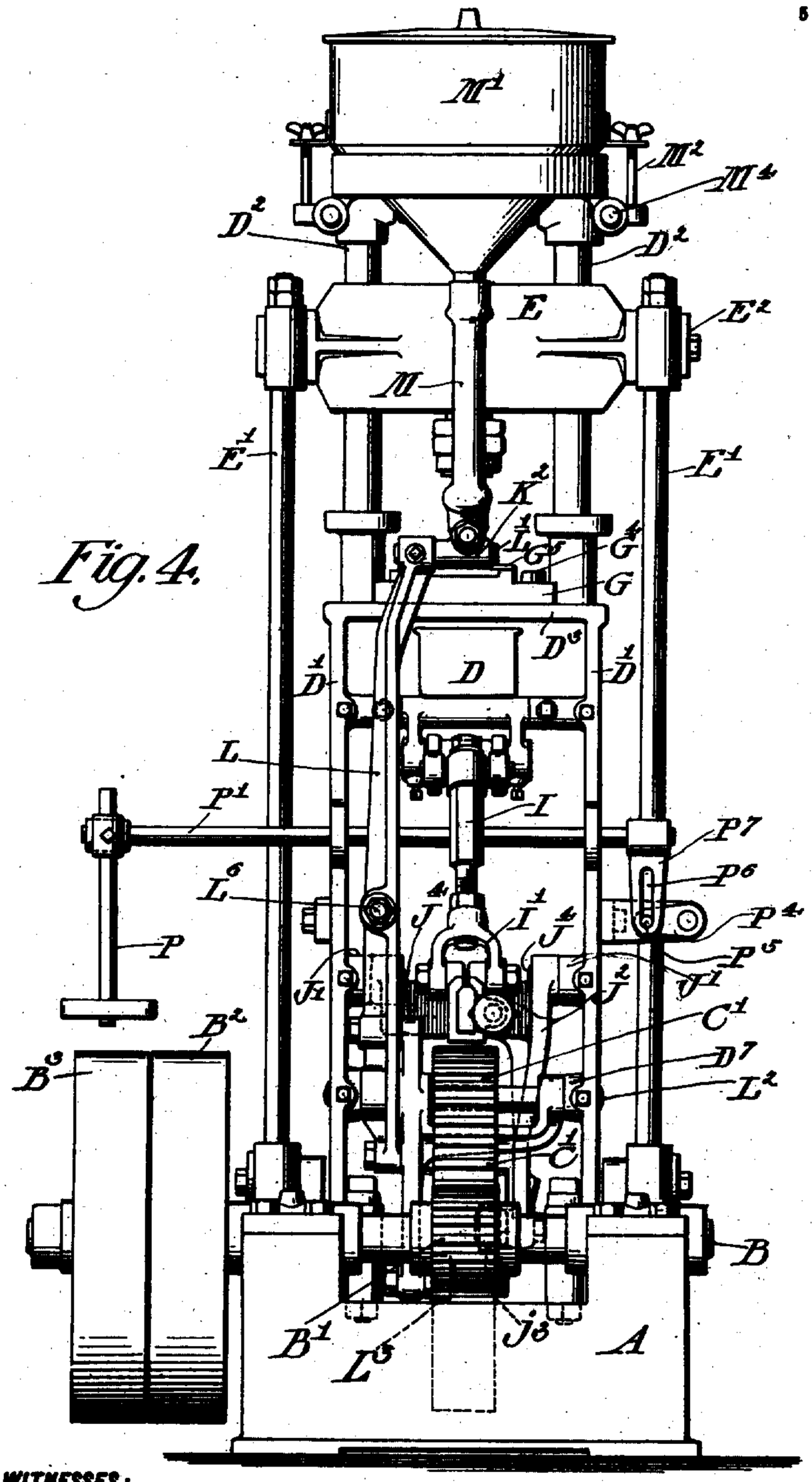
5 SHEETS—SHEET 4.

Fig. 4.



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5 SHEETS—SHEET 5.

Fig. 5.

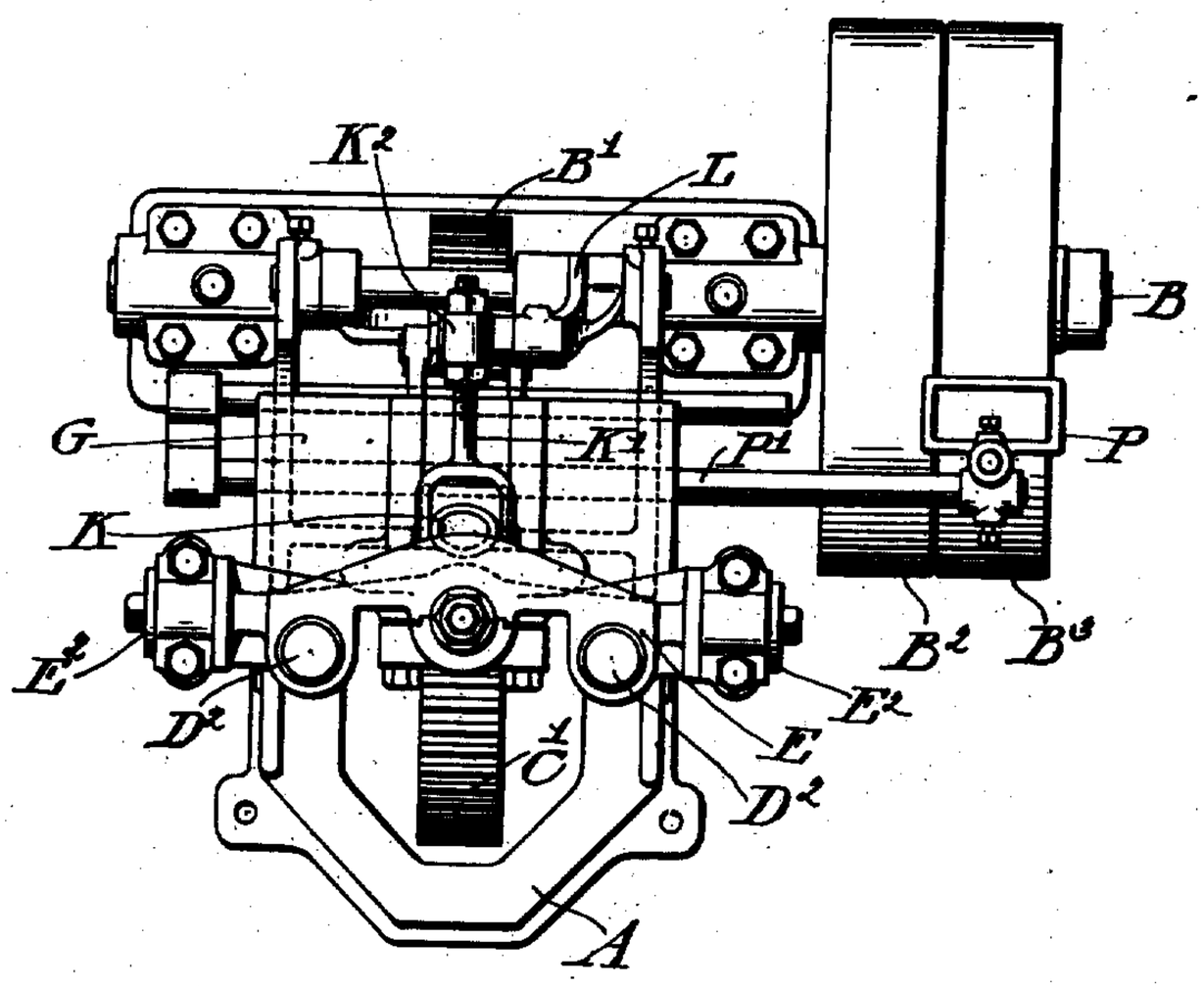
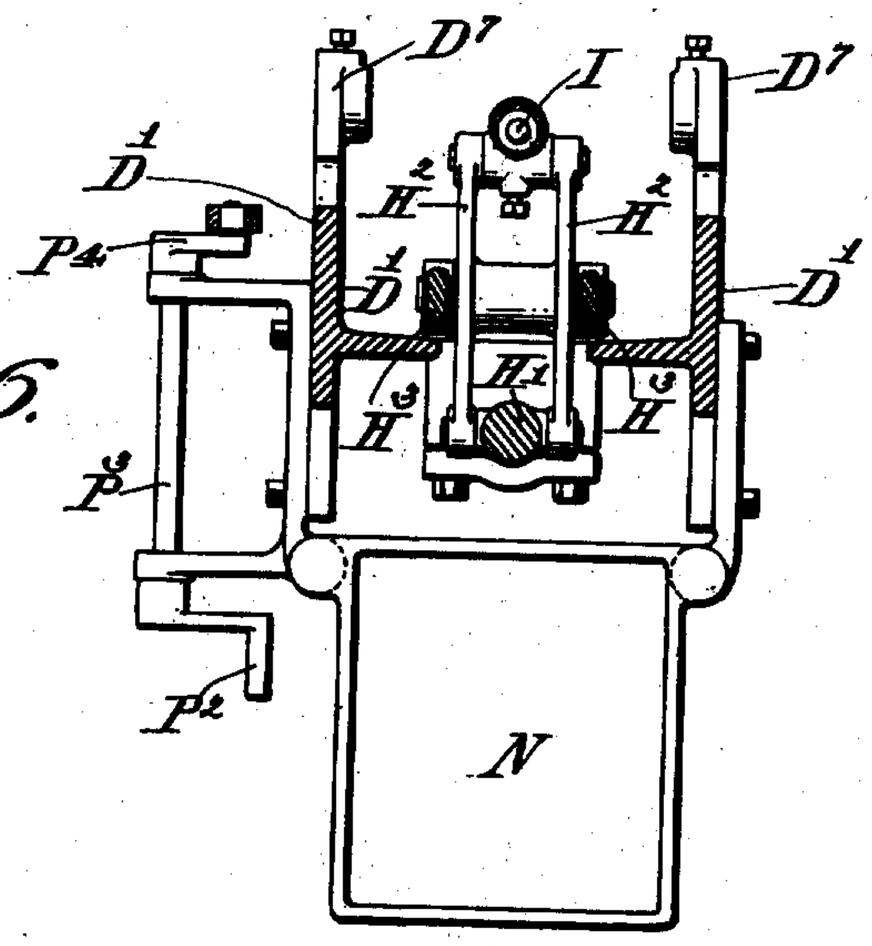


Fig. 6.



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UNITED STATES PATENT OFFICE.

EMANUEL L. RICHARDS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO JOHN WYETH AND BROTHER, INCORPORATED, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

TABLET-MACHINE.

No. 900,957. Specification of Letters Patent. Patented Oct. 13, 1908.

Application filed April 23, 1907. Serial No. 369,743.

To all whom it may concern:

Be it known that I, EMANUEL L. RICHARDS, a citizen of the United States, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Tablet-Machines, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My present invention relates to means for compressing medicinal tablets and the like from granular or powdered material.

The object of my invention is the construction of a machine for the purpose mentioned which will produce tablets of uniform quality and with little waste, which may be readily adjusted to give any desired degree of compression and tablets of any desired thickness, and which will be simple, reliable and effective in its mechanical construction.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of my invention, however, and the advantages possessed by it, reference may be had to the accompanying drawings and descriptive matter, in which I have illustrated and described a machine embodying my invention.

Of the drawings, Figure 1 is a side elevation of the machine. Fig. 2 is a front elevation. Fig. 3 is a section on the line 3—3 of Fig. 2. Fig. 4 is a rear elevation. Fig. 5 is a plan view with some parts removed, and Fig. 6 is a section on the line 6—6 of Fig. 2.

In the drawings, A represents a base having formed in it the lower halves of the bearings for the driving shaft B and for the main operating shaft C, which is driven from the shaft B through gear wheels B^1 and C^1. On the base A is bolted a main frame D comprising a pair of side plates D^1 and connecting portions. The upper halves of the bearings for the shaft C are formed in the frame D. A pair of parallel columns or guide posts D^2 extend from the upper end of the main frame D to which they are rigidly connected. A crosshead E, mounted on the guide rods D^2 is reciprocated by means of connecting rods E^1 which are journaled at their upper end on trunnions E^2 carried on the crosshead and at their lower end on wrist pins C^2 carried by, but eccentrically disposed with respect to the shaft C. The upper tablet forming plungers are in the form of pins F carried by a holder F^1, the shank of which is clamped in the crosshead E by means of a clamping yoke E^3 secured by bolts E^4. The upper end of the holder F^1 bears against and is supported by the lower end of a hollow bolt F^2 which is threaded in a nut formed partly by the crosshead E and partly by a clamping yoke E^5 adjustably secured to the crosshead by bolts E^6. The position of the upper plungers relative to the crosshead may be varied by loosening the bolts E^4 and E^6 and adjusting the holder F^1 and the bolt F^2. By tightening the bolts E^4 and E^6 the parts are prevented from working loose. The bolt F^2 forms a means for obtaining an adjustment of the plungers more delicate, accurate and secure than would be otherwise possible. A bolt F^3 passing through the hollow bolt F^2 is threaded into a socket formed in the upper end of the holder F^1. This prevents the holder F^1 from dropping and possibly injuring the plungers F when the clamping yokes are loosened. When it is desired to remove the holder F^1 and then return it without disturbing the adjustment, as in cleaning, this may be readily done by adjustment of the bolt F^3 and clamping yoke E^3.

On the top cross D^3 of the frame D between the posts D^2 is secured a table G by bolts G^4. The table G has an opening in line with the plungers F in which is secured a die block G^1. Preferably the table G has a kerf at one side of the opening receiving the die block G^1 to facilitate the clamping of the die in place by a clamping bolt G^2. The die block G^1 is provided with passages G^3 into the upper ends of which the lower ends of the plungers F are adapted to enter, and the tablets are formed in the passages G^3 between the lower ends of the plungers F and the upper ends of similar plungers H which are carried by a holder H^1 longitudinally movable in line with the holder F^1 in bearings formed in cross pieces D^4 and D^5 of the framework D. Levers H^2 supported from the framework D by links H^3 have their inner ends journaled on trunnions H^4 carried by the holder H^1, and the oscillation of the levers H^2 reciprocates the holder H^1 to move the plungers H up and down in the passages G^3. The downward movement of the holder H^1 is definitely limited by an abutment in the form of a bolt H^5 projecting from a socket D^6 formed in the framework of the web D^2 in line with the holder H^6,

and secured in any desired position by a lock nut H⁷. Similarly the upward movement of the holder H¹ is definitely limited by adjustable bolts H⁸ carried in arms H⁹ projecting laterally from the lower end of the holder H¹ and adapted to engage the transverse frame rib D⁵.

The outer ends of the levers H² are connected by a link comprising relatively adjustable parts I and I¹ with a block or crosshead I² which is secured on one arm J of a bell crank lever pivoted on pins J⁴ supported by bosses J¹ of the frame work D. The other arm J² of the lever carries a cam roll J³ which travels in the cam groove C³ formed in one side of the gear wheel C¹. To vary the stroke of the plunger holder H¹, the block I² is made adjustable along the arm J by means of a screw J⁵ swiveled in the outer end of the arm and passing through a threaded socket formed in the lug I³ of the block I².

It will be observed that the center of the pivotal connection between the link member I¹ and the block I² is so located that when the block I² is moved to the inner limit of its movement along the lever arm J, the pivotal center of the link connection is coaxial with the center of movement of the bell crank lever about the stud J⁴. In consequence, the oscillation of the bell crank lever arm J² can be made to produce any desired amount of movement of the holder H¹ from zero up to a maximum.

On the upper side of the table G are provided guideways G⁵ in which reciprocates the feed shoe K. The shoe K has pivotally connected to it a rod or link K¹ on the outer end of which is adjustably secured a block K² by means of nuts K³. One end of a lever L is pivotally connected to the block K² by the pin L¹. The lever L is pivotally supported between its ends by a stud or shaft L² journaled in ears D⁷ of the framework. The lower end of the lever carries a cam roll L³ which works in a cam groove L⁴ formed in the opposite side of the gear wheel C¹ from that in which the cam groove C³ is formed. The cam roll L³ is at all times held against the cam L⁴ by a spring L⁵ held against the upper arm of the lever L by a bolt L⁶ secured to the framework of the web D¹.

The shoe K has its upper end connected by a flexible tube M to the discharge end of a hopper or receptacle M¹ secured by bolts M² to collars M³ adjustable along transverse rods M⁴ supported by collars M⁵ adjustably secured in place on the upper end of the posts D. By this arrangement the hopper or receptacle M¹ may be adjusted toward and away from the level of the table G and also toward and away from the posts D. From the front end of the table G a chute N leads for conveying material discharged from the front end of the table onto the table N¹ secured to the framework B or into a receptacle not shown, supported on the table N¹. A waste receptacle D is suitably supported by the framework D in position to receive material which may work out of the feed shoe and be moved off of the rear edge of the table. A belt shipper P is supported by a shaft P¹ slidingly mounted in the side frames D and operated at the front of the machine by a crank handle P² secured to a shaft P³ journaled in lugs carried at the outer side of the side frames and provided at its rear end with a crank arm P⁴ having a pin P⁵ working in a slot P⁶ formed in the arm P⁷ secured to the end of the shaft P¹. By turning the handle P², the belt shipper P may be moved toward and away from the framework D to shift the driving belt, not shown, from the pulley B² fast on the shaft B to the pulley B³ loose on the shaft B.

The operation of the mechanism disclosed is as follows: Assuming the initial position of the apparatus to be that shown in Fig. 3, the plungers H are at the upper limit of their movement and their upper ends are substantially flush with the upper surface of the die block G¹, which is covered by the material in the shoe K. The rotation of the wheel C¹ in the direction indicated by the arrow causes the cam roll J³ to move into the main circular portion of the cam track C³. This draws the plungers H to the lower limit of their movement where the holder H¹ engages and is supported by the abutment H⁵. The plungers H fit snugly in the passages G³ and as a result, the suction occurring when the plungers H move downward insures that the material to be molded shall follow the plungers into the upper ends of the recesses G³. Shortly after the follower H¹ engages the abutment H⁵, the shoe K is given a to and fro movement by the engagement of the cam roll L³ with the hump L⁵ of the cam L⁴. This assists in completely filling the passages above the plungers H with the material to be compressed, and in compacting the material somewhat.

It will be observed that the front wall of the cavity in the shoe K is inclined at K⁴ where the corresponding portion K⁵ of the rear wall is vertical. As a result, when the shoe is moved away from the front of the machine, the wall K⁴ tends to wedge down the material in the shoe while on the return movement of the shoe the vertical wall K⁵ has no tendency to lift the material in the shoe.

Shortly after the cam roll L³ leaves the hump L⁵ it engages the main circular portion of the cam L⁴ and the shoe is moved back out of line with the die block G¹. During the portion of the operation just described, the wrist pins C² are moving through the extreme upper portion of their circle of movement and the plungers F are held well

above the table G. As the rotation of the shaft C continues, the crosshead E descends and the plungers F enter the recesses G^3 and complete the formation of the tablets by compressing the material in the recesses G^3 against the plungers. H.

It will be observed that the mechanism permits of a very powerful and exact pressing action, as the upper portion of the bearings for the shaft C are formed in the framework D and in the same plane with the plungers, and the holder H is supported on the posts D^2 rigidly connected to the framework D so that there can be practically no injurious lost motion in the apparatus. Moreover the parts are so arranged that the pull on the crosshead E is in practically the same plane as the lines of movement of the compressing plungers, thus avoiding lateral strains.

By adjusting the upper plunger holder in the crosshead E, any desired thickness of tablet may be obtained, and in practice I have found that the machine will make tablets of a thickness varying from that of a sheet of paper up to any thickness within the limits of the machine. The tablets produced with any one adjustment are of uniform quality and are made with very slight waste.

After the tablets are compressed as desired, the parts return to the position shown in Fig. 3. The cams C^3 and L^4 are so shaped and arranged with respect to the cam rolls L^3 and J^3 that the plungers H are moved to the upward limit of their movement just before the shoe K starts to move toward the front of the machine, so that when the shoe K does move to the front of the machine, it moves the tablets off the tops of the plungers H and discharges them into the chute N. The abutment screws H^8 insure that the upper ends of the plungers H shall not project above the surface of the guide block G^1, which might otherwise occur from the momentum of the parts and the lost motion incident to use. The arrangement of the abutment screws H^8 so that they project upward from the arms H^9 at the sides of the plunger carrier H insures against any liability of interference in the formation of tablets of the desired thickness by a collection of wastage of material compressed on the upper ends of the abutment screws. By adjusting the block I^2 along the arm J, the throw of the lever H^2 and consequent movement of the holder H^1 is adjusted as desired to vary the amount of material drawn into the passages G^3. After the block I^2 is adjusted, the length of the link formed by the members I and I^1 is adjusted to bring the upper ends of the plungers H flush with the upper surface of the die block G^1 with parts in the position shown by the drawings. The abutment screw H^5 is then adjusted in the clamping nut H^7 to the proper height. Similarly the holder F^1 is adjusted in the crosshead E to give the desired thickness of tablet. By adjusting the block K^2 on the rod K^1, wear of the parts may be compensated for so that the shoe K will always have the proper movement.

The feed of the material from the hopper M^1 to the shoe K may be varied by changing the height of the hopper M^1 above the table G and also by moving the hopper toward and away from the posts D^2 and thereby changing the angle of the tube M. This adjustment is of importance in obtaining the proper feed by gravity of different materials, some of which feed more freely than others.

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

1. In a tablet compressing machine, a die block having a passage formed in it, an upper plunger movable into and out of the upper ends of said passages, a coöperating lower plunger entering the lower end of said passage, a plunger carrier to which the lower plunger is rigidly secured, adjustable means for giving reciprocating movements of regulated lengths to said carrier, said carrier having rigid laterally extending arms, vertical abutment engaging screws adjustably carried by said arms and extending upwardly therefrom at the sides of said lower plunger, whereby liability of waste material from the compressing operation collecting on the upper ends of said abutment screws is avoided, and abutments carried by the frame work of the machine in position to be engaged by the abutment screws and thereby positively check the upward movement of the lower plunger.

2. In a tablet compressing machine, a die block having passages formed in it, plungers entering the passages of the die block at their lower ends, other plungers movable into and out of the upper ends of said passages, a feed shoe movable across the upper ends of the die block, means for moving said feed shoe into and out of the position in which it extends over said die block, means for moving the lower plungers from the position in which their upper ends are substantially flush with the upper surface of the die block to a lower position while the feed shoe is over the die block to draw material from the feed shoe into said passages, adjustable stops for positively limiting the movement of the said lower plungers in both directions, and means for moving the upper plungers into the passages to compress said material into tablets when the shoe is moved out of said position.

3. In a tablet compressing machine, a die block having passages formed in it, plungers entering the lower ends of the passages of the die block, other plungers movable into and out of the upper ends of said passages,

means for feeding material to be compressed into the upper ends of said passages, and means for operating the plungers, the means for operating the lower plungers including a reciprocating plunger holder, an oscillating lever engaging said holder for reciprocating the latter, and means for adjusting the amplitude and limits of the oscillation of said lever, abutment engaging devices for limiting the movements of the holder in both directions, rigidly secured to said holder, and abutments carried by the framework of the machine in position to be engaged by the abutment engaging portions of the holder, said abutments and abutment engaging portions being relatively adjustable to vary the stroke of the holder.

4. In a tablet compressing machine, a die block having passages formed in it, plungers, means for moving said plungers into and out of the upper ends of said passages, other plungers entering the passages of the die block at their lower ends and means for moving said other plungers in said passages, said means including a lever pivoted to the framework of the machine, means for oscillating said lever, operative connections between said lever and said other plungers including a link and a block movably supported on said lever to which the link is pivotally connected, and means for adjusting said block along said lever to carry the block from the position in which the pivotal connection between it and the link has its axis in line with the pivotal axis of the lever to other positions in which the axis of the pivotal connection between the link and the block is at one side of the pivotal connection between the lever and the framework.

5. In a tablet compressing machine, a die block having vertical passages formed in it, plungers entering the passages formed in the die block, at their lower ends, other plungers movable into and out of the ends of said passages, a feed shoe movable across the upper ends of the die block, means for moving the lower plungers from a position in which their upper ends are flush with the upper surfaces of the die block to a lower position for moving the upper plungers into and out of the passages and for giving the to and fro movement to the feed shoe, said means including a shaft transverse to, but in the same plane with the line of movement of the plungers, a driving wheel carried by said shaft and extending in a plane including the line of movement of said plungers, said cam wheel having cams on each side, a cam lever engaging the cams at one side of the wheel for operating the lower plungers, a cam lever engaging the cam at the other side for operating the feed shoe and crank arms carried by said shaft one at each side of the wheel and connections between said crank arms and the upper plungers.

6. In a tablet forming machine, a reciprocating crosshead, clamping members adjustably secured to said crosshead one above the other, said crosshead and members having two sockets formed in them one socket being formed partly in the crosshead and partly in the lower clamping member and the other socket being formed in alinement with the first socket and partly in the crosshead and partly in the upper clamping member, an abutment bolt adjustably secured in the last mentioned socket and a plunger shank secured in the lower socket with its upper end engaging said abutment.

7. In a tablet forming machine, a reciprocating crosshead, clamping members adjustably secured to said crosshead one above the other, said crosshead and members having two sockets formed in them, one socket being formed partly in the crosshead and partly in the lower clamping member and the other socket being threaded and in line with the first socket and formed partly in the crosshead and partly in the upper clamping member, a hollow threaded abutment bolt adjustably secured in the threaded socket, a plunger shank secured in the lower socket with its upper end engaging said abutment bolt, said shank being formed with a threaded socket in its upper end, and a bolt passing through said threaded abutment bolt and having its lower end screwed into the socket in said shank.

8. In a tablet forming machine, a die block having recesses in which tablets are compressed, a feed shoe having a chamber open to said die block and movable to cover and uncover said recesses, a receptacle for the material to be compressed, a flexible conduit through which the material passes by gravity feed from the receptacle to the shoe, and means for varying the position of the receptacle to change the height of the receptacle above the shoe and the inclination of the conduit.

9. In a tablet compressing machine, a die block having recesses formed in it, a feed shoe for filling said recesses with material to be compressed, said shoe being reciprocated along said block to cover and uncover said recesses and being formed with a material containing chamber open to the block, a portion of the wall of said chamber immediately adjacent said block being inclined to the vertical so that it wedges the material toward the block and into the recesses as the shoes move to uncover the recesses and the opposite portion of the wall being substantially vertical whereby any wedging action on the material is avoided as the shoe moves to cover the recesses.

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Witnesses:

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