No. 661,596. Patented Nov. 13, 1900.

F. J. BECK.

COMPRESSOR DIE FOR PILL MACHINES.

(Application filed July 20, 1900.)

(No Model.)

FIG. 1.

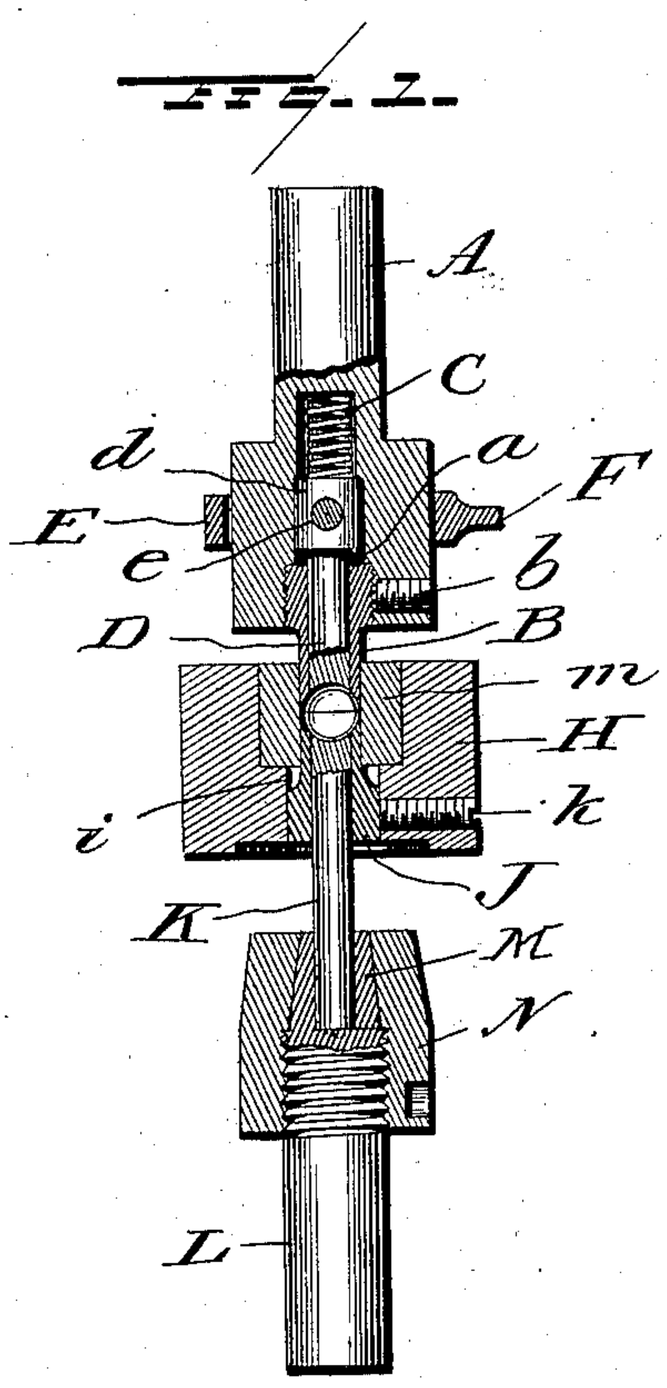


FIG. 2.

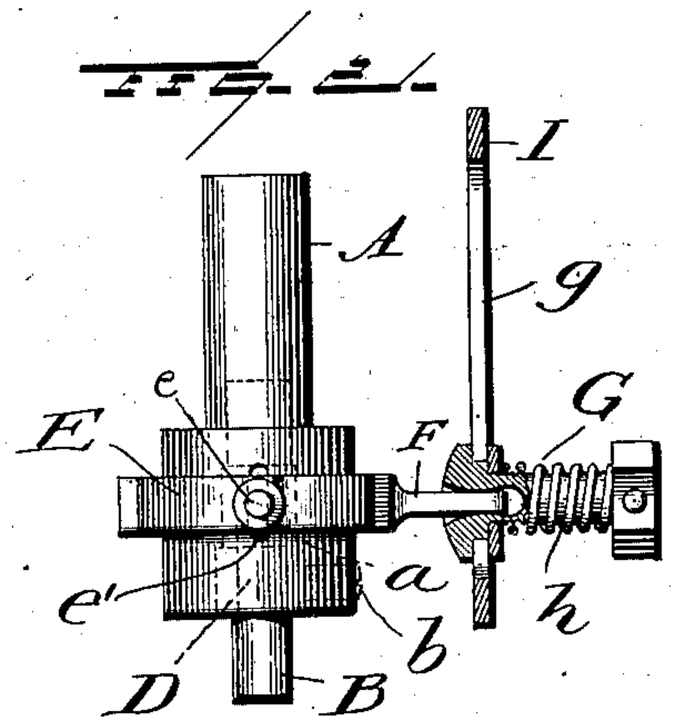


FIG. 3.

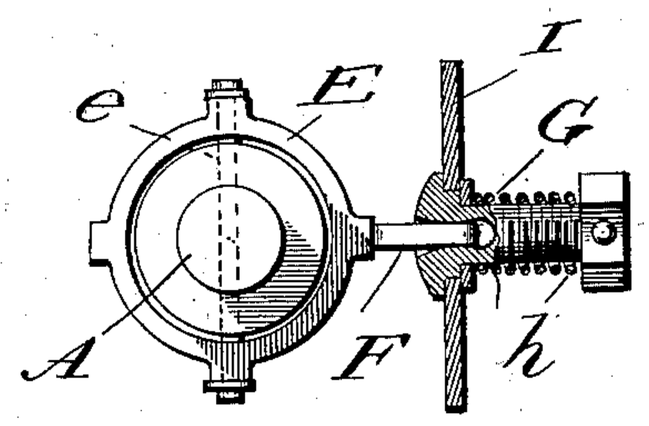


FIG. 4.

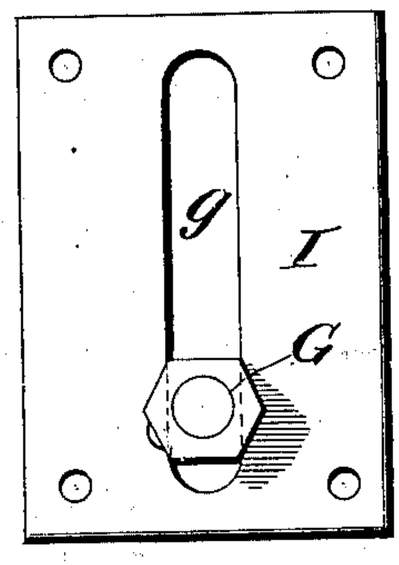
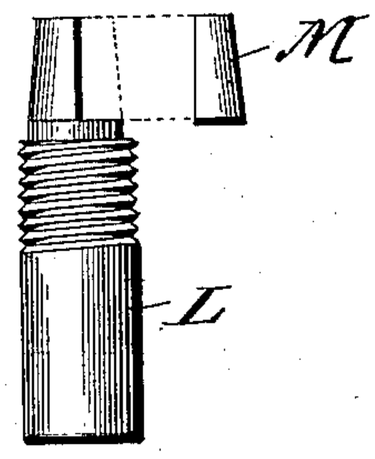


FIG. 5.



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COMPRESSOR-DIE FOR PILL-MACHINES.

SPECIFICATION forming part of Letters Patent No. 661,596, dated November 13, 1900.

Application filed July 20, 1900. Serial No. 24,318. (No model.)

To all whom it may concern:

Be it known that I, FERDINAND J. BECK, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Compressor-Dies for Pill-Machines, of which the following is a full, clear, and exact specification.

Heretofore considerable difficulty has been experienced in the manufacture of pills because of the liability of the pills breaking when the dies between which they are formed are withdrawn one from the other. As now made it is sometimes impossible for the pills when composed of certain medicaments to retain their spherical form. The object of my invention is to avoid the great waste caused by this breakage. This I accomplish by the means hereinafter fully described and as particularly pointed out in the claims.

In the drawings, Figure 1 is a vertical central section through my improved dies. Fig. 2 is a side view of the upper die, showing the drag or brake mechanism for the plunger of the upper die in section. Fig. 3 is a plan view of the same, showing said drag or brake mechanism in horizontal section. Fig. 4 is a front elevation of said drag or brake mechanism. Fig. 5 is a side view of the lower die with the clamping-nut removed.

The principal features of my invention consist of a movable upper die and lower die and a centrally-located forming-block or hopper within which said upper and lower dies coöperate to form the pills.

In the drawings, A represents the cylindrical holder for the upper die, the lower end of which is increased in diameter to form a head therefor, substantially as shown. This holder has a central longitudinally-elongated socket *a* made in its lower end, the diameter of the lowermost portion of which is preferably greater in diameter to receive the shank of the tubular part B of the upper die and the central portion of which is slightly greater in diameter than the upper portion, in which a coil expansion-spring C is placed to receive and form a chamber for the boss *d* of the plunger D of the upper die to move in, substantially as shown.

The tubular portion B is screwed up into the holder A and is held in any position to which it may be adjusted by means of a set-screw *b*, tapped radially into the side of the head thereof and biting against the screw-threaded shank of the same. The lower edge of this tubular part B is countersunk or inversely beveled, so as to correspond to the spherical plane of the pill in the manufacture of which it is designed to be used, and the upper end of said tubular part forms the floor of the chamber in which the head *d* of the plunger reciprocates. The plunger D is of a diameter just sufficient to permit it to reciprocate easily in the bore of the tubular part B and is less than that of the head thereof secured to its upper end. The lower end of this plunger when the head thereof is bearing against the upper end of the tubular part is on the same horizontal plane as the sharpened edges of said part B and is concaved on the spherical plane of the pill in the manufacture of which it is to be used, so that when the plunger is at the limit of its upper movement said concaved lower end will, together with the countersunk edges of part B, form a concavity corresponding to or nearly to one-half the circumference or spherical contours of the pill.

At points diametrically opposite each other the head *d* of the plunger is provided with radially-projecting trunnions *e*, which extend through vertically-elongated slots *e'* in the head of the upper holder and have their ends journaled in suitable bearings in the annulus E, surrounding said head. Projecting from the annulus E at a point midway between and preferably at right angles to the axial plane of the trunnions *e* is an arm F, the outer end of which enters the longitudinally-elongated socket in the head of the braking-bolt G. The barrel of this bolt passes through a vertical slot *g* in a plate I, which is suitably secured to the frame of the machine in which said dies are used in a vertical plane parallel to the line of motion of and adjacent to the upper-die holder. The barrel of said bolt is preferably screw-threaded its entire length and has a suitable nut locked on the end thereof opposite its head and has a washer surrounding it near said plate opposite the shoulders formed by the head, and between

said nut and said washer it is surrounded by a coil-spring *h*. The office of this braking-bolt is to retard the downward movement of the plunger D when the upper-die holder is making its downward stroke, so that, as shown in Fig. 1, the lower end of part B and said plunger will present a semispherical concavity as they advance to their work, and a further office of said brake-bolt is to retard the upward movement of said plunger at the beginning of the upward movement of the upper-die holder, so as to give the lower edges of the tubular part B an opportunity to withdraw from the pill just formed without breaking the same, while the lower end of the plunger holds the pill at the point of its greatest compression and before it moves upward. The spring C in the upper portion of the socket *a* of the upper-die holder operates simply as an aid to the braking mechanism to keep the plunger D down upon the pill at the commencement of the upward movement of the tubular part B. While its use is desirable, because its effect upon the plunger is more immediate than the braking mechanism, it could be dispensed with.

The forming-block H is stationary and is provided with a central vertical opening *i* therethrough concentric with the line of motion of and in alinement with the upper and lower dies. The lower part of the opening is preferably less in diameter than the upper part and has screwed therein and held in any position to which it may be adjusted by means of a set-screw *k* the stationary tubular part J of the lower die. The upper edges of this part J are of the same diameter as that of the lower portion of the part B and extend up into the upper portion of central opening *i*, the diameter of which is increased to form a seat for the bushing *m*, within the bore of which the upper and lower dies meet to form the pill.

The lower-die holder L is preferably cylindrical the greater portion of its length, has a seat formed in its upper tapered end for the shank of the lower cylindrical die K, and has a loose jaw M, which is placed against and is made to clamp the shank of said lower die K by means of a suitable clamping-nut N, the lower part of the bore of which is interiorly threaded to engage with the threaded exterior of the upper part of the cylindrical portion of the lower-die holder L and the bore of the upper portion of which is tapered, so that as it is screwed onto the lower-die holder it clamps the lower die securely in place.

The lower die K enters and moves in the bore of the stationary tubular part J and is of such length that when at the limit of its upper movement its upper end will extend slightly below the plane of the top surface of the forming-block. The upper edges of the stationary tubular part J are countersunk on the same spherical plane as the lower edges of the tubular part B of the upper die, and the upper end of the lower die K is concaved, so as to correspond to the curvature of the concavity of the lower end of the plunger D of said upper die. Thus when the upper and lower dies meet and are in operative positions in the forming-block they coöperate to form a perfectly-spherical pill either independently of the cylindrical walls of the bore of the bushing *m* or in conjunction therewith.

The operation of my invention is substantially as follows: In their first position the upper-die holder will be at the limit of its upper movement and the parts D and B will be out of the bore of and above the forming-block H and the lower die will be at the limit of its lower movement, in which position its upper end will be in the position shown in Fig. 1 of the drawings. While in this position the medicated powder is fed into the bore of the forming-block from above, and then the upper dies move down toward the position shown in Fig. 1 to form a perfectly-spherical pill. After the formation of the pill the tubular part B of the upper die moves upward a slight distance before the plunger starts to move, substantially in the manner hereinbefore explained, and then the lower die follows on upward until the pill is above the plane of the top surface of the forming-block, whereupon it is brushed laterally off of said dies and blocked by suitable mechanism.

It will of course be understood that a gang of these dies may be used in the same machine, and it will be readily understood that in this event one holder may be utilized for several sets of dies. All such modifications I desire to be considered as coming within the scope of my invention.

My improvements can be used just as well in the manufacture of powdered or plastic compressed confectionery or medicated products of any shape desired as well as pills. The dies hereinbefore described are confined to the manufacture of pills; but the configuration and design of the working ends of these dies could be shaped so as to be utilized in the manufacture of any of the products above mentioned.

What I claim as new is—

1. In a pill-machine, the combination with a forming-block, a stationary tubular die therein, and a lower reciprocal die movable in the same, of an upper reciprocal tubular die, and a plunger-die movable therein.

2. In a pill-machine the combination with a forming-block, a stationary tubular die therein, and a lower reciprocal die movable in the same, of an upper reciprocal tubular die, and a plunger-die movable therein, said tubular die and plunger moving simultaneously downward to the work, but the initial upward movement of said tubular die being prior to that of said plunger.

3. In a pill-machine, the combination with a forming-block, an adjustable stationary tu-

bular die therein, and a lower reciprocal die movable in the same, of an upper reciprocal tubular die, and a plunger-die movable therein.

4. In a pill-machine, the combination with a forming-block, a stationary tubular die therein, and a lower reciprocal die movable in the same, of an upper adjustable reciprocal tubular die, and a plunger-die movable therein.

5. In a pill-machine, the combination with a forming-block, an adjustable stationary tubular die therein, and a lower reciprocal die movable in the same, of an upper adjustable reciprocal tubular die, and a plunger-die movable therein.

6. In a pill-machine, the combination with a stationary forming-block, having a vertical central opening therethrough, a stationary tubular die secured in the lower part of said opening, a bushing in the upper part of the same, and a lower reciprocal die operating in and through the tubular die, of an upper reciprocal tubular die and a plunger-die therein.

7. In a pill-machine, the combination with a stationary forming-block, having a vertical central opening therethrough, a stationary tubular die secured in the lower part of said opening, a bushing in the upper part of the same, and a lower reciprocal die operating in and through tubular die, of an upper reciprocal tubular die and a plunger-die therein, said tubular die and plunger moving simultaneously downward to the work, but the initial upward movement of said tubular die being prior to that of said plunger.

8. In a pill-machine, the combination with a forming-block, a stationary tubular die therein, an upper reciprocal tubular die and a plunger-die movable therein, of a reciprocal lower die coöperating with said reciprocal plunger and tubular die to form the pill, and thereafter following the same during the upward movement, until its end is at or above the plane of the upper surface of said forming-block.

9. In a pill-machine the combination with a forming-block, a stationary tubular die therein, an upper reciprocal tubular die and a plunger-die movable therein, said reciprocal tubular and plunger dies moving simultaneously downward to the work, but the initial upward movement of said tubular die being prior to that of said plunger, of a reciprocal lower die coöperating with said reciprocal plunger and tubular dies to form the pill within said forming-block and thereafter following the same to a point at or about the plane of the top of said forming-block.

10. In a pill-machine the combination with a forming-block, a stationary tubular die therein and a lower reciprocal die movable in the same, of an upper reciprocal tubular die, a plunger-die having a slight reciprocal movement-therein, and braking mechanism for said plunger-die whereby the initial movement of said tubular die in either direction precedes that of said plunger.

11. In a pill-machine the combination with an upper die consisting of a tubular part B and a reciprocal part D having a slight movement in the bore of said tubular part independent thereof, of an annulus to which the upper end of said plunger-die is pivotally connected, a plate having a vertical slot therein, and a braking-bolt movable in said slot to the head of which said annulus is suitably connected.

12. In a pill-machine the combination with the reciprocal upper-die holder, and the upper die consisting of a tubular part secured in the lower end of said die-holder, and a plunger-die having a limited movement in and independent of said tubular part and having trunnions projecting radially from the upper end thereof which extend through vertically-elongated slots therein, a bolt with the head of which said annulus is suitably connected and which extends through said slot, a nut on the end of said bolt opposite said head, and a coil expansion-spring surrounding said bolt between said nut and said plate.

13. In a pill-machine, the combination with a forming-block, an adjustable stationary tubular die therein, and a lower adjustable die movable in the same, of an upper reciprocal tubular die, and a plunger-die movable therein.

14. In a pill-machine, the combination with a forming-block, and a lower reciprocal die movable in the same, of an upper reciprocal tubular die, and a plunger-die movable therein.

15. In a pill-machine, the combination with a forming-block, and a lower reciprocal die movable in the same, of an upper adjustable reciprocal tubular die, and a plunger-die movable therein.

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Witnesses:
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