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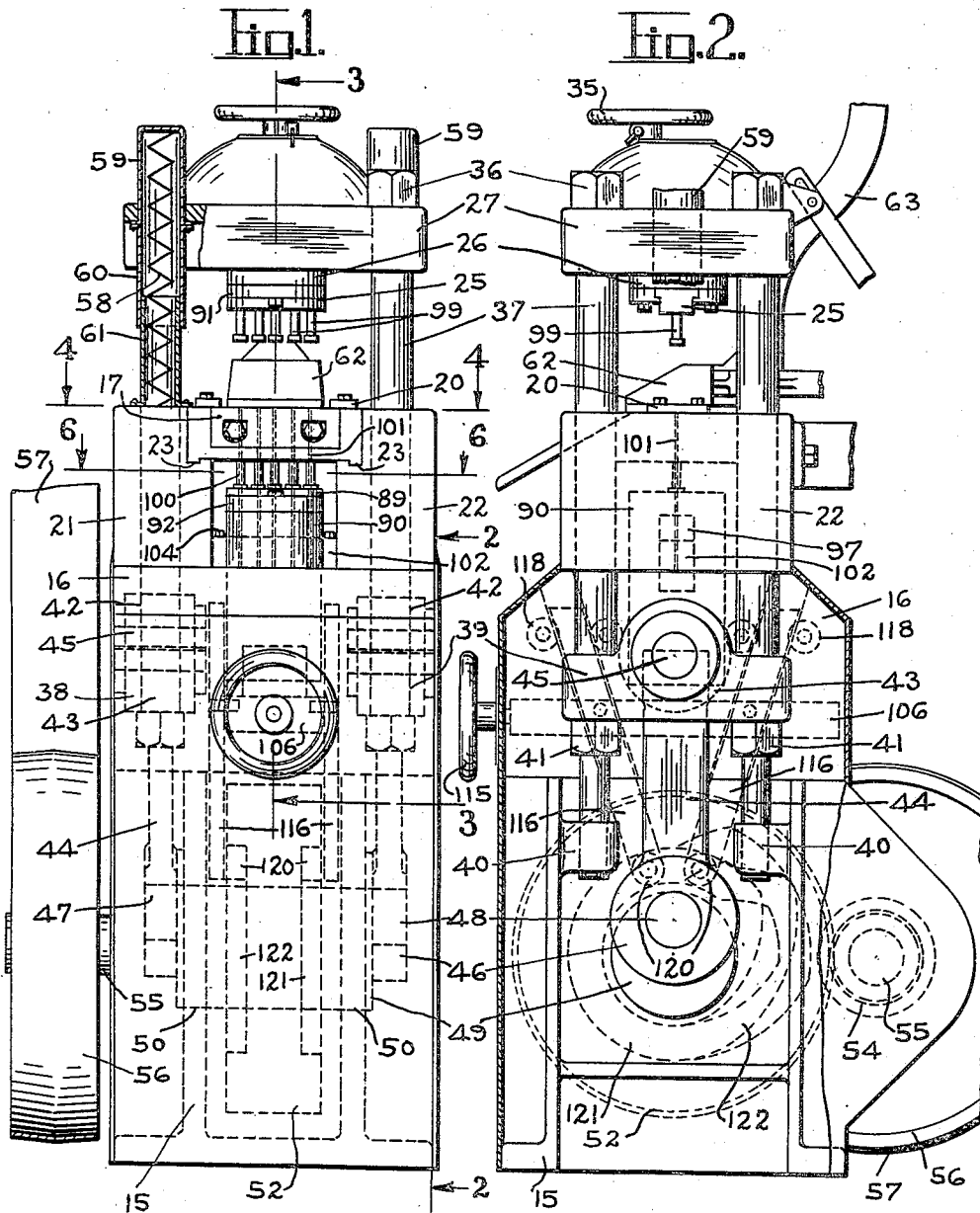
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2,219,048

TABLET MAKING MACHINE

Original Filed Feb. 2, 1937

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

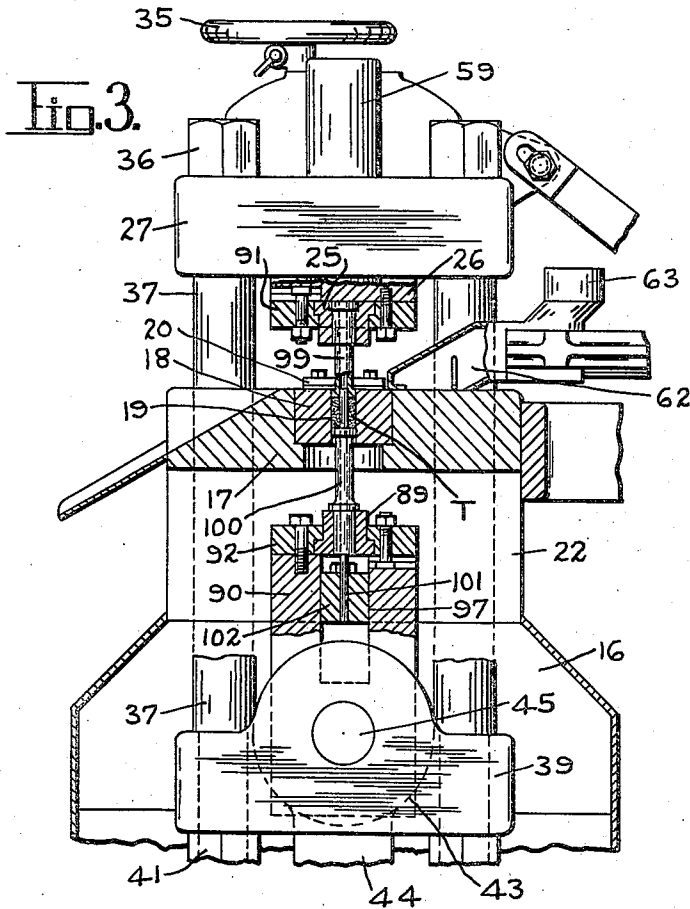
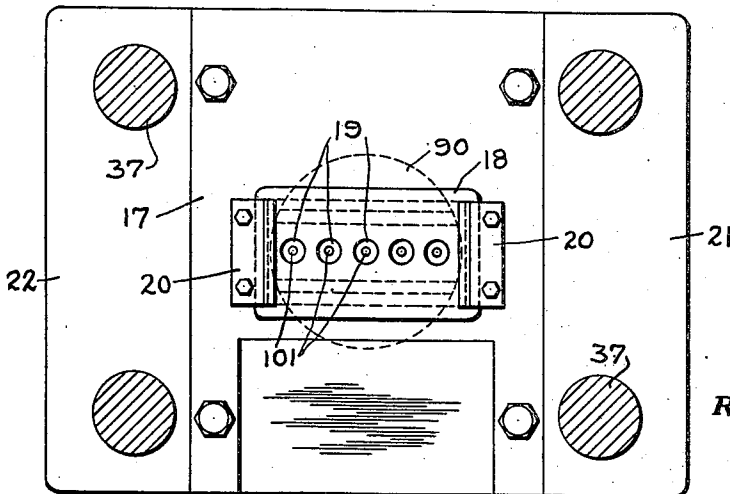


Fig. 4.



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Fig. 5.

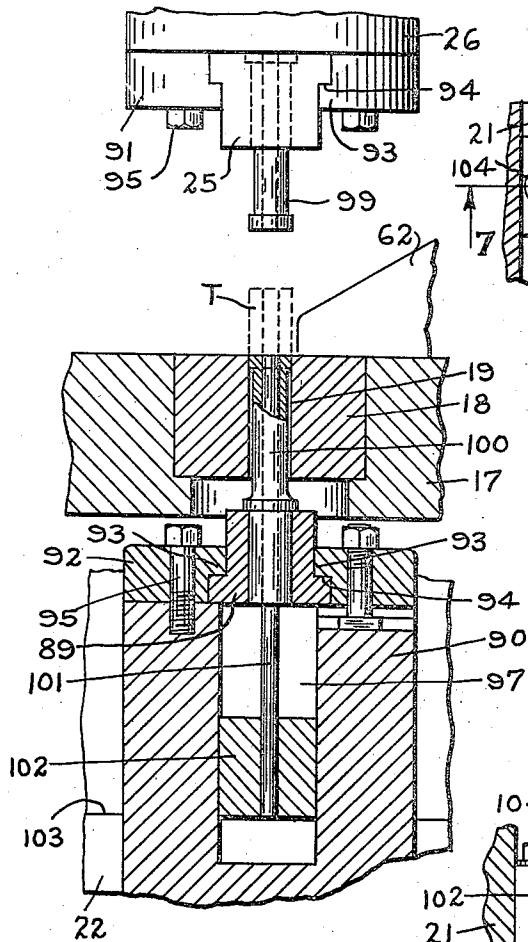


Fig. 6.

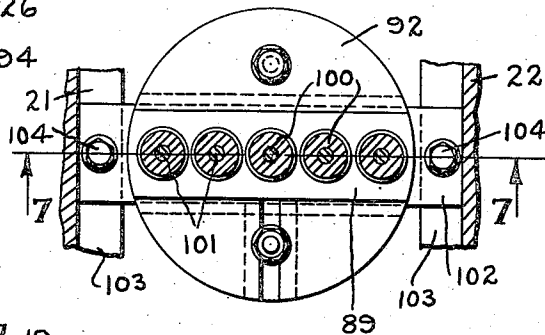
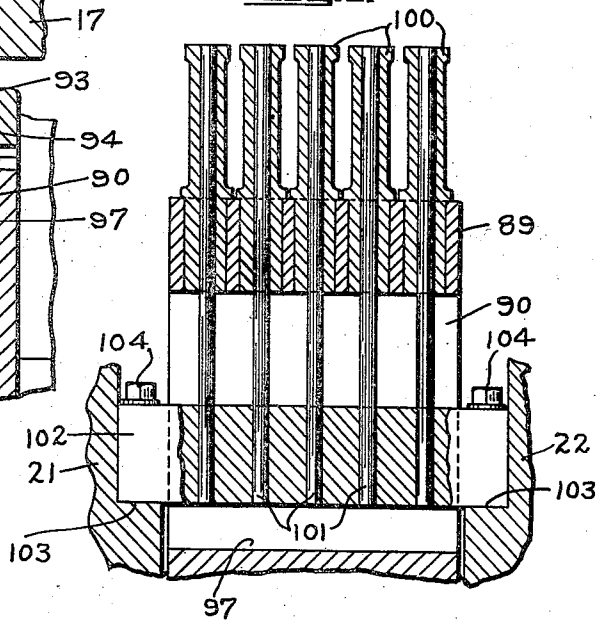


Fig. 7.



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UNITED STATES PATENT OFFICE

2,219,048

TABLET MAKING MACHINE

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Original application February 2, 1937, Serial No.
123,627. Divided and this application Janu-
ary 5, 1940, Serial No. 312,485

6 Claims. (Cl. 18—16)

This invention relates to machines for making apertured tablets from powdered materials, and more particularly to a tablet making machine of this nature having improved hollow tablet forming tools, including punches, dies and ejectors.

This application is a division of my copending application for a "Tablet making machine," Serial No. 123,627, filed February 2, 1937.

Previous machines for producing tablets and like products from powdered material for use in making buttons, insulating washers, blanks requiring further operations, etc., were subject to the disadvantage that the powdered material employed would fly about in the form of dust, and would settle upon the operating parts thereof, particularly on surfaces having exposed lubricant, such as gears, cams and slides. This usually produced abrasion, sticking and injurious strains and fatigue, and therefore, sometimes resulted in breakage and failures.

A further disadvantage of such machines was that the lubricating oil or grease supplied to the various bearings would often creep into the die, and cause discoloration of the tablets, rendering them useless, and it was impossible to remove such lubricant without completely overhauling the machine.

A still further disadvantage of such prior tablet making machines was that considerable time and labor was required to make the necessary adjustments in the punch and ejector strokes, so that they would properly cooperate to form the desired product. In many instances such adjustments required a complete resetting of the machine for each trial, an operation which was time and labor consuming and seriously interfered with production. Moreover, the former types of tablet presses were often quite complicated in design and the parts requiring adjustment were relatively inaccessible.

By means of the present invention, the above and other disadvantages have been avoided and a tablet making machine has been provided having a rectangular multiple punch and die holder in which it is possible to compress tablets of a great variety of shapes and sizes. The die cavities may be arranged compactly in one or a pair of spaced straight rows resulting in rapid production. The parts are readily accessible for quick adjustments and the principal operating parts are effectively sealed from loose powder or lubricant.

One object of the present invention is to provide a machine of the above nature having means for permitting the size and weight of the tablets

to be adjusted without disassembling the parts of the machine.

A further object is to provide a machine of the above nature having an improved form of adjustable relatively shockless tablet ejecting mechanism.

Another object is to provide in such a machine, cam and eccentric means driven by a common central source of power for operating the punch-carrying head and the tablet ejector mechanism.

A further object is to provide a machine of the above nature which will be extremely strong and compact, having only a few projecting parts, and provided with means for effectively lubricating the parts subject to the greatest stresses.

A still further object is to provide a tablet making machine of the above nature which will be relatively simple in construction and inexpensive to manufacture compared with its wide range of uses, easy to manipulate and clean, and very efficient and durable in use.

With these and other objects in view, there has been illustrated on the accompanying drawings one form in which the invention may be conveniently embodied in practice.

In the drawings:

Fig. 1 is a front elevational view of the improved tablet-pressing machine.

Fig. 2 is a side elevational view of the same.

Fig. 3 is an enlarged fragmentary vertical sectional view, taken on the line 3—3 of Fig. 1, and illustrating the formation of an apertured tablet.

Fig. 4 is an enlarged sectional plan view of the die block taken on the line 4—4 of Fig. 1, looking downwardly.

Fig. 5 is an enlarged vertical sectional view similar to Fig. 3, but illustrating the ejection of a formed apertured tablet from the die.

Fig. 6 is an enlarged top plan view of the ejector block, ejector rods, and the aperture forming pins, taken on the line 6—6 of Fig. 1.

Fig. 7 is a fragmentary vertical sectional view taken on the line 7—7 of Fig. 6.

Referring now to the drawings wherein like reference numerals designate like parts throughout the several views, the numerals 15 and 16 denote lower and upper frames, respectively, which frames are secured together as by bolts for supporting the various mechanisms of the machine. The upper portion of the upper frame 16 forms a horizontal supporting table for a die block 17 in which is mounted a die 18, herein shown as having a plurality of tablet forming

openings 19, said die 18 being retained in place by means of clamp bars 20.

The die block 17 extends between two upright members 21 and 22 which are interconnected with said block by means of cooperating tongues and grooves 23. A plurality of hollow punches 99 are suspended by a punch block 25, which in turn is secured to a cylindrical ram 26, and said punches 99 are arranged in vertical alinement with the die openings 19 so that when the ram 26 descends, they will enter the dies and compress the loose powdered material disposed therein.

The punch ram 26 is mounted in a horizontal head 27 which is adapted to be vertically reciprocated. In order to vertically reciprocate the horizontal head 27 and the ram 26, said head 27 is connected as by means of nuts 36 to a plurality of vertical tie rods 37, one of which is disposed at each corner of the head, and which extend downwardly therefrom in two pairs to a point below the upper frame 16.

The tie rods 37 pass through the ends of a pair of laterally spaced cross-beams 38 and 39, and then into a pair of bearing and guiding lugs 40, respectively, formed on the lower frame 15. The tie rods 37 are retained in connection with the cross-beams 38 and 39 by means of nuts 41 located beneath said cross-beams. Each cross-beam 38 and 39 has a slotted opening 42 formed in its center portion wherein is disposed one end 43 of a pair of downwardly extending crank-links 44 which are rotatably connected to the cross-beams 38, 39 by pivot pins 45. The crank links 44 are rotatively mounted at their lower ends 46 upon short eccentric pins 47 and 48 extending from opposite ends of a horizontal main shaft 49 which is journaled in bearings 50 in the lower frame 15. By means of this construction, the crank-links 44 will cause a reciprocating action to be imparted to the cross-beams 38 and 39, the four tie-rods 37, the cross-head 27, and the punches 99.

The main shaft 49 is adapted to be rotated by a large gear 52 secured thereto, and which meshes with a pinion 54 mounted on a horizontal cross-shaft 55, which extends out of the frame 15 and has a pulley 56 secured thereon. The pulley 56 may be suitably driven by means of a belt 57 from any desired source of power, such as an overhead counter-shaft, receiving power from a motor, not shown.

In order to assist the main shaft 49 in raising the head 27 at each upward stroke of the links 44 and tie-rods 37, provision is made of two coiled compression springs 58 (one shown in Fig. 1), the lower ends of said springs engaging against the upper surface of the upper frame 16, and the upper ends pressing against the upper ends of two flanged tubular inverted casings 59, respectively, and secured to the horizontal head 27. Two pairs of air-tight sleeves 60 and 61, which telescope within each other, are employed to cover the lower parts of the springs 58 and serve to prevent ingress of powder or dust into the casings and onto the coiled springs 58.

Die-filling mechanism

The mechanism whereby the die openings 19 may be positively filled with powdered material, and the formed pellets or tablets intermittently removed from the upper face of the die block 17 after they have been ejected from the dies as hereinafter described is partially illustrated in Fig. 3. In this mechanism the hopper 62 carrying powdered material is reciprocated in timed

relation with the operations of the punches 99, so as to be disposed over the die openings 19 between the strokes of the punches, said hopper also serving to remove completed tablets ejected from said die openings. The hopper 62 is maintained full of powdered material by a flexible tube 63 leading to any suitable source of supply.

Tablet ejectors

In Figs. 1, 2, 3, 5, 6 and 7 a plurality of hollow tablet ejecting rods 100 are shown rigidly held in a sliding ejector rod block 89, which block is secured to an ejector ram 90. The upper ends of the ejector rods 100 are adapted to form bottoms for the die openings 19, as well as to eject the compressed apertured tablets T therefrom.

The punch block 25 and the ejector rod block 89 are both retained on the rams 26 and 90 by means of clamping plates 91 and 92 respectively. Each of the clamping plates 91, 92 is provided with a lip 93 which overhangs shoulders 94 on the respective blocks whereby said blocks 25, 89 are clamped firmly against the respective rams 26, 90 by means of bolts 95, 95. The lips 93 and the shoulders 94 extend across the rams 26 and 90, so that the blocks 25, 89 may be horizontally moved to bring the punches 99 and ejector 100 into alinement with the openings 19 in the die 18.

In the punch block and ram assembly, the block 25 abuts directly against the under face of the ram 26, whereby a solid and rigid backing for the punches 99 is provided. In the ejector rod block and ram assembly, however, the block 89 overlies a transverse slot 97 which passes diametrically across the ram 90.

Center pins or core rods 101 for cooperating with the die openings 19 of the dies 18 are provided, and are adapted to enter and slidably fit the bores of the hollow punches 99 and the hollow ejector rods 100. The center pins 101 are rigidly supported by a stationary cross-bar 102 which extends through the transverse slot 97 in the movable ejector ram 90 and is secured at each of its ends to a pair of shoulders 103, 103 formed at opposite sides of the upright members 21 and 22, as by screws 104.

The center pins 101 extend upwardly to the upper surface of the die 18 and pass through the hollow ejector rods 100 and into the lower ends of the hollow punches 99. By means of this construction, it will be seen that each tablet formed in the press will have a central aperture. The portion of the opening 97 below the cross-bar 102 is left vacant in this arrangement to permit the ram 90 to be moved upwardly with respect to said bar 102 to actuate the ejector rods 100.

The mechanism for vertically reciprocating the ejector ram 90 and through it the hollow ejector rods 100 and for vertically adjusting said ram 90 for varying the stroke of the same is fully described in the above mentioned parent application. This mechanism includes an elongated horizontally disposed base plate 106 (Fig. 2) adapted to be moved vertically in timed relation with the operation of the punches 99 by means of camming slots 121, 122 formed in the opposite side faces of the large drive gear 52, and which act on rollers 120 provided on the lower ends of a pair of slide bars 116. The slide bars 116 are suitably connected to the base plate 106 to permit its adjustment, as is fully described in said parent application, the upper ends of said bars being guided by two pairs of rollers 118, 118. The camming slots 121, 122 are adapted to act on the

base plate 106 in such a manner as to first gradually raise it, allow it to remain at rest while in "up" position, then permit said plate to abruptly drop, and to remain at rest for a substantially long period while in "down" position during the formation of the tablets. The ejector ram 90 is secured to the base plate 106 in order to permit it to be vertically adjusted relatively thereto as described in the aforesaid application.

Operation

In operation, after the proper die 18 has been assembled in the die block 17, the punch block 25 will be adjusted vertically to the desired point by means (not shown) actuated by the hand-wheel 35. The ejector block 89 will likewise be adjusted as desired by turning the hand-wheel 115 to actuate mechanism (not shown) but acting on the ram 90. The hollow ejector rods 100 will form the bottoms for the die openings 19 during the punching process and will thereafter be raised to bring their upper ends to the level of the upper surface of the die 18 to eject the tablets. A standard length of ejector rod 100 will preferably be used for all sizes of tablets.

It will be understood that one of the camming slots 121 and 122 will be advanced angularly with respect to the other, due to the spacing apart of the slides 116, so that the lifting action of said camming slots will occur simultaneously upon the slides 116. The action of the camming slots 121, 122 will cause the plate 106 and the ejector ram 90 to rise and to eject the formed tablets T just before the horizontal head 27 carrying the punches 99 reaches the limit of its upward stroke. The dwell occasioned by a section of the camming slots is sufficiently long to permit complete vertical ejection of the tablets T as above described, and also permits a slight downward movement of the horizontal head 27 and a rearward movement of the hopper 62 to take place. The abrupt drop occasioned by another portion of the camming slots disposes the ejector rods 100 in their normal bottom position, the rods 99, ram 90, and plate 106 being rigidly supported by the shoulders formed on the upper frame 16 to insure a solid and firm abutment against which the punches 99 may act to compress the powdered material in the dies into solid hollow tablets T. During the forward and backward movement of the hopper 62, which occurs in timed relation between the strokes of the punches 99 and the ejector rods 100, the complete filling of the die openings with the powdered material takes place.

When the hollow ejector rods 100 are in "down" position, forming bottoms for the die openings 19, the aperture-forming stationary core rods 101 will extend upwardly therethrough with their upper ends substantially in alignment with the upper surface of the die block 17. As the hollow punches 99 descend into the die openings 19 to form a tablet, the core rods 101 will enter the bore of the punches 99. When the punches 99 again rise and the ejector rods 100 are lifted, the apertured tablets T will be forced upwardly from the core rods 101, out of the die openings 19, and will be pushed therefrom by the hopper 62 as it advances laterally over the die openings 19. The ejector rods 100 will then be retracted downwardly, the core rods 101 remaining stationary in the die openings 19, and these openings 19 will be again filled with powdered material from the hopper 62.

One advantage of the present invention is that

the centrally disposed driving gear which has camming slots in its opposite faces and the oppositely disposed crank links 44 and slides 116, produces a balanced mechanism which is capable of withstanding comparatively heavy stresses without occasioning vibration or uneven operation. The use of the machine herein disclosed will result in a material increase in production of tablets of any size or form, and since adjustments may be made without disassembling the machine, shut downs for repairs and adjustment, or for changing the size of tablets will be reduced to the minimum.

While there have been disclosed in this specification one form in which the invention may be embodied, it is to be understood that this form is shown for the purpose of illustration only, and that the invention is not to be limited to the specific disclosures, but may be modified and embodied in various other forms without departing from its spirit. In short, the invention includes all the modifications and embodiments coming within the scope of the following claims.

Having thus fully described the invention, what is claimed as new, and for which it is desired to secure Letters Patent, is:

1. In a machine for making apertured tablets, a stationary die, a movable hollow punch fitting said die, means to slide said punch into the top portion of said die from above, a movable hollow ejector rod fitting said die and slidable through said die from below, said ejector rod forming a base for said die during the punching operation and serving to eject said tablets subsequent thereto, a block secured to said ejector rod below said die and movable with said ejector rod, a slotted ram secured to said block, a center core rod extending through said die and ejector rod, and a stationary cross-bar mounted in said machine immediately below said ejector rod block and extending through the slot in said ram, said core rod being rigidly secured to said cross-bar.

2. In a machine for making apertured tablets, a stationary die, a movable hollow punch fitting said die, means to slide said punch into the top portion of said die from above, a movable hollow ejector rod fitting said die and slidable through said die from below, said ejector rod forming a base for said die during the punching operation and serving to eject said tablets subsequent thereto, a ram secured to and movable with said ejector rod below said die, said ram having a transverse slot, a core rod extending through said die and ejector rod at all times and through the lower end of said punch on the down stroke thereof, and a stationary cross-bar located in said slot and rigidly supported in said machine outside of said ram, said core rod being rigidly secured to said cross-bar.

3. In a machine for making apertured tablets, a stationary die having a die opening there-through, a reciprocable punch adapted to enter the top of said die opening from above, a reciprocable hollow ejector rod adapted to enter the die opening from the bottom and to form a bottom for the die opening, a ram secured to said ejector rod and having a transverse slot formed therein, an aperture-forming core rod extending upwardly within the slot in said ram and through said ejector rod into the die opening, and a stationary cross-bar extending transversely through the slot in said ram to support said core rod, said cross-bar being supported at its ends outside of said ram.

4. In a machine for making apertured molded

tablets, a stationary die having a die opening therethrough, a reciprocable punch having a bore and being adapted to enter the die opening from the top, a reciprocable hollow ejector rod adapted to enter the die opening from the bottom and to form a bottom for the die opening during the molding of said tablet, a reciprocable ram for holding said ejector rod and having a transverse slot formed therein, an aperture forming core rod extending upwardly within the slot in said ram and through the ejector rod into the die opening, and a stationary cross-bar extending transversely through the slot in said ram to support said core rod, the upper end of said core rod being disposed substantially in transverse alinement with the upper surface of said die and being adapted to enter the bore of said punch when the latter is at the lower part of its stroke.

5. In a machine for making apertured tablets, a stationary die having a die opening therethrough, a hollow reciprocable punch adapted to enter the die opening from the top, a reciprocable hollow ejector rod adapted to enter the die opening from the bottom and to form a bottom for

the die opening, a reciprocable ram for holding said ejector rod and having a transverse slot formed therein, an aperture-forming core rod extending upwardly within the slot in said ram and through said ejector rod and the die opening, and a stationary cross-bar extending transversely through the slot in said ram to support said core rod.

6. In a machine for making apertured tablets, a stationary die having a die opening there-
through, a hollow reciprocable punch adapted to enter the die opening from the top, a reciprocable hollow ejector rod adapted to enter the die opening from the bottom and to form a bottom for the die opening, a reciprocable ram for holding said ejector rod and having a transverse slot formed therein, an aperture-forming core rod extending upwardly within the slot in said ram and through said ejector rod and the die opening, a stationary cross-bar extending transversely through the slot in said ram to support said core rod, and means to adjust the throw of said ejector rod-carrying ram to vary the length of said tablets.

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