No. 741,461. PATENTED OCT. 13, 1903.

E. C. CLARK.

PILL MACHINE.

APPLICATION FILED MAY 13, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

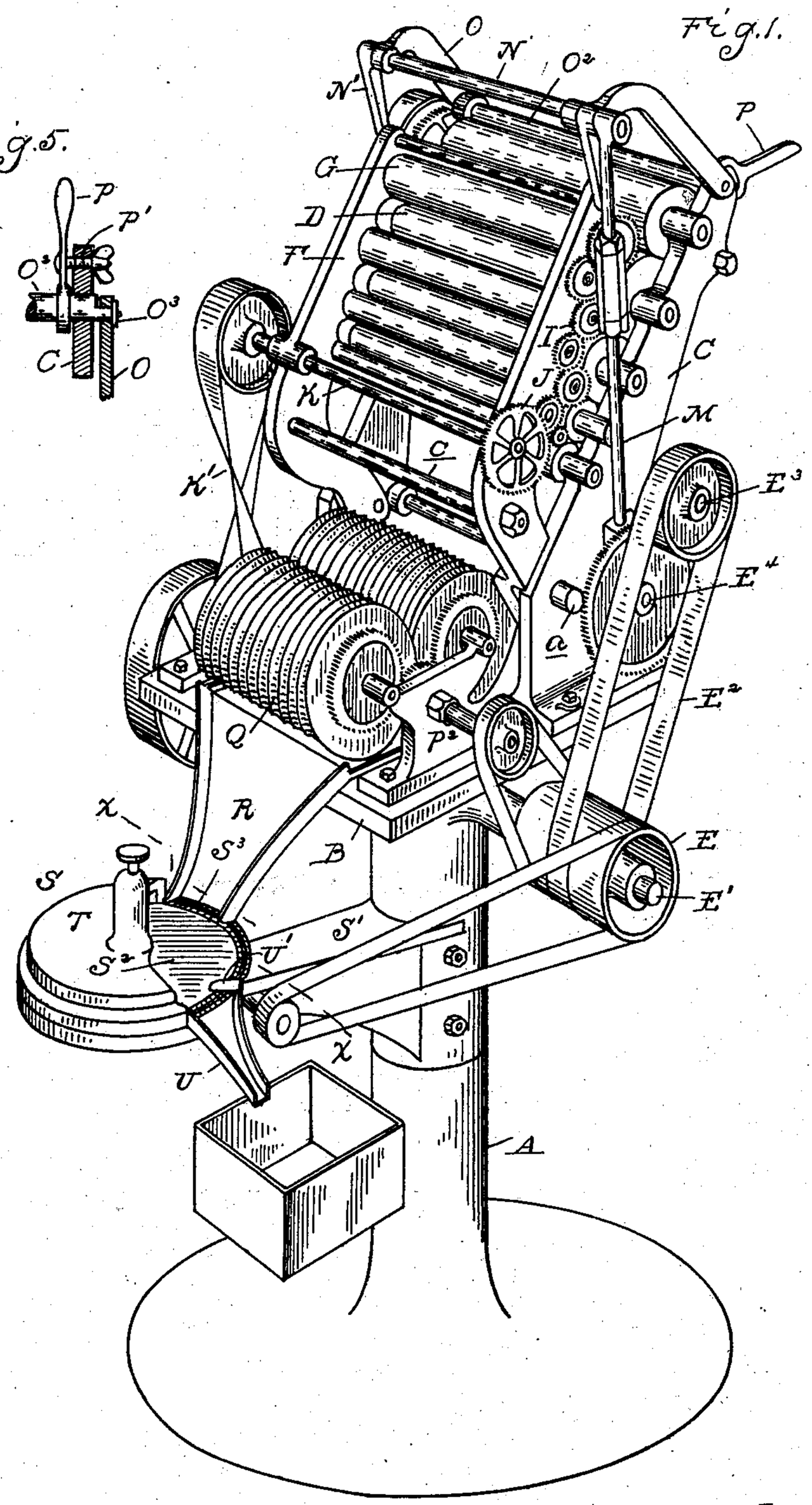

Fig. 5.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

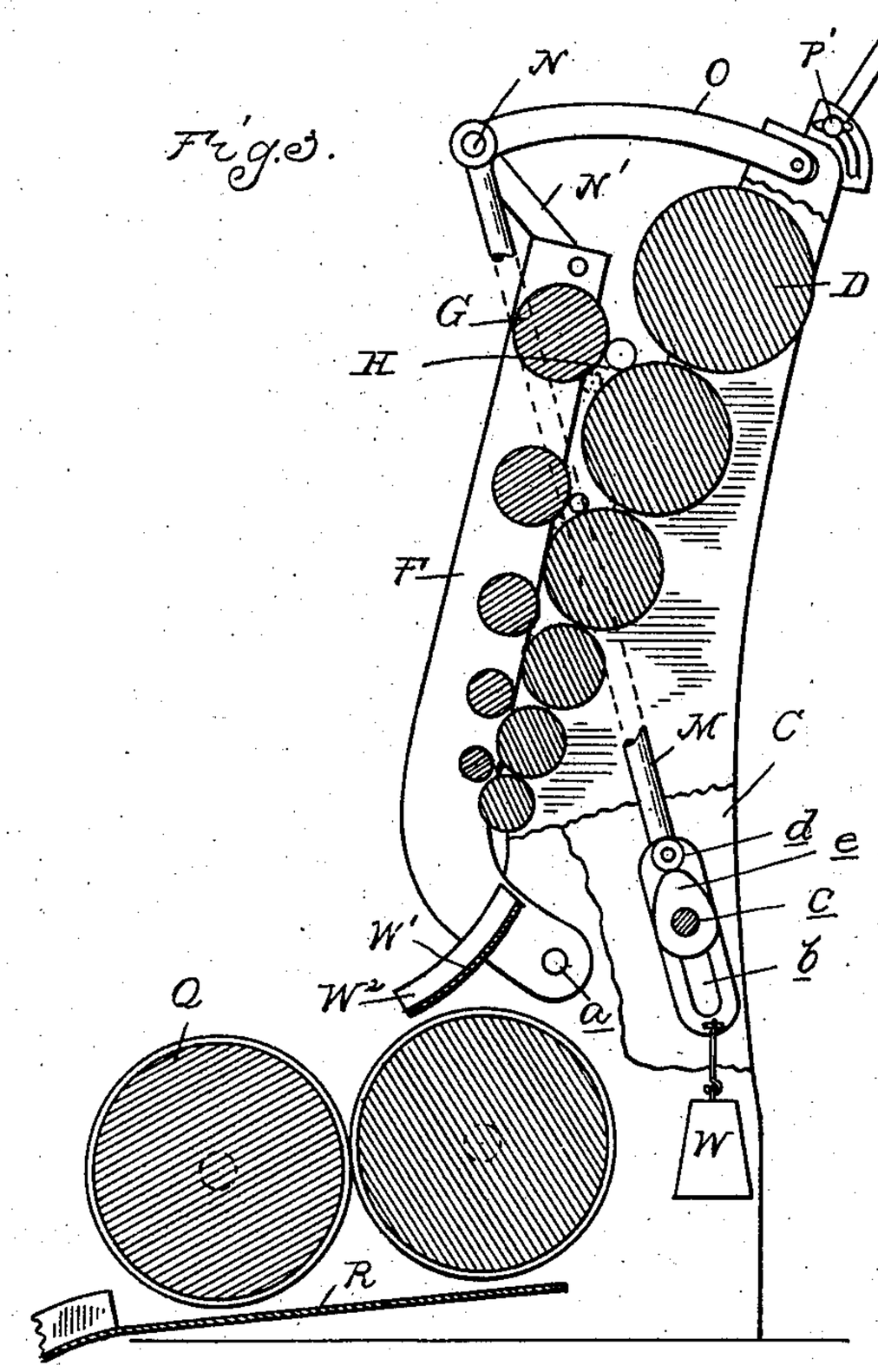


Fig. 2.

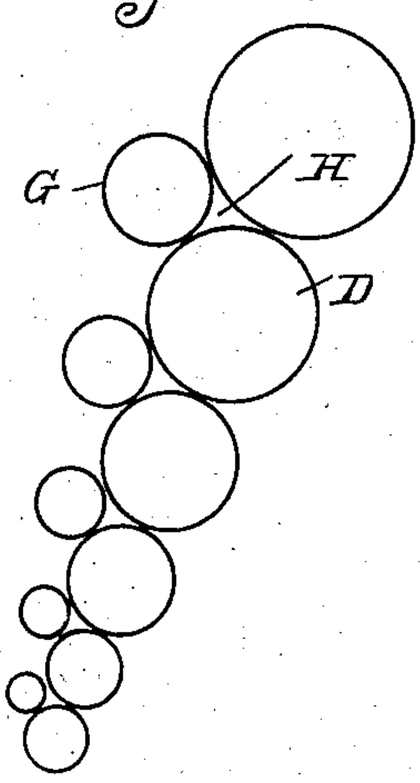


Fig. 6.

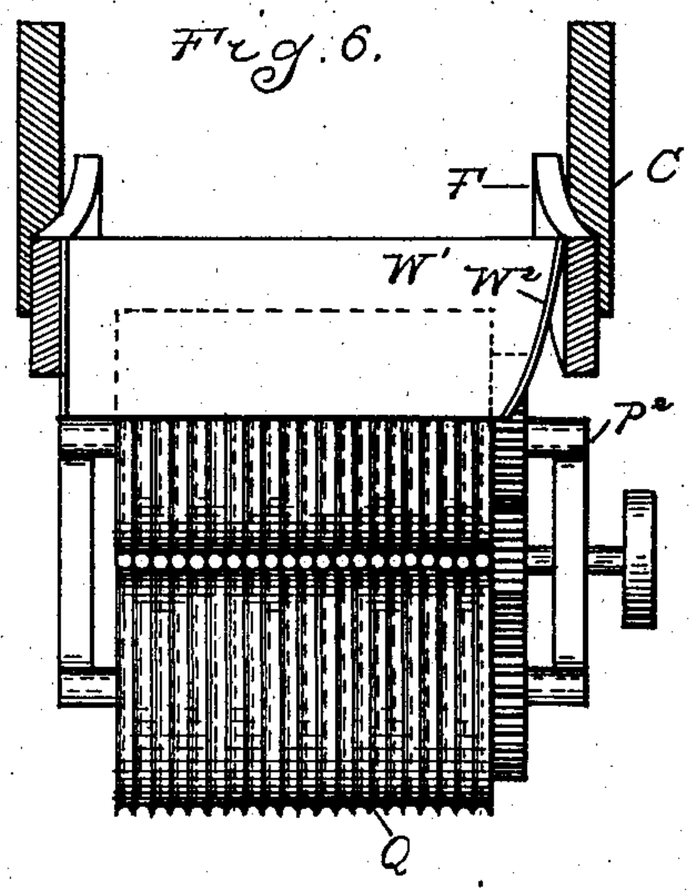
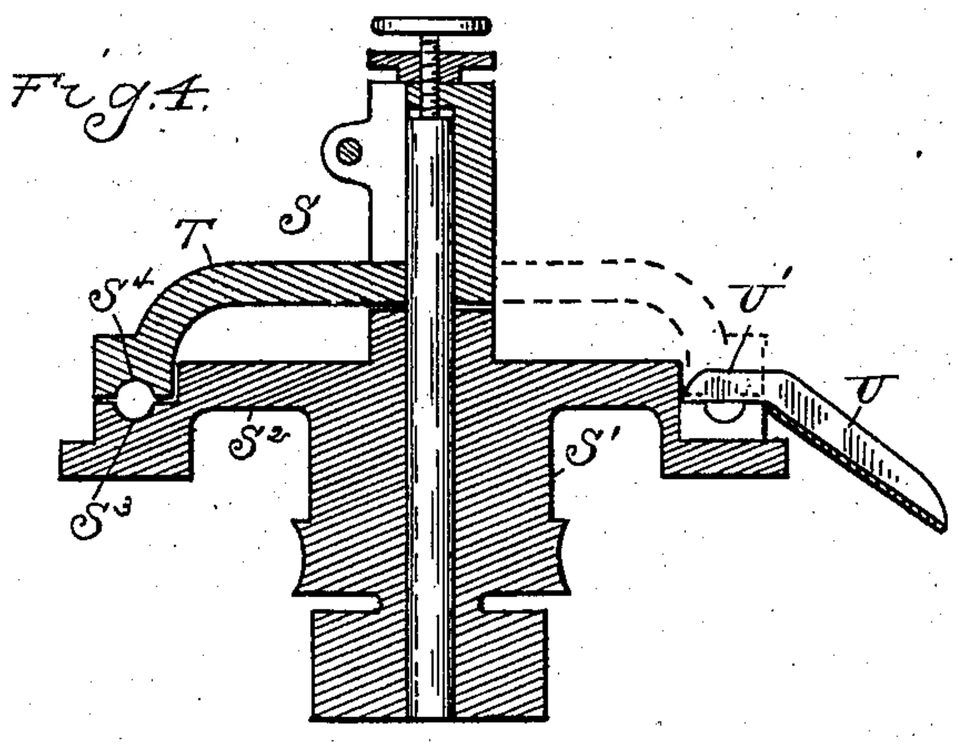


Fig. 4.



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No. 741,461. Patented October 13, 1903.

UNITED STATES PATENT OFFICE.

ERNEST C. CLARK, OF DETROIT, MICHIGAN, ASSIGNOR TO PARKE DAVIS & COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

PILL-MACHINE.

SPECIFICATION forming part of Letters Patent No. 741,461, dated October 13, 1903.

Application filed May 13, 1901. Serial No. 60,056. (No model.)

To all whom it may concern:

Be it known that I, ERNEST C. CLARK, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Pill-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to the construction of a machine intended particularly for the manufacture of pills; and it consists in the construction, arrangement, and combination of the parts, as hereinafter set forth, and more particularly pointed out in the claims.

In the drawings, Figure 1 is a perspective view of a machine embodying my invention. Fig. 2 is a diagram-section through the rolls of the cylinder rolling device, showing the parts in position when at work in rolling a mass. Fig. 3 is a similar section showing the two sets of rolls separated and in full and dotted lines different positions of the cylinder which is being rolled in the machine. Fig. 4 is a cross-section through the pill-rolling machine on line *x x*, Fig. 1. Fig. 5 is a detail section through the top of one side of the inclined frame C, illustrating the adjustable connection between that frame and the links which connect the swinging frame therewith. Fig. 6 is a horizontal section through the machine.

A is the standard, B is a table at the top thereof, and C is an inclined frame extending up from the table. In this frame are journaled a series of rolls D, which are driven rolls and which preferably are gradually decreased in size from the top to the bottom. These rolls are all preferably driven in the same direction, and in this construction I have shown them driven from suitable belt connection from the drive-pulley E on the drive-shaft E′. This connection is made by the belt E^2 to the pulley on the shaft E^3, which shaft has a pinion meshing with the gear-wheel E^4 on the shaft *c*. This shaft *c* extends across the frame and at the opposite side of the machine from that seen in Fig. 1 has suitable gear connection to the various shafts, upon which are located the rolls D. These rolls are preferably driven with a uniform peripheral speed.

F is a frame consisting of suitable side bars rigidly connected together and pivoted at *a* on the frame C. This frame carries a series or set of rolls G, preferably decreasing in size from the top to the bottom of the set, and these rolls are secured in the frame F and the frame F to the frame C in such a way as to locate one roll opposite the space between the pair of rolls D. For the sake of convenience and ease of description I will refer to this V-shaped space formed by the contiguous faces of the rolls D as a "pocket" or "rolling pocket." The rolls G, therefore, in the frame F are arranged so that one of them is opposite each pocket H between the rolls D. The rolls G are driven by suitable gearing I, which is shown on the end of the frame F, and this in turn driven by the gear-wheel J on the shaft K, which receives power from the drive-shaft E′ by means of a suitable belt K′. This gearing is such as to impart to the rolls G rotation in the same direction, being in the same direction as that imparted to the rolls D. In order to open and close the rolling pocket, the two sets of rolls are caused to move to and from each other. In this case I have shown the frame F as movable, being turned upon its pivot *a* by means of the connecting-rod M, which at its lower end is provided with a slot *b*, engaging over the shaft *c*, which is the main drive-shaft of the gearing which propels the rolls D. This engagement of the slotted end of the rod M with the shaft permits a longitudinal and pivotal motion between the rod and the shaft and acts as a guide and support for the end of the rod. The rod is provided with a roller-wrist *d*, engaging a cam *e* on the shaft *c*, by means of which the rod M is given an upward reciprocation at intervals, being drawn down as the cam permits by the counterweight W, hung on the lower end of the rod M. The upper end of this rod M is connected to the bar N, which is connected to the frame F by means of the links N′, pivoted at each end. The bar N is connected with the frame C by means of the swinging links O, which at their inner ends are connected to the crank-pins O^3 on the ends of the shaft O^2. This shaft may be rocked in its bearings in the frame C by means of the handle or lever P, and this lever may be locked in its adjusted position by the

set-screw P′, Fig. 5. By rocking the shaft O^2 the distance between the two sets of rolls can be nicely adjusted, and thus determine the size cylinder the machine will roll.

Below the cylinder-rolls D and G and journaled in suitable bearings on brackets P^2 on the frame are the cutting-rolls Q, which are grooved rolls, with the edges of the grooves in contact, so that if the cylinder or strip of plastic material is dropped thereon in passing therethrough it will be cut. One of these grooved rolls is driven at a faster speed than the other and both move in the same direction, the result being to hold the cylindrical blank long enough to cut it into sections without distorting its cylindrical shape. The cutting-up rolls are made of slightly-shorter length than the shaping-rolls, and a guide W′ is preferably interposed between the shaping-rolls and the cutting-up rolls. This guide preferably has a guide-flange W^2 to direct the blanks, so that their ends will project beyond the ends of the cutting-up rolls and cut off the ends and discharge them at the ends of the cutting-up rolls. This prevents end fragments of small size from going through this machine, and this insures the delivery to the rolling-machine of only blanks of full size.

Below the cutting-up rolls Q is an inclined feed-chute R, which delivers the blanks to the pill-rolling device S, supported on the bracket S′ of the standard A. This pill-rolling device is of well-known construction and consists or a lower driven plate S^2, having marginal grooves S^3 and an upper stationary plate T, having complementary grooves S^4. The upper plate T is cut away at one side, as plainly shown in the drawings, a sufficient distance to enable the pills to be fed thereon and to be removed therefrom. The rolled pills run down an inclined chute U and thence to any suitable point, being scraped off the revolving plate by the scraper-finger U′ at one edge of the chute.

The operation of the machine is as follows: The parts being in the position shown in Fig. 3, with the upper pocket open, the operator throws into the upper pocket a piece of plastic material of approximately the desired size to make a cylindrical blank of the proper length and reduced diameter equal to the space between the smallest pair of rolls. As soon as the plastic material is in the open pocket the pockets are closed by means of the weight W as the cam *e* rotates and permits the weight to descend and draw downward the frame F, moving the rolls into the position shown in Fig. 2. The plastic material in the upper pocket will be rolled into a cylinder of the size proportionate to the size of that pocket in its closed position. This rolling will take place after one revolution of the cam *e*, and as soon as the cam again reaches the position shown in Fig. 3 the upper pocket will be opened sufficiently to allow the blank formed therein to pass between the upper roll and fall into the next lower pocket, and at the same time the operator will throw in another piece of the plastic compound. The blank in the second pocket as that pocket gradually closes will be slightly reduced in diameter, being rolled in such second pocket, and the second pocket will be opened when the parts again reach the position shown in Fig. 3 sufficient to allow the blank to pass therefrom and pass into the next lower pocket. This operation will be repeated again for the third, fourth, and fifth pockets, and in the fifth pocket the blank will be shaped into a cylinder of the desired size. When the lower pocket is opened by the movement of the cam *e* through the mechanism described, the cylinder will drop from the rolls and between the cutting-up rolls, where the cylinder will be formed into a series of small blanks of the size for each separate pill or tablet and will pass from the cutting-up rolls onto the chute R and be delivered into the pill-rolling machine S, where they will be rolled into pills of the desired size and be delivered therefrom on the chute U.

It will be seen with the construction described that the rolls G are held down only by the weight W and that the tension may be varied, if necessary, by changing the size of the weight, and that if any hard foreign substance should get into the plastic mass the rolls will not be injured, for they are held together only with a yielding pressure. It will also be observed that the rolls G may be swung about the pivot *a* and moved away from the rolls D simply by moving out the upper end of the frame F, which can be done at any time in the operation of the machine, this movement being permitted by means of the links N′ and O from the frame F to the frame C, and thus the machine can be cleaned or foreign substances removed from the pockets at any time without stopping the operation of the machine. There is sufficient incline beneath the cutting-up rolls Q, so that the blanks formed thereby will be fed along into the chute R as fast as they are formed. The separating movement of the rolls G from the rolls D is eccentric to the axis of the rolls D, so that in the open position of the rolling-pocket (shown in Fig. 3) there is a feed-opening between the movable roll or pocket-closing roll G and the upper roll D sufficiently large to allow of feeding in a blank or piece of material larger than the blank which those rolls will make, while the outlet opening or passage between the pocket-closing roll and the next lower roll D will be a smaller passage of such a size as to admit the discharge of the previously-rolled blank, but prevent the exit of the incoming blank or piece of material.

It is obvious that I may use for certain classes of work only a single pair of rolls D, which between them will form a single rolling-pocket and a single pocket-closing roll G, and in that case the frame F would, of course, carry but a single roll. It is also obvious that while I have shown the rolls G as mov-

able away from the rolls D, that within the spirit of my invention would be a machine in which the rolls D would be made movable to and from the rolls G to open and close the rolling-pocket.

What I claim as my invention is—

1. The combination of a pair of driven rolls arranged in juxtaposition to form a rolling-pocket, a driven pocket-closing roll journaled opposite the rolling-pocket, means for separating said pair of rolls and said pocket-closing roll to open the pocket sufficiently to permit the discharge of the rolled blank, over one roll of the pair, and enough wider in relation to the other roll of the pair, to permit of feeding in a larger blank.

2. The combination of a series of driven rolls arrranged in juxtaposition to form rolling-pockets between the adjoining rolls, and a second series of driven pocket-closing rolls opposite each pocket, means for separating the pocket-forming rolls and pocket-closing rolls, to open the pocket wider on the feed side than on the discharge side thereof for the purpose described.

3. The combination of an upright series of driven rolls arranged in juxtaposition, to form rolling-pockets between adjoining rolls, and a second series of driven pocket-closing rolls, opposite each pocket, means for separating the two series so as to cause the pocket-closing rolls to move farther from the upper roll than the lower roll of its coöperating pair of pocket-forming rolls.

4. The combination of a series of driven rolls of decreasing diameter arranged in juxtaposition to form rolling-pockets between adjoining rolls, and a second series of complementary driven pocket-closing rolls opposite each pocket, of decreasing diameters, and means for separating the two series.

5. In a machine for rolling mass into cylindrical form, the combination of a plurality of groups of rolls forming pockets of different sizes, all of said groups being adapted to operate simultaneously and each group upon a separate mass, means for rotating said rolls, and means permitting the successive feeding of each mass from group to group until the same has been rolled to desired size; substantially as described.

6. In a machine for rolling a plastic mass into a cylinder, the combination of a multiple of groups of driven rolls, each group forming a pocket of a size smaller than the pocket of the preceding group, and each group being adapted to operate upon the blank independently of the other groups for successively rolling the blank to a desired diameter, and means for permitting the automatic feeding of the blank from one group to the other; substantially as and for the purpose described.

7. In a machine of the character described, the combination with oppositely-disposed supporting-frames, a pair of rolls fixedly mounted upon one of the frames, a roll on the other frame arranged to occupy a position at one side of and approximately centrally between said first-mentioned pair of rolls, all of said rolls being arranged to coöperate in forming a pocket therebetween, mechanism for driving all of said rolls, and means for yieldably forcing said frames toward each other; substantially as described.

8. The combination of the frame C supporting a series of driven rolls, of the hinged frame F also supporting driven rolls, and a connection from the frame F to the frame C consisting of the links N′ and the links O, substantially as described.

9. The combination of the frame C, the frame I pivoted thereto, with the connection between the two consisting of the links N′ and O, the actuating-rod M and a loose connection between the links and the drive mechanism of the connecting-rod, whereby the frame F may be turned about its pivot, substantially as described.

10. The combination of the frame C, the frame F pivoted thereto, the connection between the two frames consisting of the links N′ and O, the shaft O′ on the frame C and the crank-pin O^3 on the shaft O^2 to which the ends of the links O are connected.

11. The combination with the driven rolls D, of the movable pocket-closing rolls G, the connecting-rod M by which these rolls are moved to and from the driven rolls, the cam *e* for actuating said rod M positively in one direction and a weight for actuating it in the other direction, substantially as described.

12. In a machine for rolling pill mass, the combination of two opposing rolling devices for reducing the mass to a size to be cut into pills, approximately vertically disposed frames for holding said rolling devices in fixed rolling relation, means for pivotally connecting the lower ends of the frames and means for adjusting one of said frames toward and from the other for changing the distance between the rolling devices, said rolling devices being supported free to be separated without affecting said adjusting devices; substantially as described.

13. In a machine for rolling pill mass, the combination of two opposing rolling devices for reducing the mass to a suitable size to be cut into pills, means for pivoting one end of said devices together, and an extensible connection between said devices for holding the same in fixed rolling relation but permitting them to be separated; substantially as described.

14. In a machine of the character described, the combination of a set of rolls arranged in juxtaposition to form rolling-pockets between adjoining rolls, a set of pocket-closing rolls, oppositely-arranged supporting-frames for the rolls, mechanism for driving all of said rolls, and yieldable means for forcing the frames toward each other to hold the two sets of rolls in rolling contact with a blank to be operated upon; substantially as described.

15. The combination of a set of rolls ar-

ranged in juxtaposition to form rolling-pockets between adjoining rolls, a set of pocket-closing rolls, mechanism for driving all of said rolls, means for moving the two sets of rolls apart to open the pockets, and means for yieldably pressing said sets of rolls into rolling contact with the blank to be operated upon; substantially as described.

16. In a machine for rolling masses into cylindrical form, the combination of a plurality of groups of rolls, all of said groups adapted to operate simultaneously and each group upon a separate mass, means for rotating said rolls, and means for successively feeding each mass from group to group until the same has been rolled to desired size; substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ERNEST C. CLARK.

Witnesses:
L. J. WHITTEMORE,
H. C. SMITH.