

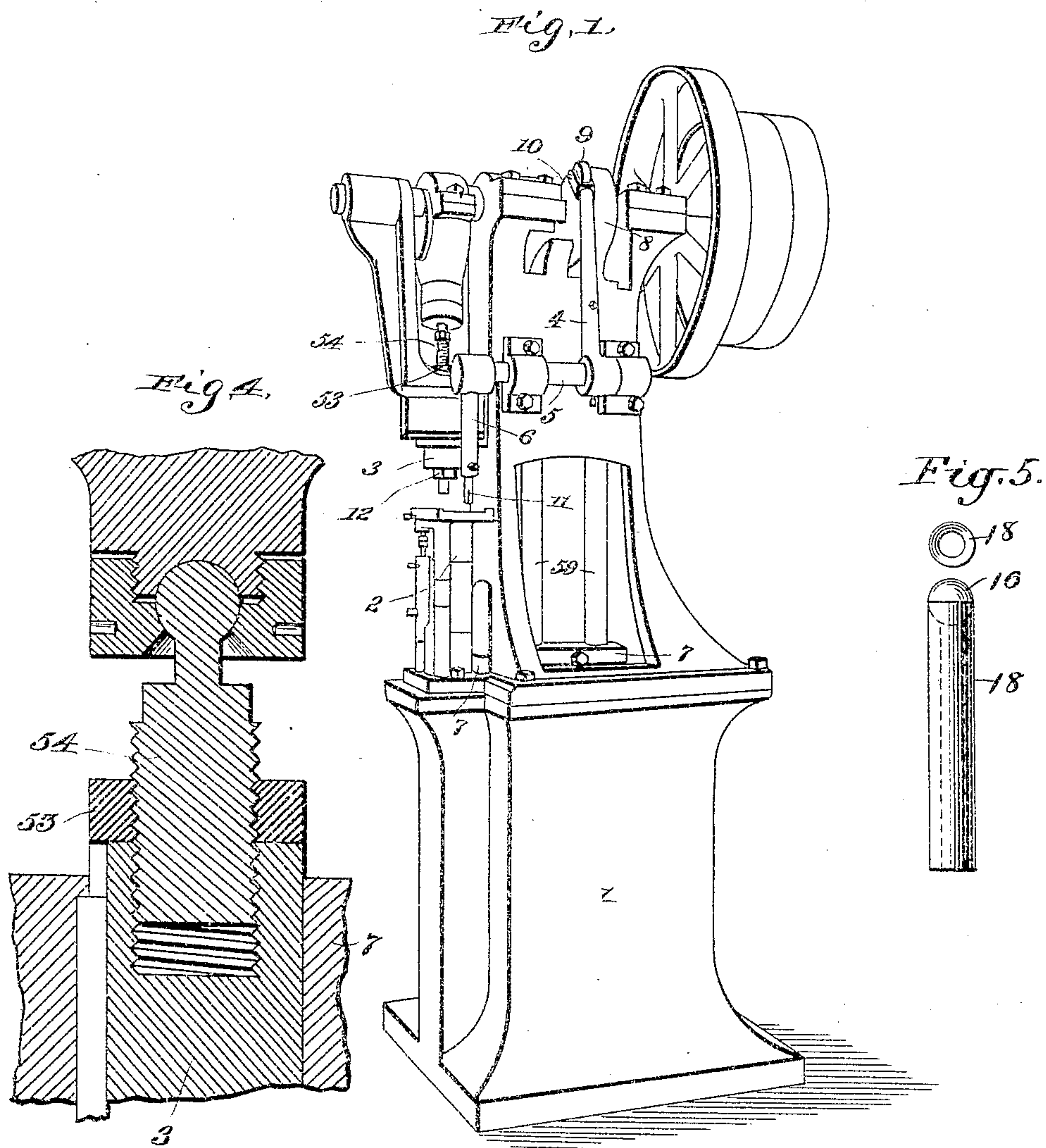
No. 778,750.

PATENTED DEC. 27, 1904.

F. P. KIRZINGER.
PILL OR TABLET MACHINE.

APPLICATION FILED OCT. 20, 1902.

2 SHEETS—SHEET 1.



Witnesses:
Leon Gramman
J. F. Chapinsky

Inventor:
Frank P. Kirzinger.
By Abraham Knobel,
Attorney.

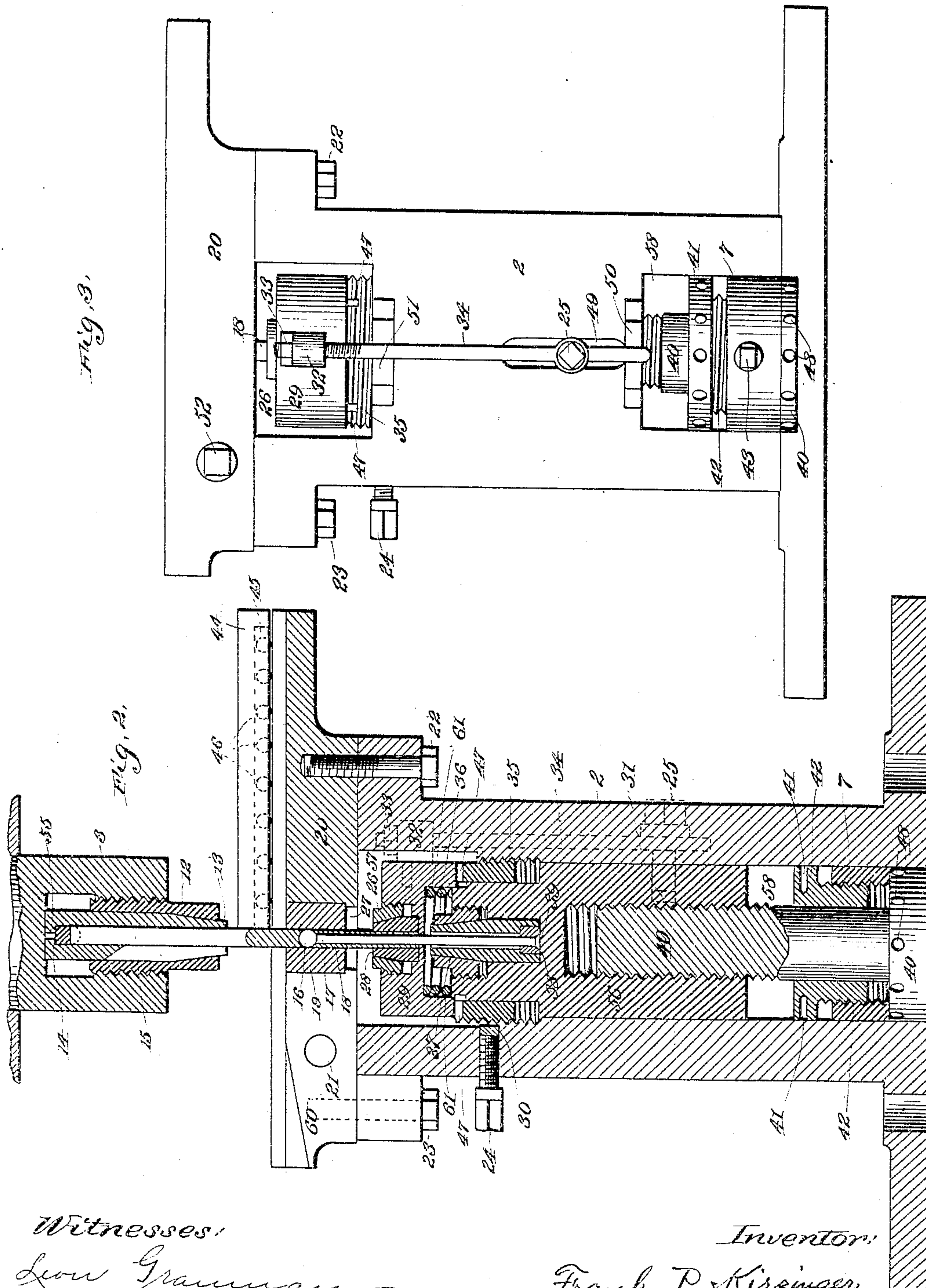
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UNITED STATES PATENT OFFICE.

FRANK PAUL KIRZINGER, OF LOUISVILLE, KENTUCKY, ASSIGNOR OF
ONE-HALF TO MILTON D. BRYANT, OF LOUISVILLE, KENTUCKY.

PILL OR TABLET MACHINE.

SPECIFICATION forming part of Letters Patent No. 778,750, dated December 27, 1904.

Application filed October 20, 1902. Serial No. 128,097.

To all whom it may concern:

Be it known that I, FRANK PAUL KIRZINGER, a citizen of the United States, and a resident of Louisville, in the county of Jefferson and State of Kentucky, have invented a new and useful Improvement in Pill or Tablet Machines, of which the following is a specification.

My invention relates to machines for making pills and tablets of dry comminuted substances; and the objects of my improvement are, first, facility of adjustment; second, to prevent the breaking of the pills and tablets as they are ejected from the mold and removed from the die-punches; third, saving of material and time in the making of die-punches, and, fourth, to provide a machine which may readily be adjusted for making either pills or tablets. I attain these objects by means of the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of the machine with the hopper and feed-shoe removed; Fig. 2, a vertical central section through the die-punches; Fig. 3, a front elevation of the platen-stand; Fig. 4, a section of a portion of the upper plunger, the threaded stem, and the ball-and-socket joint; and Fig. 5, an enlarged detail view of a portion of the lower die-punch.

Similar numerals refer to similar parts throughout the several views of the drawings.

The main body of the machine consists of the specially-adapted punch-press 1 and the platen-stand 2. The hopper for receiving the material to be operated on and the shoe for filling the mold being such as are commonly used are omitted from the description and drawings in order to avoid complication.

In the punch-press the reciprocatory motion of the plunger is obtained by the usual eccentric and strap. The joint between the strap and plunger is of the ball-and-socket type, which facilitates the taking up of lost motion in the joint and adjusting the plunger, since to raise or lower the plunger it is necessary only to loosen the lock-nut 53 and turn the stem 54, which is threaded into the upper end of the plunger. The plunger 3 is splined in its bearing to prevent its turning, since a slight rotary movement here often causes trouble

from eccentricity of the upper die-punch. 50
The twin rods 59 are connected with the cam-strap 8 and serve to operate the lift-arm 7, which extends out through the slot provided therefor in the front of the main frame and into the lower portion of the platen-stand 2. 55
This lift mechanism is for ejecting the pill or tablet from the mold. The feed-shoe is operated by the arm 4, which carries the contact-roller 9, arm 6, and shaft 5, all of which are actuated by cam 10. Arm 6 is tubular and 60 carries in its bore a loosely-fitting rod 11, adapted to drop into a socket in the rear end of the shoe. When the shoe is to be removed, the rod 11 is pushed up into arm 6 till clear of the socket in the shoe. The cam 10 is of 65 such form as to push the shoe over mold 19 at the proper time and jar and shake it there in order to insure the filling of the mold. To prevent the shoe sticking on account of powder between the bearing-surfaces, the plates 70 44, which hold it down to its work, are provided with a longitudinal ball-race 45, adapted to receive loosely the balls 46, and thus form a ball-bearing.

The plunger 3 is bored and tapped out at 75 its lower end to receive the die-punch 15. Heretofore these die-punches have been made with a large, usually tapered, shank to fit into a hole in the bottom of the plunger and fastened with a set-screw and have been turned 80 down from a large piece to the diameter required for forming pills of different sizes. In this way the punches have been rendered expensive and their breakage a serious matter. With my improvement straight stock 85 of the required diameter is used and both ends shaped, forming double-ended die-punches, so that if one end is chipped or otherwise injured they may be turned end for end. This plan is rendered practical by providing for each diameter of punch a split 90 chuck 13. The solid end of the chuck 13 is pierced by a hole 55, smaller than the bore, to admit a small punch for removing the die in the event of its sticking. To prevent injury 95 to the end of the die-punch which is not in use, a small plug 14, of brass or other metal softer than the punch, is inserted behind it. The

chuck 13 is tapered on its split end and is held in place and constricted by the gland 12, which is internally correspondingly tapered at its outer end and externally threaded, so as to screw into the end of plunger 3. This secures the perfect alinement of the punch and prevents its loosening.

The stand 2 is removable from the body of the machine, being set on the horizontal forward extension of the base and secured thereto by bolts, as shown in Fig. 1. The bolts by which platen-stand 2 is secured to the base of the machine pass through holes in the wings of the base of said platen-stand, (shown in Fig. 2,) which fit said bolts loosely, so that the platen-stand may be moved and adjusted to secure exact alinement of the mold 19 and the punch 15. By this means perfect alinement of the lower and upper punches may be readily secured, notwithstanding any wear of the parts or lack of precision in construction. The platen-stand 2 is made in two parts, the table 20 being secured to the base by the bolts 22 and 23. The table 20 is bored out vertically to receive the cylindrical mold 19. This mold-aperture is contracted at its lower end 27, forming a shoulder, so that when mold 19 is dropped into it the upper face remains flush with the surface of table 20. The table 20 is slit at one end, as shown at 60, and provided with a clamping-bolt 52 for securing mold 19.

The lower die-punch is constructed in two parts, the straight solid shaft 17 and the tubular member 18, which telescopes over it. I am aware that a device somewhat similar has been made in which a tubular die is screwed into the mold; but it will be understood that mine is a tubular punch which reciprocates, as well as the solid punch within it. The stand 2 is preferably square externally and bored longitudinally and centrally to receive and form a bearing for the lift-plunger 56, threaded internally near the upper end of the bore to receive the bushing 35 and slotted transversely at its top 57 and bottom 58. The bolt 40 has a circular head pierced with wrench-holes 48 and stands on its head on the flat extension of the main frame provided for the platen-stand 2. Its threaded shank is screwed into the lower end of the lift-plunger 56, which is suitably tapped out therefor. Plunger 56 is reduced in diameter at its upper end, so as to slide in bushing 35. Its upper end is also bored out to receive the punch 17 and its chuck 37 and counterbored and tapped to receive the gland 36. The punch member 17 is made single-ended and of the same diameter throughout. The chuck 37 is not split and does not necessarily fit the member 17; but its bore is such as to receive the largest punch used, and its lower end is counterbored. A bushing 38 is provided to fit each size of punch 17, so that in case of breakage only the straight punch must be renewed. The aperture in bushing 38 is slightly coun-

tersunk at the bottom and the punch 17 slightly upset, as shown at 39, that the punch may be held down firmly. The chuck 37 is tapered at its upper end, and the gland 36 is internally correspondingly tapered, so as to hold member 17 down firmly when screwed into the threaded hole in plunger 56. The tubular member 18 is chucked in the movable and adjustable chair 29 and is made of straight stock of the same diameter throughout. It is quite short, so as to be made with little expense, and is slightly upset at its lower end like member 17, and its end, thus enlarged, is accommodated by the countersink in the bottom of the chuck 28 and is thus held down firmly by said chuck. A chuck 28 is provided for each size of member 18 to fit snugly. The chuck 28 is secured by gland 26, threaded and screwed into chair 29. Only two sizes of member 17 are used, and these differ but slightly in diameter. The aperture in the bottom of the chuck-hole in chair 29 is the size of the larger member 17, and the blank end of member 18 rests firmly on the shoulder about this aperture. The depth of member 18 that mold 19 may receive the requisite amount of powder to form the pill is adjusted by means of the threaded bushing 35. This bushing is provided with wrench-slots 47. Chair 29 rests on this bushing when at its lowest point. When adjusted, bushing 35 is set by means of set-screw 24. The soft plug 30 serves to prevent injury to the thread of the bushing. Member 17, which is actuated by plunger 56, is adjusted by turning bolt 40 by inserting a suitable wrench in holes 48. Plunger 56 is held from turning with bolt 40 by set-screw 25, which is screwed into it and works in slot 49 in the wall of stand 2. When member 17 has been set at the required height, the adjustment is fixed by setting down the set-screw 25 on the soft plug 31, which in turn engages bolt 40 without injuring the thread. Chair 29 is made to sink positively with plunger 56 by connecting-rod 34. The rod 34 is enlarged near its lower end where it has a hole for set-screw 25, and its upper end is threaded for adjusting-nut 33. The threaded end passes through the extension-lug 32, which is firmly screwed into the chair 29. Rod 34 is adapted to slide in lug 32. In practice I prefer to use two rods 34 with their set-screws, &c., in order to connect plunger 56 and chair 29 together positively without cramping. Between the plunger 56 and the chair 29 is a strong spiral spring 61, which presses chair 29 upward and forces lug 32 firmly against adjusting-nut 33, so that when the members 17 and 18 of the lower die-punch are set and their die ends form a perfect hemisphere they will move upward together when raised by lift-arm 7 till chair 29 strikes the lower surface of table 20. When this occurs, the upper end of member 18 is flush with the surface of table 20 and the pill 16

is half exposed. Then, chair 29 being unable to rise further and plunger 56 still rising, spring 61 is compressed, rod 34 slides in plug 32, and member 17 rises till it also is flush with the surface of table 20. This leaves the pill 16 exposed and ready to be easily pushed off by the shoe, which is timed to advance just at that instant. When the pill has been removed, lift-arm 7 sinks, carrying with it plunger 56, member 17 sinks till the hemispherical bed is again perfect, when nut 33 strikes lug 32, resisting the expansion of spring 61, and both die-punch members sink together till bolt 40 strikes its base and chair 29 rests on bushing 35. The amplitude of the lift is adjusted by means of the threaded lift-adjusting bushing 42, which is provided with wrench-holes 41 and set with the set-screw 43.

With my improved mechanism the hemispherical bed is unbroken while the pill is being extracted from the mold, so that there is no danger of its being broken by the small punch member on account of the resistance of the wall of the mold, and the mold is kept free to make perfect pills at all times. When the pill is entirely free from the mold, it is raised a little higher out of the cup-shaped bed, so that it is readily pushed off by the shoe. When the machine is to be used for making tablets, a single lower die-punch is used, member 18 with its chair 29 is removed, and the die-punch secured by means of a split chuck in the place of chuck 37, similar to upper chuck 13. In this case the lower die-punch may be made double-ended, like the upper.

The manner of adjusting my machine and its operation may now be described.

The table-top 20 is removed from its stand 2. The proper mold 19 is dropped into the receptacle therefor and secured by the clamp-screw 52. The members 17 and 18 of the lower die-punch are then secured in their respective chucks. Member 18 is telescoped over member 17, chair 29 brought down onto spring 61, and lugs 32 over rods 34. Nuts 33 are then screwed onto rods 34, drawing chair 29 down till the die ends of members 17 and 18 register, forming a perfect hemispherical cup. The plunger 56 is now elevated or lowered till it is judged that the mold is of sufficient depth to produce a pill of the required density. The upper die-punch 15 is then chucked in plunger 3 and adjusted to touch the lower one, as previously described. Plunger 3 is now raised and table 20 applied and secured with bolts 22 23. The lift is then adjusted. To do this, lift-arm 7 is raised to its highest point, bushing 42 is screwed up till the die end of 17 is flush with the surface of table 20, and screw 43 is set up. Arm 7 is then placed at its lowest point and bushing 35 screwed up into contact with chair 29 and set with set-screw 24. A pill may now be made. If the pill is not sufficiently dense, the mold is not

sufficiently deep and the lower die-punch must be lowered. The bushing 35 is first lowered, and then plunger 56, by means of bolt 40, till chair 29 rests on bushing 35, and plunger 3 is lowered correspondingly. If, however, the pill is too dense, plunger 3 is first raised, then plunger 56, and finally bushing 35, into contact with chair 29.

I am aware that punch-presses and machines for making pills and tablets from dry comminuted material with solid and with tubular dies have been made, and I do not desire to claim these broadly; but

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a pill and tablet machine, the combination with a main frame and mechanism for producing compression, of a removable and adjustable platen-stand which contains adjustably laterally the tablet or pill mold, and the die punch or punches laterally and vertically, substantially as specified.

2. In a pill and tablet machine, the combination with a main frame and mechanism for producing compression, of a cylindrical reciprocating plunger splined in its bearing, a threaded stem having a ball on its upper end adjustably screwed into the upper end of said plunger and locked by a nut on said stem, and a ball-and-socket joint between said stem and the eccentric-strap, substantially as specified.

3. In a pill and tablet machine, having a main frame and mechanism for producing reciprocatory motion of an upper and a lower plunger, the combination of an upper plunger threaded at its lower end and centrally bored, a split chuck in the central bore for holding a die-punch, and the die-punch of diameter equal that of the pill or tablet to be made therewith and of uniform diameter throughout its length, substantially as described.

4. In a machine for making pills and tablets, having a shoe for filling the pill-mold with the powdered medicine, the ball-bearing cover-plates 44, provided with the ball-race 45 and the balls 46, for holding said shoe down to its work, prevent its sticking, and adapt it to be shaken and jarred, substantially as described.

5. In a pill and tablet machine, the combination of a removable and adjustable stand, said stand bored vertically, an adjustable reciprocating plunger fitting the bore of said stand, said plunger centrally bored and tapped in its upper end and provided with a chuck, and a straight die-punch of uniform diameter throughout its length and slightly upset at its lower end secured by said chuck, as described.

6. In a pill and tablet machine, the combination with means for producing reciprocatory motion of a lower and an upper plunger, of an inner die-punch member chucked in the lower plunger, of an adjustable chair actuated by said plunger, and a tubular die-punch chucked in said chair and telescoping over said inner die-punch, all so arranged and coacting

that the said die-punches move upward together to eject the pill bodily from the mold, till the outer punch is flush with the surface of the mold, that the said outer punch then
5 rests and the inner punch continues to rise till it also is flush with the surface of the mold, thus lifting the pill free from its hemispherical bed, that the inner punch sinks till the said hemispherical bed is again completed, and
10 both punches then sink in unison to the proper point for forming the bottom of the mold, as described.

7. In a pill and tablet machine, in combination with a platen-stand and means for reciprocating upper and lower die-punches, a
15 plunger in the bore of said platen-stand, a bolt threaded into said plunger for adjusting the same as to height, said bolt having its

head resting, when said plunger is down, on a base formed on the main frame of the machine, a movable chair for the external tubular die-punch, said chair resting, when said
20 plunger is down, on an adjustable base and adjustable as to depth by means of said adjustable base, and adjustable as to height by
25 means of a rod or rods 34 threaded and having adjusting-nuts 33 and connecting it with the actuating-plunger 56, and the adjustment for the lift of the lower die-punch comprising the adjusting-bushing threaded into the outer
30 end of the lift-arm 7 and its set-screw 43, substantially as specified.

FRANK PAUL KIRZINGER.

Witnesses:

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