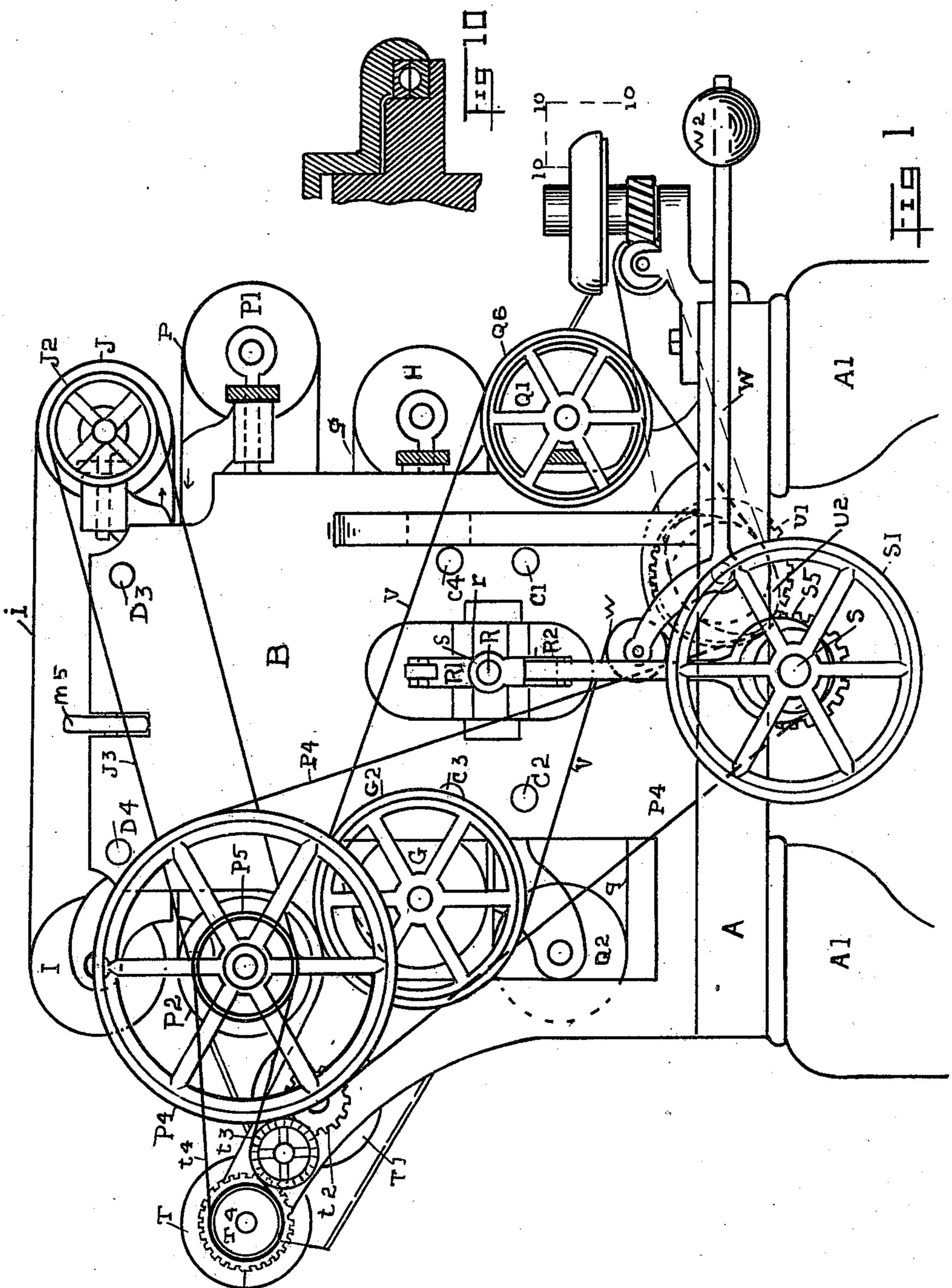
No. 684,912. Patented Oct. 22, 1901.

A. COLTON.

PILL FORMING MACHINE.

(Application filed Jan. 28, 1901.)

(No Model.) 5 Sheets—Sheet 1.



WITNESSES.

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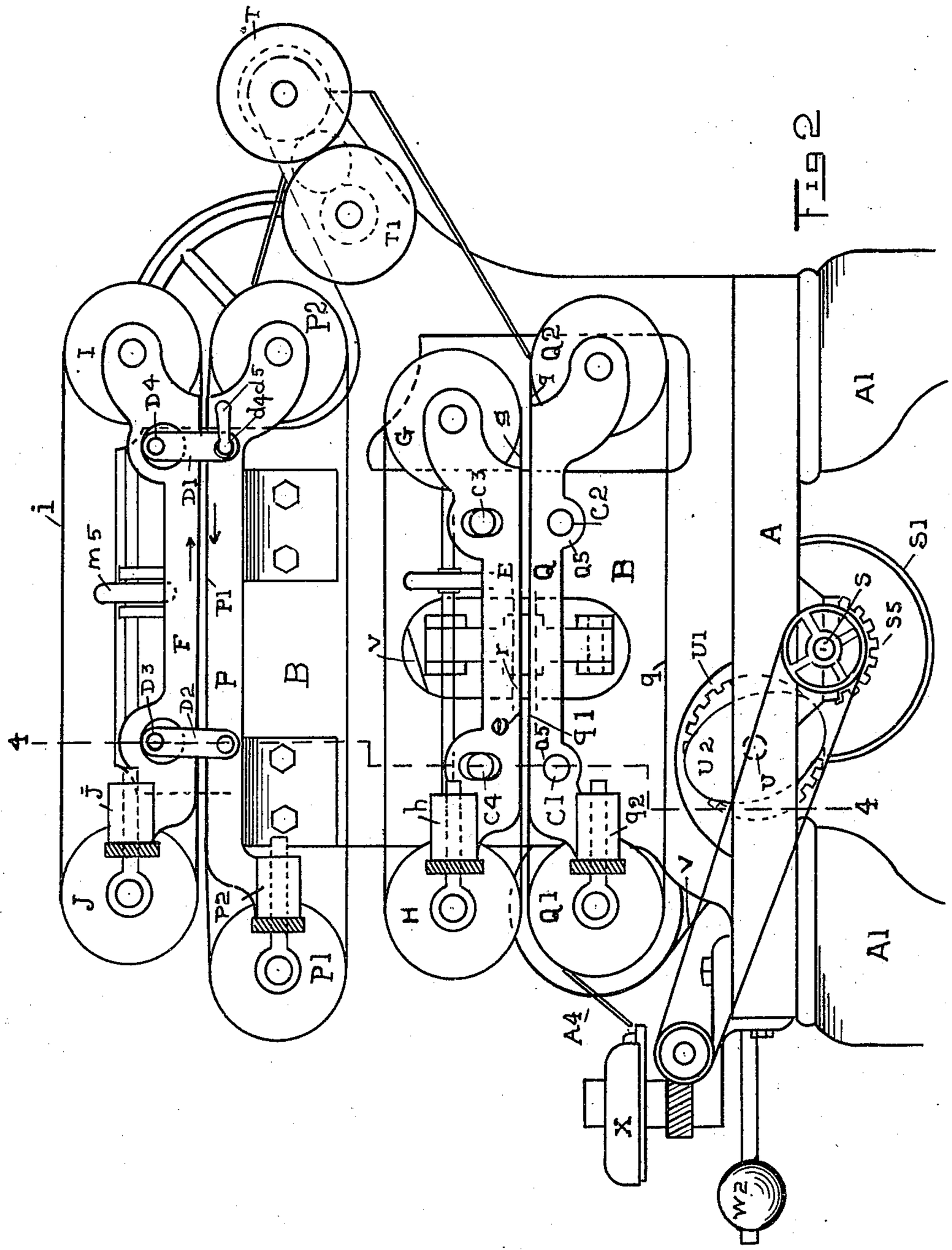

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No. 684,912. Patented Oct. 22, 1901.

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(Application filed Jan. 28, 1901.)

(No Model.) 5 Sheets—Sheet 3.

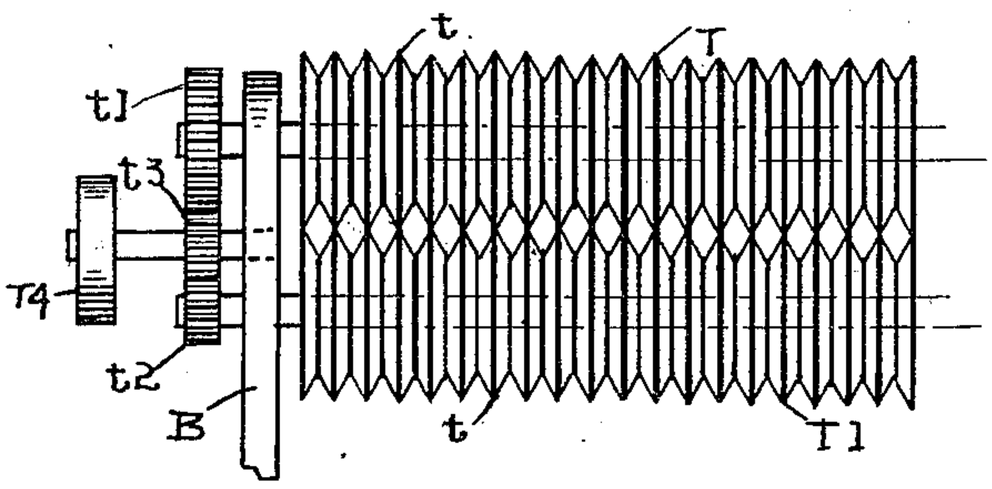

FIG 11

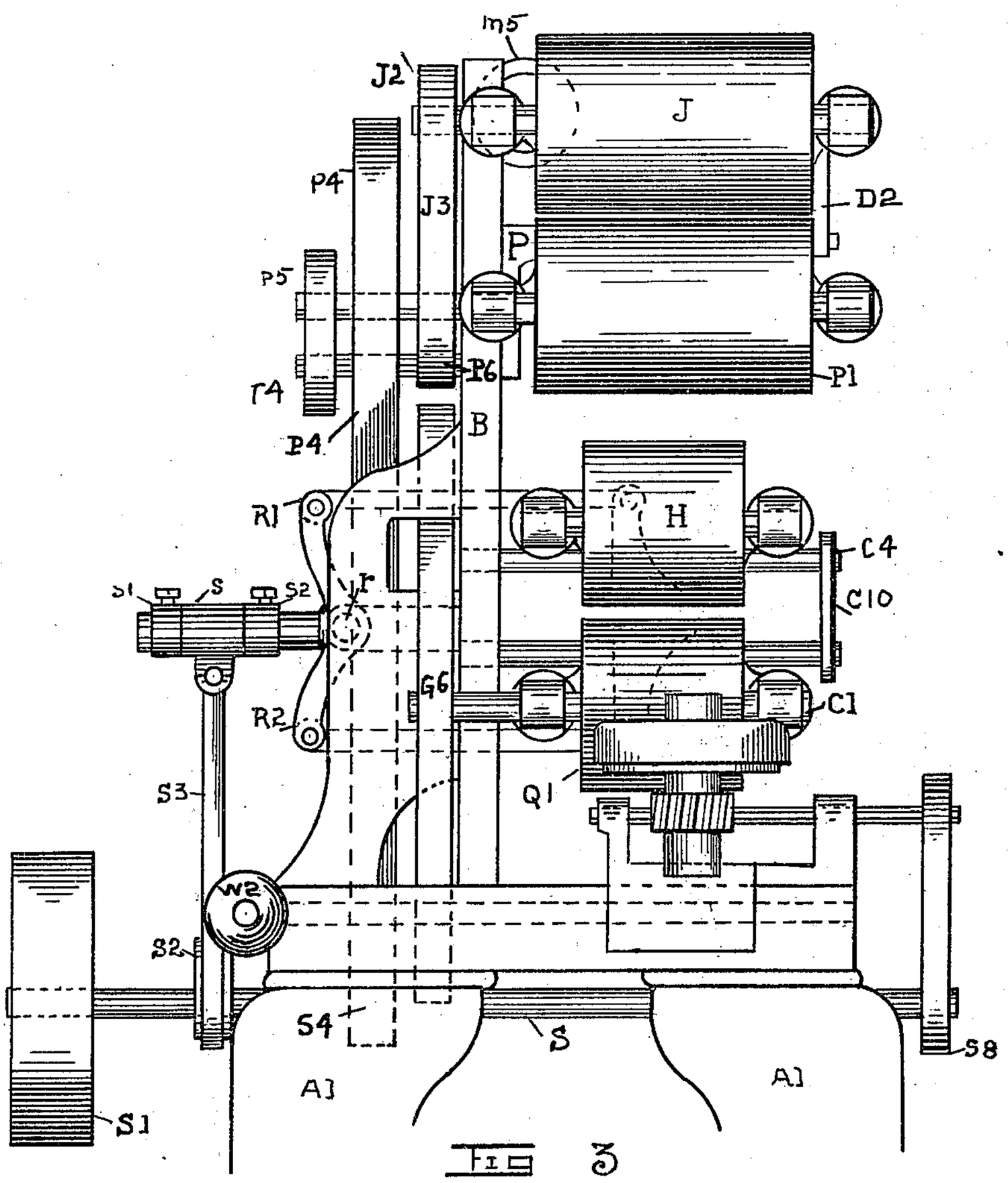

FIG 3

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PILL FORMING MACHINE.

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(No Model.) 5 Sheets—Sheet 4.

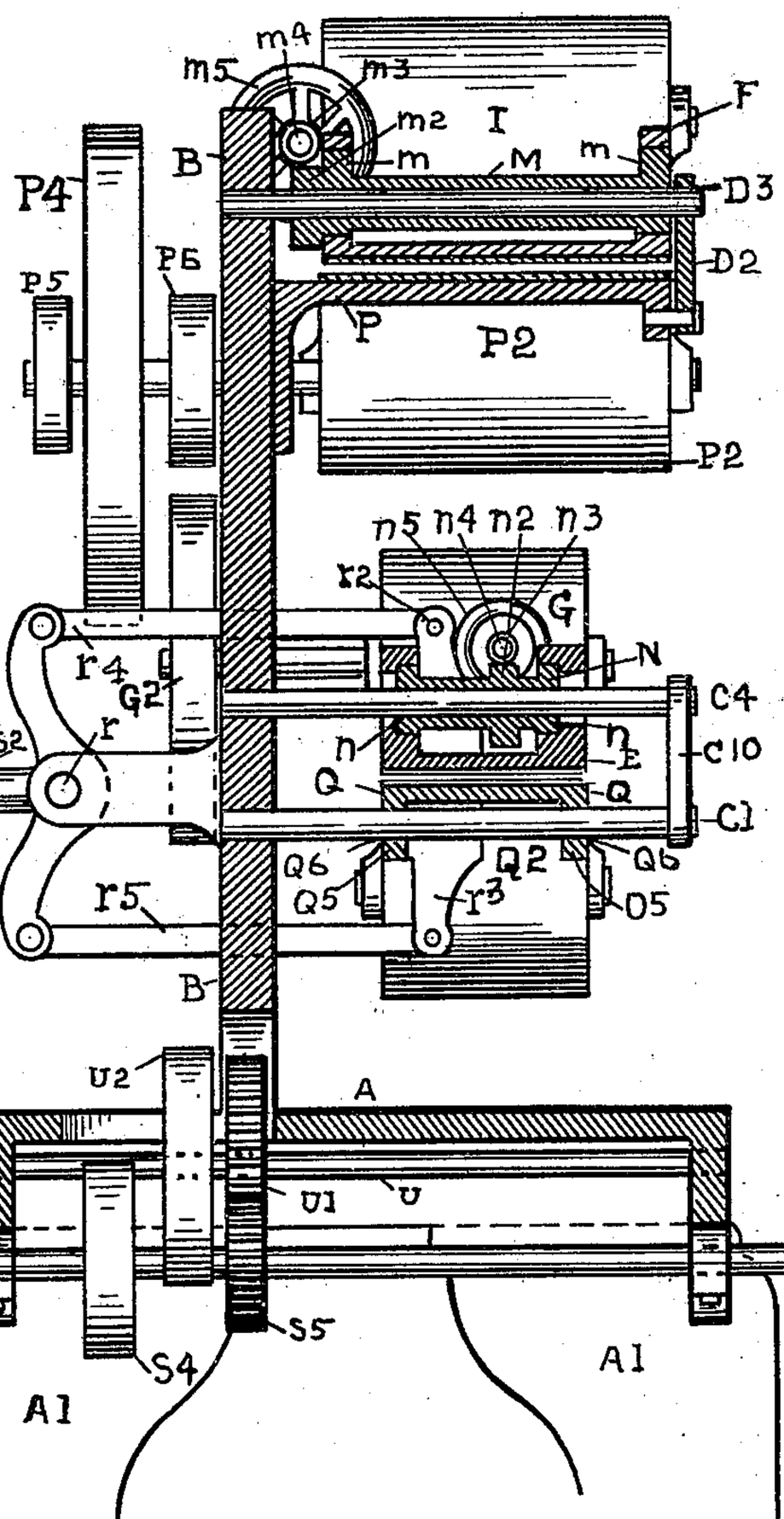

FIG 4

WITNESSES.

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(Application filed Jan. 28, 1901.)

(No Model.) 5 Sheets—Sheet 5.

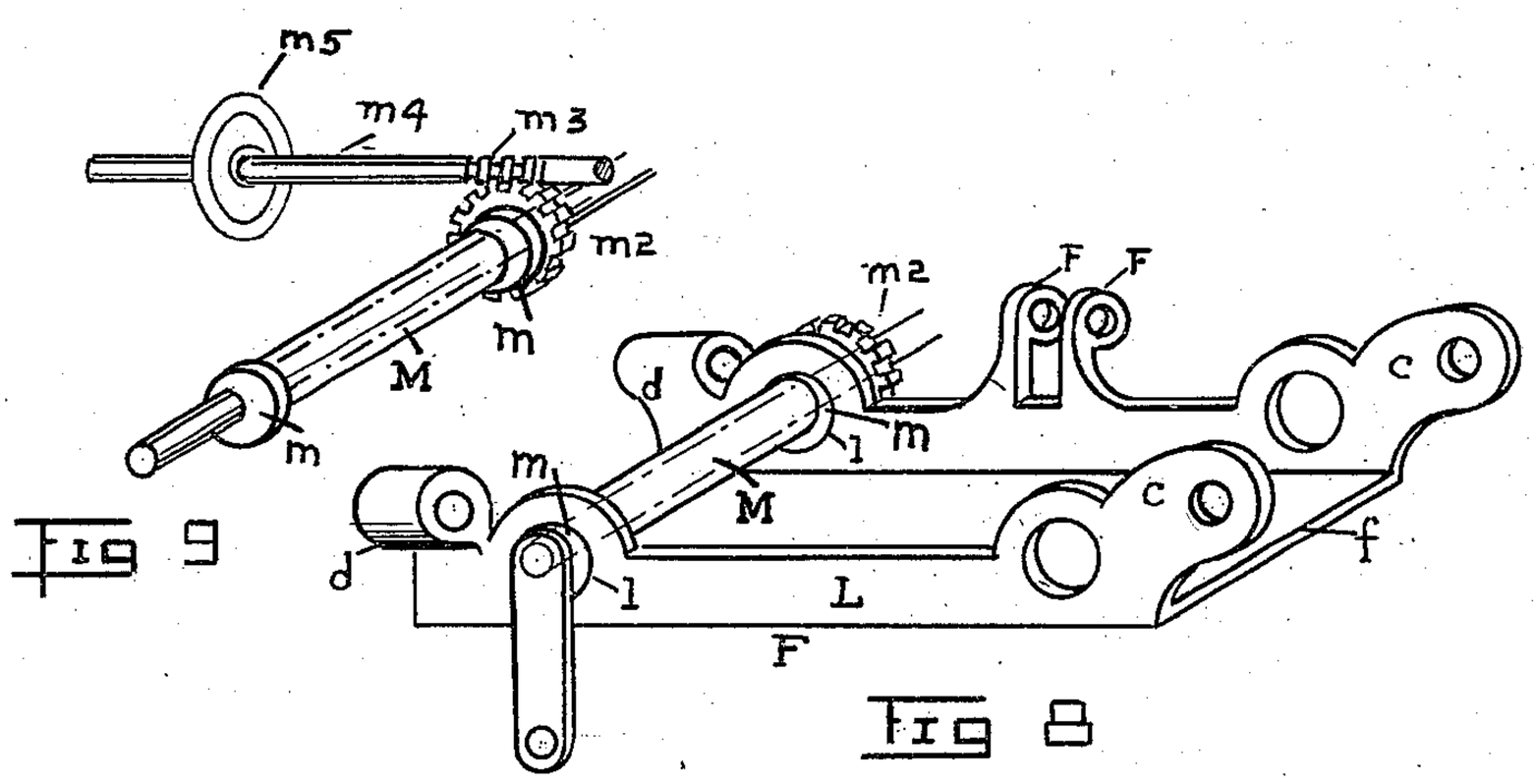

Fig 9

Fig 8

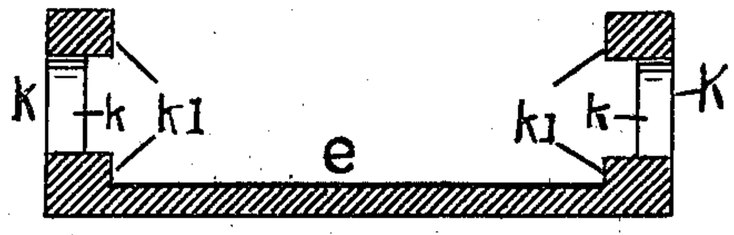

Fig 7

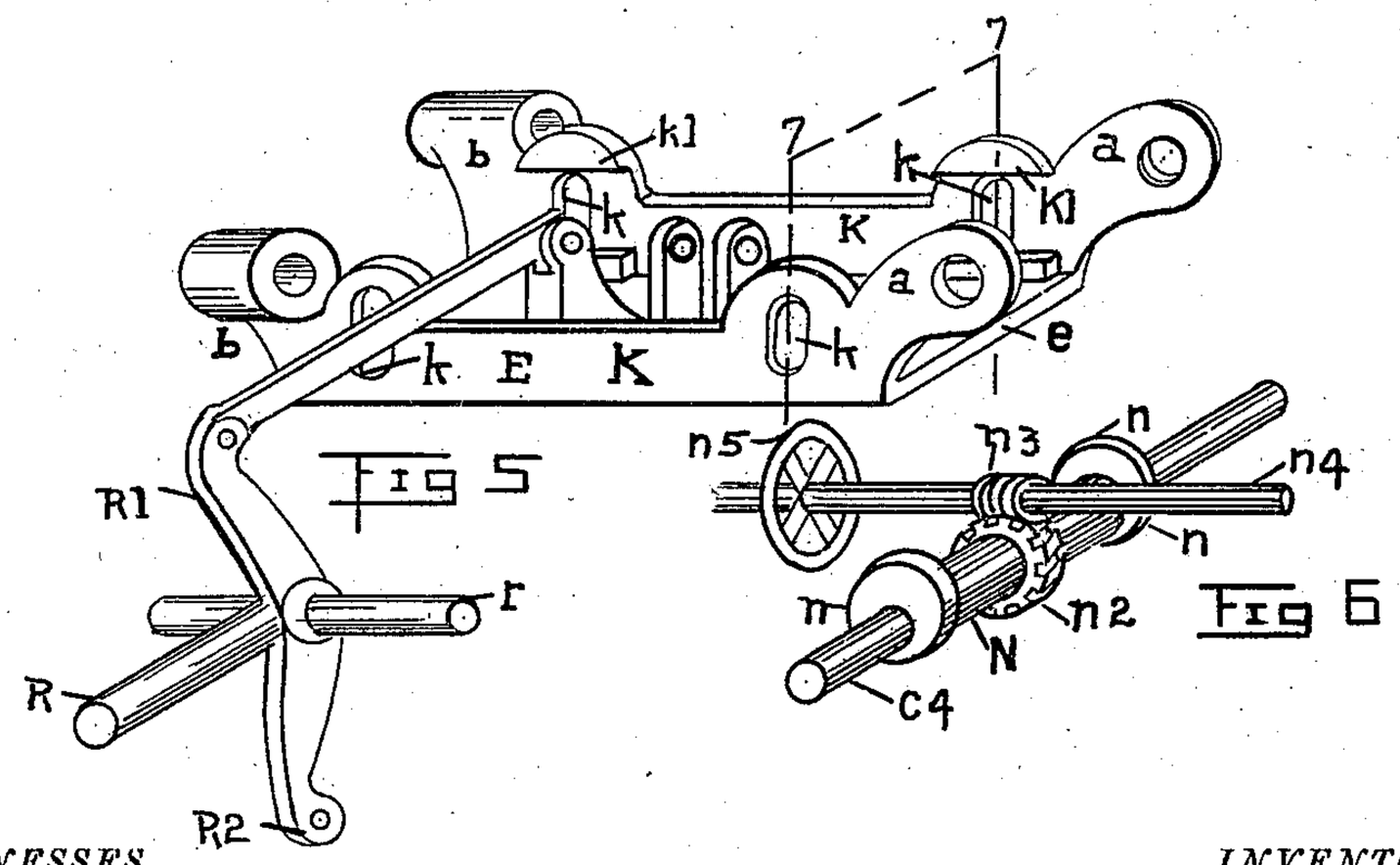

Fig 5

Fig 6

WITNESSES.

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UNITED STATES PATENT OFFICE.

ARTHUR COLTON, OF DETROIT, MICHIGAN.

PILL-FORMING MACHINE.

SPECIFICATION forming part of Letters Patent No. 684,912, dated October 22, 1901.

Application filed January 28, 1901. Serial No. 44,981. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR COLTON, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Pill-Forming Machines; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to pill-forming machines; and it consists in the improvements hereinafter described, and pointed out in the claims.

The general operation of the machine embodying my invention is as follows: The pill mass is first rolled into a cylindrical form, which is conventionally called the "pipe." The pipe is then cut into short cylindrical lengths and these short cylinders rolled between approximately parallel surfaces, and thereby shaped into spherical form, after which they may be fed to a machine for reforming them into an ovoid or ellipsoidal form.

Referring to the accompanying drawings, Figure 1 is a side elevation of the assembled machine looking at the side at which the various shafts are supported. Fig. 2 is an elevation of the same looking at the side opposite to that shown in Fig. 1. Fig. 3 is an elevation looking at the end at the right of Fig. 1 and at the left of Fig. 2. Fig. 4 is a section on the line 4 4 of Fig. 2 looking from the left-hand side of the same. Fig. 5 is a perspective view of the upper belt-supporting plate of the spherical pill-forming apparatus, together with a part of the apparatus used for producing a lateral reciprocating motion of such plates. Fig. 6 is a perspective view of details of the plate-adjusting mechanism. Fig. 7 is a section on the lines 7 7 of Fig. 5. Fig. 8 is a perspective view of the upper belt-supporting plate of the pipe-rolling apparatus. Fig. 9 is a perspective view illustrating details of the apparatus for adjusting the plate shown in Fig. 8. Fig. 10 is a detail section on lines 10 10, Fig. 1. Fig. 11 is a plan view of the pipe-cutting rolls.

The same reference-letters indicate the same part in all the views.

A is the base of the frame, and A′ A′ the legs supporting said base. B is a plate rising vertically upward from the edge of the base A at one side thereof.

C′ C^2 C^3 C^4 and D^3 D^4 are cylindrical rods fixed at one end in the plate B and extending at right angles thereto over the base A.

E and F are frames consisting of flat plates *e* and *f*, with lugs *a a b b* and *c c d d* rising from their four corners. Said lugs support pulleys G H and I J in such a position that if the faces of the plates *e f* were extended they would be tangent to their adjacent pulleys.

g is a belt, preferably of rubber, passing around the pulleys G H and against the outer face of the plate *e*.

h is a device for adjusting the distance apart of the pulleys G H, so that the tension of the belt *g* may be regulated.

i is a belt passing around the pulleys I J and against the outer face of the plate *f*.

j is an adjusting device similar to *h*.

K L are lateral flanges on the frames E F. In the flanges K are formed vertical slots *k*, through which the rods C^3 C^4 extend.

k′ represents lugs extending inward from the flanges *k* at right angles thereto at each end of the slots *k*.

l represents circular apertures through the flanges L, through which the rods D^3 D^4 extend.

M represents sleeves, one of which is on each of the rods D^3 and D^4.

m m are eccentrics upon the sleeve M, and m^2 is a worm-wheel upon said sleeve. The eccentrics *m m* fit into the apertures *l*.

m^3 is a worm gearing with the worm-wheel m^2.

m^4 is the shaft upon which is the worm m^3. The shaft m^4 turns in bearings on the frame F and is provided with a hand-wheel m^5. By turning the hand-wheel m^5 the sleeves M are rotated and the frame F raised or lowered by means of the eccentrics *m m*.

The mechanism for raising and lowering the frame E is the same as that just described for the frame F, except that the vertically-elongated slots *k* engage upon opposite sides

of the arbors C^3 and C^4. The sleeve N is located entirely between the flanges K. The eccentrics $n\,n$ engage the faces of the lugs k', and the worm-wheel n^2, worm n^3, shaft n^4, and hand-wheel n^5 are all located between the flanges K.

P is a stationary frame secured to the plate B and extending at right angles thereto beneath and adjacent to the frame F. It is not adjustable, but is secured rigidly to the plate B. The frame P is of the same construction as the frame F and is provided with corresponding pulleys P' P^2, belt p, face-plate p', and adjuster p^2.

Q is a frame entirely similar to the frame E, except that the adjusting mechanism is omitted. The plate Q is provided with pulleys Q' Q^2, belt q, face-plate q', adjuster q^2, answering to the corresponding parts of the frame E and is adapted to reciprocate longitudinally to the rods C' C^2 upon said rods. The frame Q is located beneath and adjacent to the frame E, with its plate q' parallel and adjacent to the plate e. The flanges Q^5 Q^5 have apertures Q^6 formed in them, through which pass the rods C' C^2.

R R' R^2 are three lever-arms extending from the rock-shaft r, which is pivoted in a lug extending from the plate B.

r^2 r^3 are lugs extending from the frames E and Q, respectively.

r^4 and r^5 are connecting-rods extending, respectively, from the outer end of the arm R' to the lug r^2 upon the frame E and from the outer end of the arm R^2 to the lug r^3 upon the frame Q.

S is a shaft resting in bearings under the base A and extending transversely across the machine.

S' is a driving-pulley upon the shaft S.

S^2 is an eccentric upon the shaft S.

S^3 is an eccentric-rod engaging with the eccentric S^2 at one end and with a sleeve s, around the arm R, at the other end.

s' s^2 are adjustable collars upon the arm R at each end of the sleeve s. The sleeve s may be moved to different positions along the arm R by moving the collars s' s^2 to different positions. When the shaft S is rotated, the arm R is caused to oscillate by the eccentric S^2 and rod S^3. The extent of the oscillation of the arm R may be regulated by moving the sleeve s along said arm.

T T' are rolls bearing in the frame of the machine and provided with registering peripheral cutting-flanges t. Said cutting-flanges come close together or are tangent, as shown in Fig. 11, and their peripheries are preferably finely notched.

t' is a gear-wheel upon the same shaft as the roller T, and t^2 is a gear-wheel upon the same shaft as the roller T'.

t^3 is a gear-wheel intermediate between the gear-wheels t' and t^2.

By the chain of gearing t' t^2 t^3 the rollers T T' are constrained to turn in opposite directions.

S^4 is a pulley upon the shaft S, and P^4 is a pulley upon the same shaft as the pulley P^2.

p^4 is a belt passing around the pulleys P^4 and S^4, so as to communicate motion from the latter to the former.

P^5 is a pulley upon the same shaft as the pulley P^4.

T^4 is a pulley upon the same shaft as the roller T.

t^4 is a belt passing around the pulleys P^5 and T^4, so as to communicate motion from the former to the latter.

P^6 is a third pulley upon the same shaft as the pulley P^4.

J^2 is a pulley upon the same shaft as the roller J.

J^3 is a belt passing around the pulleys P^6 J^2, so as to communicate motion from the former to the latter.

S^5 is a gear-wheel upon the shaft S.

U is a counter-shaft resting in bearings on the base A parallel to the shaft S.

U' is a gear-wheel upon the shaft U, its teeth meshing with the teeth of the gear-wheel S^5.

U^2 is an elliptical pulley upon the shaft U.

G^2 is a pulley upon the same shaft as the pulley G, and Q^6 is a pulley upon the same shaft as the pulley G'.

V is a belt passing over the elliptical pulley U^2 and the pulley G^2 and Q^6.

W is a lever pivoted to the base having a pulley w at one end and a weight w^2 at the other end. The lever W acts to take up any slack that would otherwise be in the belt V.

X is a device having two relatively rotatable disks with registering semi-elliptical grooves in their adjacent faces and adapted to take the spherical pills that feed from the rest of the mechanism shown and form said pills into an ellipsoidal form. This machine is shown and fully described in my application, Serial No. 40,712, filed December 22, 1900, and pending contemporaneously with this.

The operation of the above-described machine is as follows: The power is applied to the pulley S^4, which causes the shaft S to rotate. The rotation of the shaft S is communicated to the pulley P^4 through the belt p^4, and the rotation of the pulley P^4 rotates the pulley P^2 and the pulleys P^5 and P^6, which are on the same shaft with it. The motion of the pulley P^2 is communicated to the belt p, and thereby to the pulley P'. Rotary motion is communicated to the cutting-rollers T T' by a belt t^4 passing over the pulleys P^5 and T^4. Motion is communicated to the roller J by a belt J^3 passing over the pulleys J^2 P^6. The motion of the pulley J is communicated to the belt i, and thereby to the pulley I. It will be noticed that the adjacent parts or strands of the belts i and p run in opposite directions, as indicated by the arrows, Fig. 2. The pulley J^2 should be larger than the pulley P^6, so that the velocity of the belt i shall be less than that of the belt p. The rotation

of the shaft S communicates motion to the counter-shaft U through the gear-wheels S^5 U'. The shaft U carries with it the elliptical pulley U^2. The rotation of the pulley U^2 drives with a continuously-varying velocity the belt V, which drives the pulley G^2, and thereby the pulley G, and the pulley Q^6, and thereby the pulley Q'. The motion of the pulley G is communicated to the belt *g*, and thereby to the pulley H, and the motion of the pulley Q' is communicated to the belt *q*, and thereby to the pulley Q^2. It will be noticed that the motion of the adjacent parts or strands of the belts *g* and *q* are in opposite directions and that the velocity of the belt *q* is the greater, because the pulley Q^6 is smaller than the pulley G^2. The oscillation of the levers R R' R^2 reciprocates the frames E and Q in a direction lateral to the machine, which frames carry with them the pulleys G H and Q' Q^2, plates *e* and *q'*, and the belts passing around said pulleys and over said plates.

S^8 is a pulley upon the shaft S, through which the machine X is operated.

The pill mass is fed by an attendant between the belts upon rolls J and P' and is carried thereby between the plates *f* and *p*, which afford a support to said belts, so that they present an even surface. The mass is rolled into a pipe by said belts moving in opposite directions and is dropped out from between the rolls I P^2 and is then fed between the cutting-rolls T T', which cut it into short lengths, which are fed by gravity between the belts *g* and *q*, which are given, as above described, two relative motions in the same plane, but at right angles to each other. This motion of the belts *g* and *q* rolls the small pieces of mass into a spherical form and allows them to drop out from between the rolls Q H into a trough or chute A^4, by which they are carried to the forming-machine X and made into an ellipsoidal shape.

In machines for forming ellipsoidal pills by rolling the mass between grooved plates the smaller ends of the pills are apt to be left unfinished and imperfect. By first shaping the pills into a spherical form and then re-forming them the pills come out practically perfect, inasmuch as the original spherical form of the pill is very approximately that of the furnished pill, so that if the mass forming the smaller ends is untouched by the re-forming machine it is still of the correct shape for all practical purposes.

By adjusting the distance apart of the plates P and F and the plates Q and E, pills of different diameters, within, say, the scope of eight sizes, may be made with one set of cutting-rolls, as while rolls cut the pipe of the same length in all cases, the diameter of the pipe, and consequently the amount of material in it, will vary in proportion to the distance apart of the frames P F and of the frames Q F.

The above-described pill-forming machine does not require a skilled attendant. The mass having been fed to the machine, the pills are formed automatically and fed into a receptacle. It is better to connect the outer ends of the arbors C' C^2 C^3 C^4 together by yokes C^{10}. (Shown in Figs. 3 and 4, but omitted from Fig. 2 for the sake of clearness.) In the same way the arbors D^3 D^4 are connected to the frame P by yokes D' D^2.

At the lower end of the yoke D' there is an eccentric d^4, provided with a handle d^5. By this eccentric and handle the frame F may be made accurately parallel to the frame P.

The lower face of the plate *e* is made slightly convex from end to end. The convexity is so slight that it does not show in the drawings.

The variable velocity given to the belts *g* and *q* by the elliptical driver U^2 makes the rotation of the pills certain, so that none of the pieces of mass become flattened and are carried in this shape through the machine.

By fastening the arbors C', C^2, C^3, C^4, D^3, and D^4 to the plate B at one end, leaving the other end free, I adapt the parts to be readily removed and replaced for the purpose of oiling or cleaning.

I claim—

1. In a pill-forming machine, the combination of an adjustable means for forming the mass into cylindrical pipes of different diameters, means for dividing said pipes into short pieces, two parallel adjacent surfaces, means for giving said surfaces relative motion in two directions, and means for varying the distance apart of said surfaces, substantially as and for the purpose described.

2. In a pill-forming machine, the combination of a belt passing around pulleys, a plane surface adjacent, and parallel to said belt, means for imparting a longitudinal motion to said belt, and means for producing a relative lateral motion between said belt and surface, substantially as and for the purpose described.

3. In a pill-forming machine, the combination of a frame, pulleys supported by said frame, a belt passing around said pulleys, a plane surface adjacent and parallel to said belt, means for imparting longitudinal motion to said belt and means for imparting lateral motion to said frame, substantially as described.

4. In a pill-forming machine, the combination of a belt passing around pulleys, a plane surface adjacent and parallel to said belt, means for imparting a varying longitudinal motion to said belt, and means for producing a relative lateral motion between said belt and surface, substantially as described.

5. In a pill-forming machine, the combination of a belt passing around pulleys, a plane surface adjacent and parallel to said belt, a belt adapted to drive one of said pulleys, and an elliptical pulley adapted to drive the belt which drives one of said first-mentioned pulleys, substantially as described.

6. In a pill-forming machine, the combination of a frame, pulleys supported by said

frame, a plane surface upon said frame between said pulleys and in a plane approximately tangent to said pulleys, a belt passing around said pulleys and over said plane surface, a second plane surface adjacent, and parallel to said first-named plane surface, means for imparting longitudinal motion to said belt, and means for imparting a lateral motion to said frame, substantially as described.

7. In a pill-forming machine, the combination of the main frame, rods C^3, C^4, extending therefrom, a frame, E, adapted to slide longitudinally on said rods and adapted to be adjusted vertically with reference thereto, pulleys on the frame E, a belt passing around said pulleys, a plane surface adjacent, and approximately parallel to said belt, means for imparting a longitudinal movement to said belt and means for imparting a reciprocating motion to the frame, E, in the direction of the length of said rods, substantially as described.

8. In a pill-forming machine, the combination of the main frame of the machine, one or more rods C^3, C^4, fixed at one end in said main frame and free from said main frame at the other end, a frame E, adapted to slide upon one or more of said rods from the free end thereof, pulleys on the frame E, a belt passing around said pulleys, means for giving said belt a longitudinal movement, means for reciprocating the frame E, longitudinally on said rods, and a plane surface adjacent and approximately parallel to said belt, substantially as and for the purpose set forth.

9. In a pill-forming machine, the combination of a fixed cylindrical rod, or rods, C', D^3, a frame provided with pulleys, and a belt passing over said pulleys, one or more sleeves adapted to pass over said rod, or rods, eccentrics on said sleeves engaging said frame and means for rotating said sleeves, substantially as described.

10. In a pill-forming machine, the combination of a fixed cylindrical rod or rods, C', C^2, a frame E, provided with vertically-elongated slots adapted to engage over said rods, sleeves adapted to engage over said slide upon said rods, eccentrics upon said sleeves adapted to engage said frame, and means for rotating said sleeve, located upon said frame, substantially as described.

11. In a pill-forming machine, the combination of frames E, and Q, adapted to be reciprocated laterally, pulleys upon said frames, a belt passing over the pulleys upon one of said frames, a belt passing over the pulleys upon the other of said frames, said frames being so located that said belts shall lie adjacent and approximately parallel to each other, means for giving each of said belts a longitudinal motion, and means for reciprocating each of said frames laterally, substantially as described.

12. In a pill-forming machine, the combination of frames E, Q, adapted to be reciprocated laterally, pulleys upon said frames, a belt passing over the pulleys upon one of said frames, a belt passing over the pulleys upon the other of said frames, said frames being so located that said belts shall lie adjacent and approximately parallel to each other, means for giving each of said belts a longitudinal motion, a lever pivoted between its ends, and adapted to swing in a plane cutting the direction of motion of said belts, one end of said lever being connected to one of said frames and the other end to the other of said frames, and means for oscillating said lever, substantially as described.

13. The combination of a machine, for automatically making spherical pills, a machine for rolling said spherical pills into an ellipsoidal form, and a means for receiving the spherical pills from the former machine and delivering them to the latter, substantially as described.

14. In a pill-forming machine, the combination of two adjacent flat and approximately parallel surfaces, and means for imparting relative motion to said surfaces in two directions, substantially as shown and described.

15. In a pill-forming machine, the combination of two adjacent and approximately parallel surfaces, means for imparting relative motion to said surfaces in two directions, and means for feeding the mass in small pieces of suitable volume, between said surfaces, substantially as described.

16. In a pill-forming machine, the combination of frames E, and Q, one or all of which being adapted to be reciprocated laterally, pulleys upon said frames, a belt passing over the pulleys upon one of said frames, a belt passing over the pulleys upon the other of said frames, said frames being so located that said belts shall lie adjacent and approximately parallel to each other, means for giving said belts longitudinal motion in opposite directions and at different velocities, and means for producing a relative lateral motion of said frames, substantially as described.

17. In a pill-forming machine, the combination of frames E, and Q, one or all of which being adapted to be reciprocated laterally, pulleys upon said frames, a belt passing over the pulley upon one of said frames, a belt passing over the pulley upon the other of said frames, said frames being so located that said belts shall lie adjacent and approximately parallel to each other, means for giving said belts a variable longitudinal motion in opposite directions and at different aggregate velocities, and means for producing a relative lateral motion of said frames, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

ARTHUR COLTON.

Witnesses:
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ELLIOTT J. STODDARD.