

No. 869,283.

PATENTED OCT. 29, 1907.

E. WINTER.
MILL FOR MANUFACTURE OF TUBES, &c.
APPLICATION FILED APR. 2, 1906.

3 SHEETS—SHEET 1.

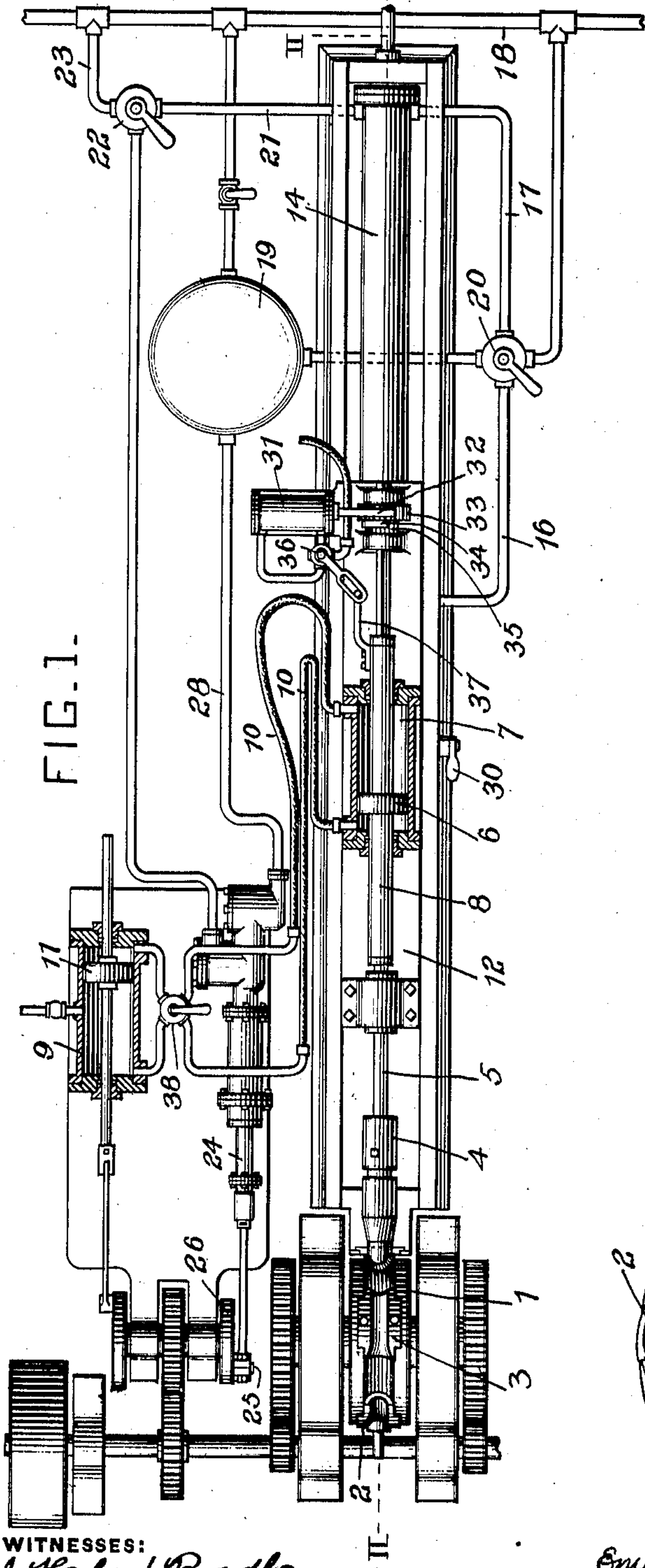


FIG. 1.

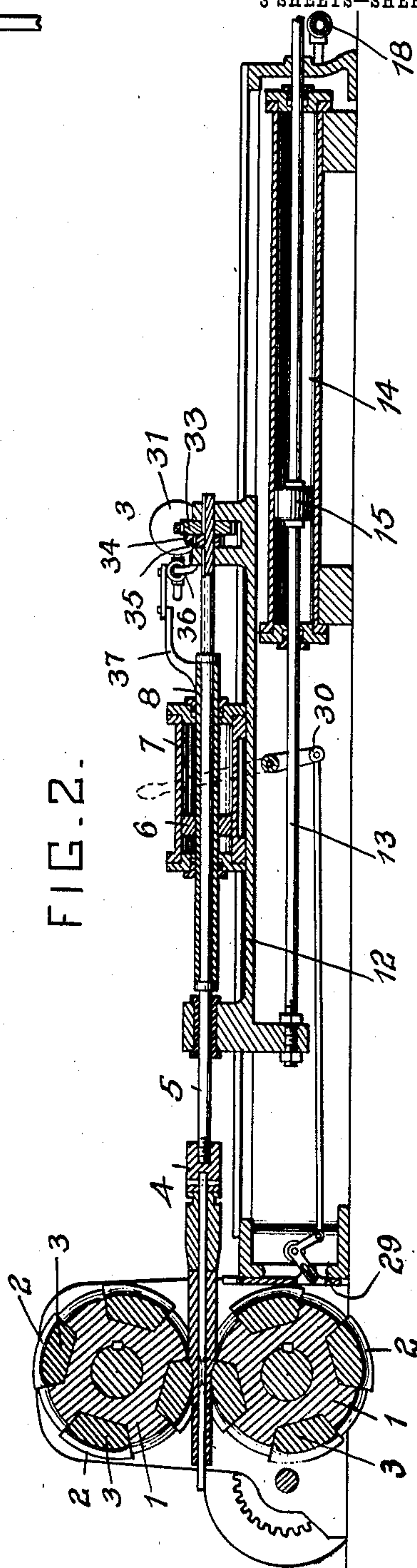


FIG. 2.

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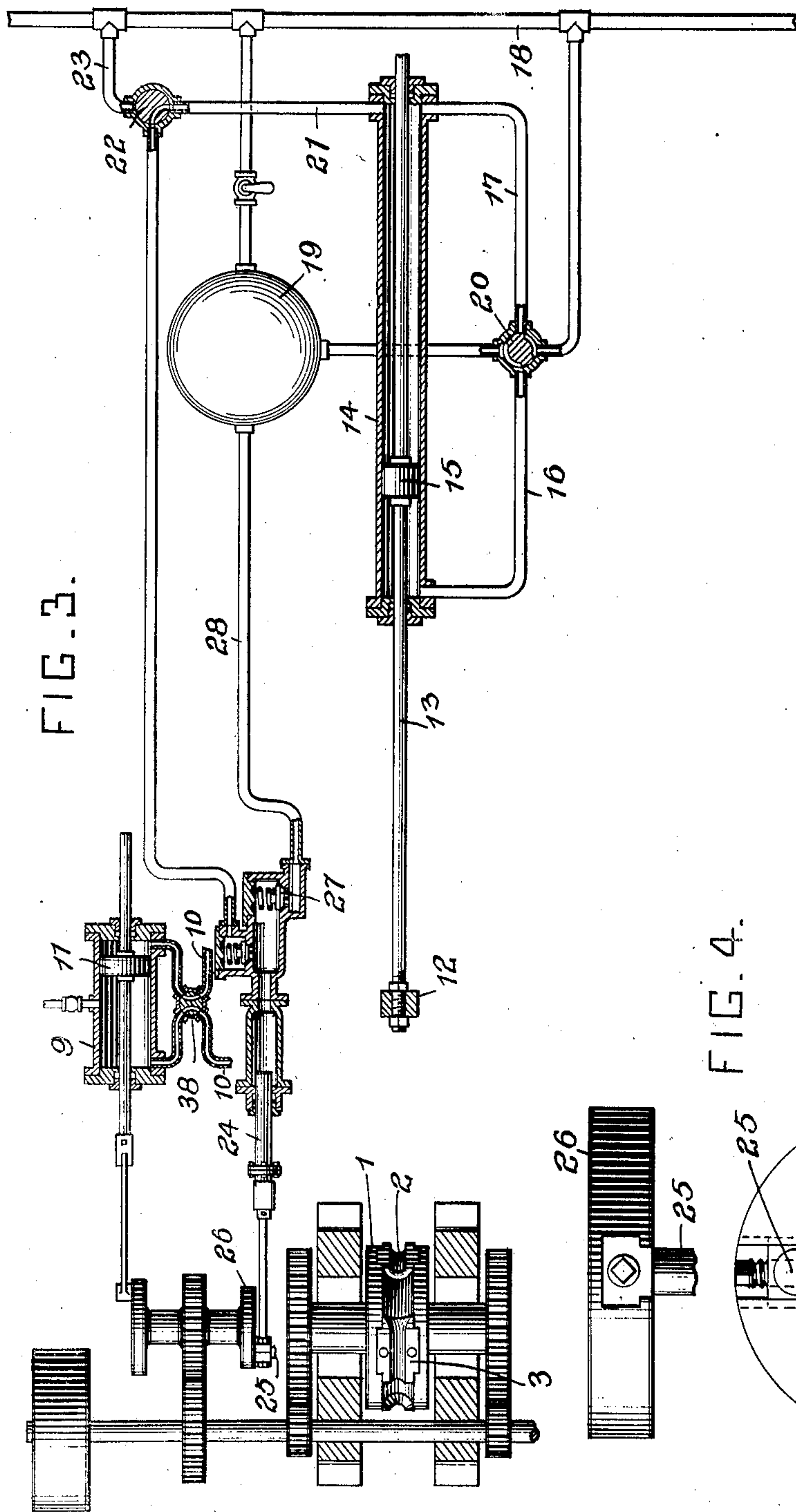
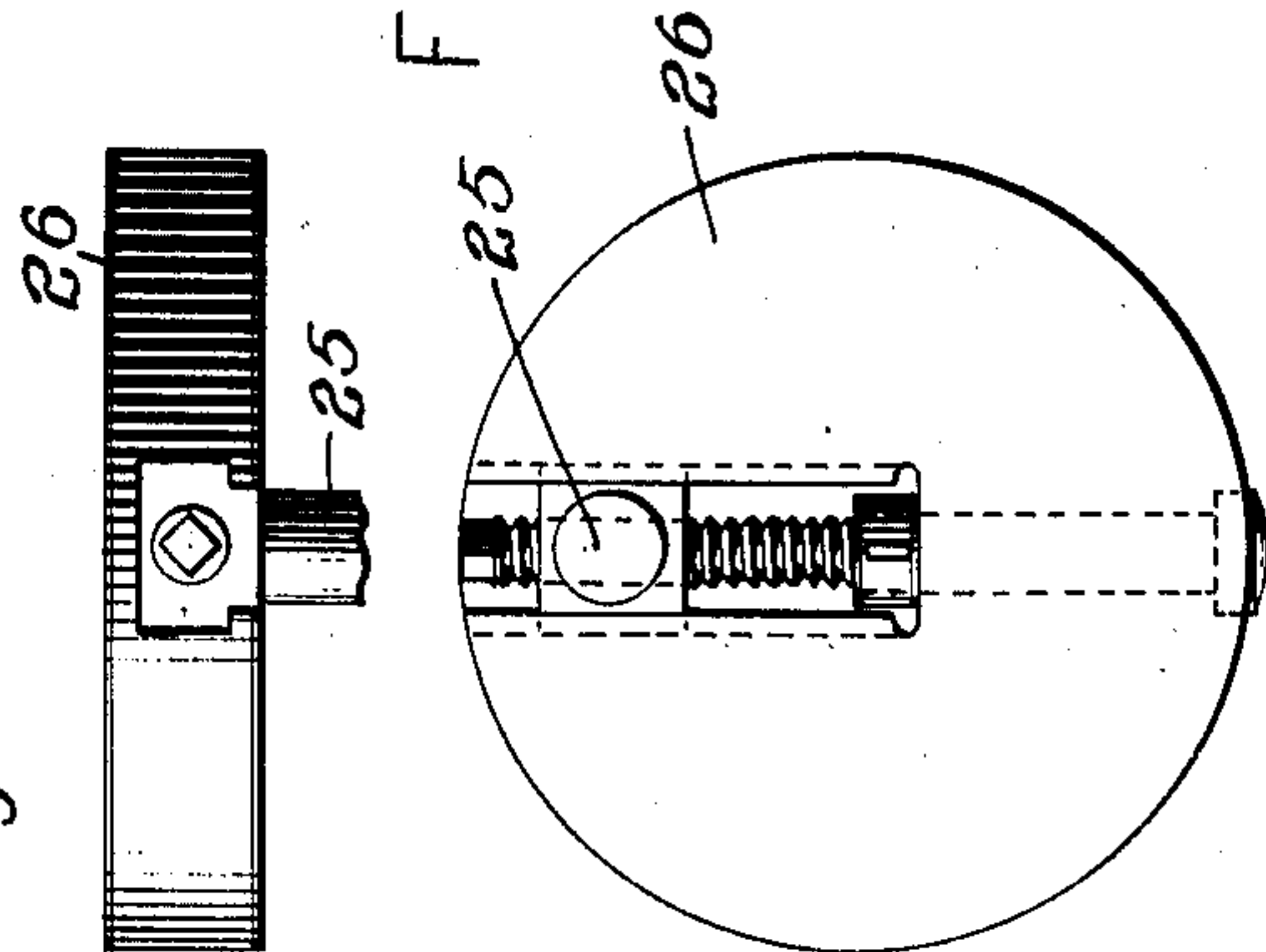


FIG. 3.

FIG. 4.



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3 SHEETS—SHEET 3.

FIG. 6.

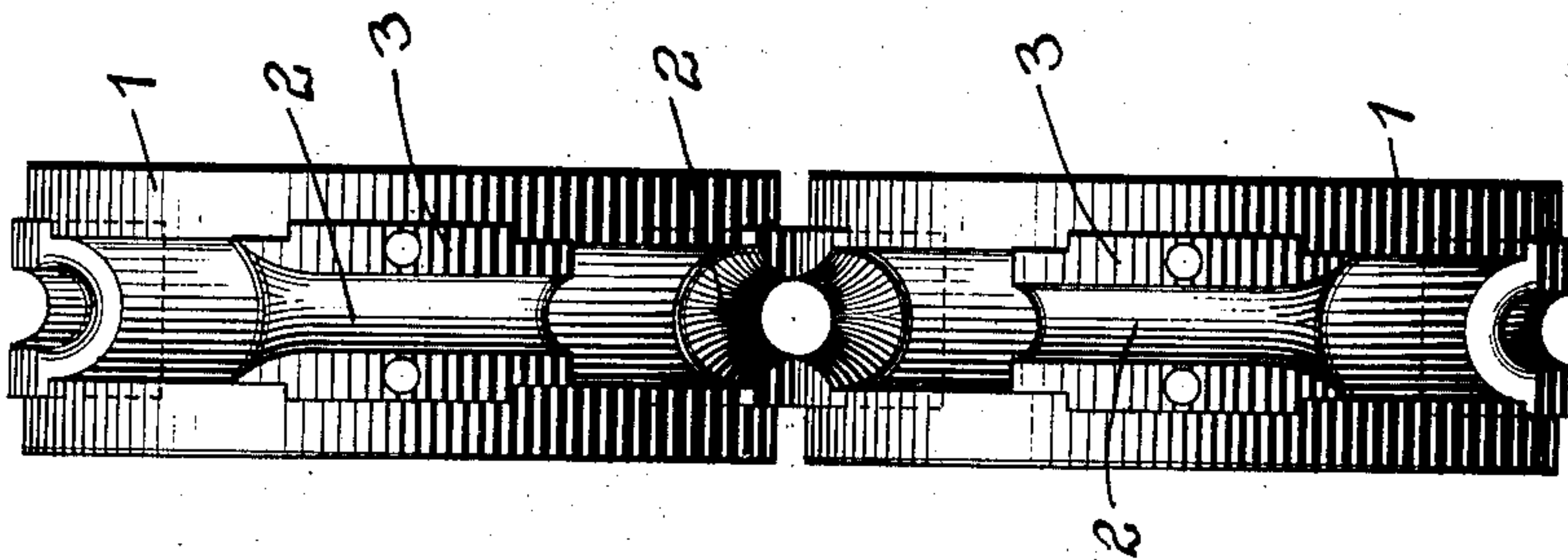
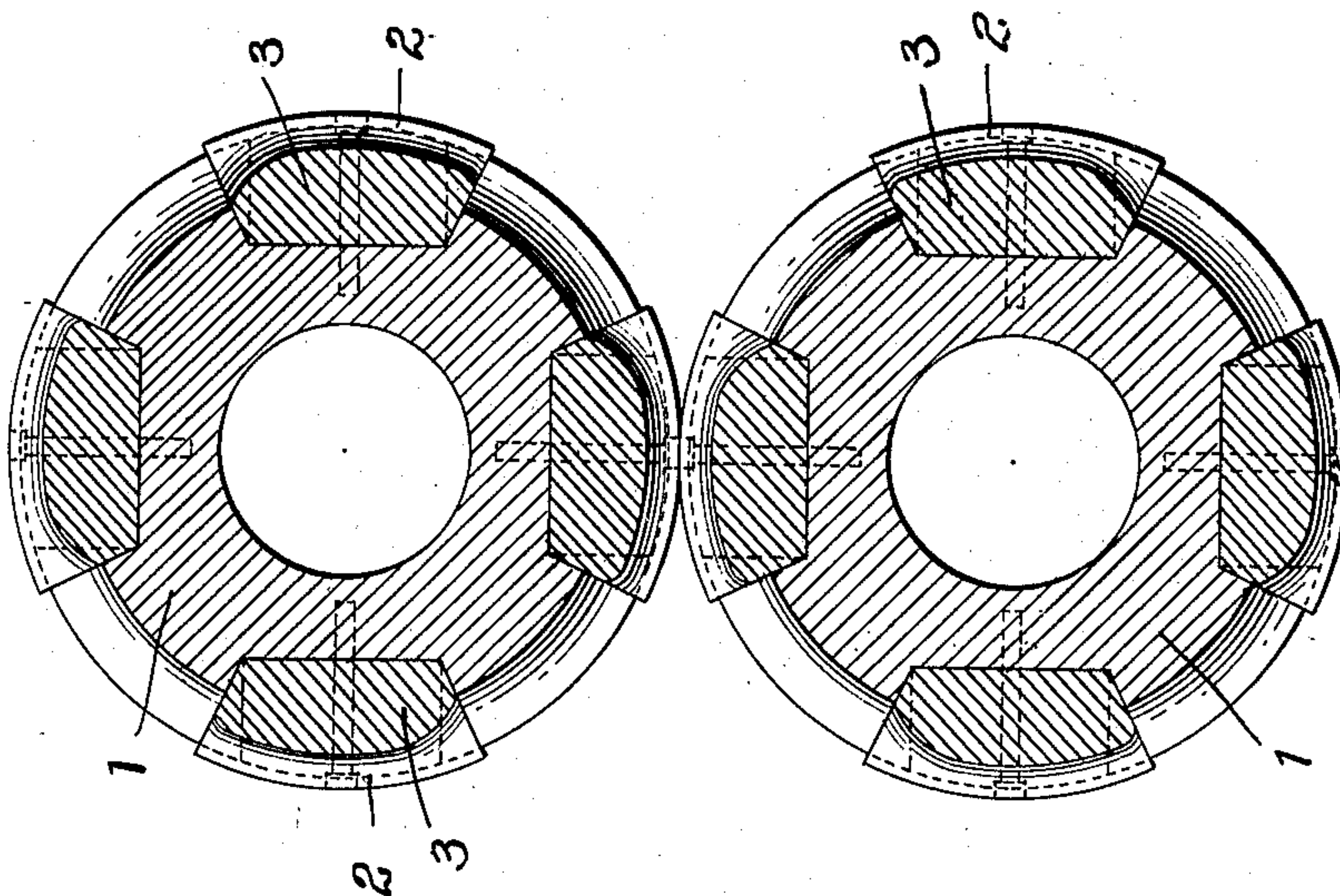


FIG. 5.



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UNITED STATES PATENT OFFICE.

EMIL WINTER, OF PITTSBURG, PENNSYLVANIA.

MILL FOR MANUFACTURE OF TUBES, &c.

No. 869,283.

Specification of Letters Patent.

Patented Oct. 29, 1907.

Application filed April 2, 1906. Serial No. 309,415.

To all whom it may concern:

Be it known that I, EMIL WINTER, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or
5 discovered certain new and useful Improvements in Mills for the Manufacture of Tubes, &c., of which improvements the following is a specification.

In an application filed May 9th, 1905, Serial No. 259,501, I have shown and described certain improvements in mills for swaging steel, iron, copper and other
10 billets to rods, bars or pipes, said improvements consisting generally stated in the employment of continuously rotating rolls having one or more dies or swaging portions, means controlled by the swages for imparting
15 a back and forth reciprocation to the billet, means for intermittently feeding the billet forward between the rolls, and means for rotating the billet during reduction.

The invention described herein relates to further improvements in the class or kind of mechanism above referred to.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings forming a part of this
25 specification Figure 1 is a top plan view of my improved machine; Fig. 2 is a sectional elevation on a plane indicated by the line II—II Fig. 1; Fig. 3 is a sectional plan view of the apparatus; Fig. 4 shows in edge and side elevation of the adjustable connection from the power
30 shaft to the plunger of the feeding pump; Fig. 5 is an elevation on an enlarged scale of the swaging or reducing rolls; and Fig. 6 is a sectional elevation of the same.

In the practice of my invention, the rolls 1 are provided with one or more dies or swaging portions 2, which
35 may be integral with the rolls, but preferably are formed in blocks, 3, which are secured in recesses formed in the peripheries of the rolls, as shown in Figs. 2, 5 and 6. The swaging portions have tapering matrices arranged so that the narrow portions will first bear on the billet
40 in the normal operation of the machine during which the rolls rotate in the direction of feed of the billet. Between the swaging portions the rolls are reduced in diameter, to permit of the billet being drawn back after each swaging operation.

The billet to be reduced is secured to a holder, 4, carried by a rod, 5, to which feed and reciprocatory movements are imparted, the forward portion of the reciprocation being equal to the peripheral movement of the rolls. This rod is connected to the piston, 6, of a fluid
50 pressure cylinder 7, but as the rod is rotated as hereinafter described, it is preferred to pass the rod loosely through a tube or hollow piston rod 8 to which the piston is secured. The rod is so connected to the hollow piston rod as to be free to rotate therein but to move
55 back and forth with the piston rod and piston. This construction permits of the rod and billet being rotated,

without affecting the piston or piston rod. The cylinder 7 is connected at points adjacent to its ends, to a cylinder 9 by pipes 10, which will permit of a movement of the cylinder 7, as hereinafter described. The piston
60 11 of the cylinder 9 is operated directly or indirectly by the rolls 1 or some connection thereto, so that a complete reciprocation will be imparted for each swaging action on the billet. In the construction shown there will be four swaging operations during each rotation of the
65 rolls, hence the piston 11 of the cylinder 9 is reciprocated four times during each revolution of the rolls. The cylinders 7 and 9 are charged with fluid at such a pressure that the piston 6 will immediately respond to any movement of the piston 11. While any fluid may
70 be employed, it is preferred that one having some elasticity, as air, should be used, and while the pressure should be sufficiently high to insure prompt response by the piston 6, as stated, a yielding under abnormal conditions should be provided for. The connections
75 10 should be such as to permit of the movement of the cylinder 7 with the carriage 12 on which said cylinder is mounted. This carriage is connected to the rod 13, passing through the cylinder 14 and having the piston
80 15 secured thereto.

In the forging operation it is desirable that the carriage 12 should be given first a comparatively quick movement, after the billet has been secured to its holder, to bring the latter into operative relation or feed position relative to the swaging dies, second, a step by
85 step feed movement, and third, a quick uniform movement away from the dies to strip the finished article from the holder and to move the latter to a position to receive another billet. These movements are effected by fluid pressure mechanism of any suitable design, and
90 as the described movements should preferably be positive and uniform, it is preferred to employ an incompressible fluid as water. While any suitable construction may be employed, that shown presents many advantageous features. The ends of the cylinder 14 are
95 connected by pipes 16 and 17 to a four-way valve mechanism 20, which is also connected to a high pressure supply line, 18, and to a reservoir 19. By shifting the valve 20 of the four-way mechanism, either end of the cylinder, 14, can be connected to the high pressure feed
100 line 18 and the opposite end of the cylinder to the exhaust reservoir 19, so that by properly shifting the valve 20 a quick uniform movement of the piston 15 and the carriage 12 can be produced. In order to effect a step by step feed movement of the piston 15 and carriage 12,
105 the cylinder is connected by a pipe, 21, to the outlet port of a pump mechanism which is controlled in its operation by or in accordance with the swaging dies, so that a feed movement will occur when the billet is free from the grip of the dies. It is preferred for reasons
110 hereinafter stated that the connection from the cylinder 14 to the outlet port of the pump should be through

a two-way valve mechanism, 22, which is also connected by a pipe 23, leading to the high pressure supply line.

The plunger 24 of the pump is connected to a crank pin 25 adjustably mounted on a disk 26, which is driven through suitable gearing by the power shaft of the machine. By adjusting the crank pin 25, the length of stroke of the plunger 24 can be changed in accordance with the amount of feed desired. The inlet port 27 of the pump is connected by a pipe 28 to the reservoir 19.

After the carriage has been moved towards the rolls to feed position by pressure from the line 18 the valve 20 is shifted to cut off such pressure from the cylinder, 14, but the connection of the pipe 16 with the reservoir 19 is maintained. At the same time the valve 22 is shifted to connect the outlet port of the pump with the cylinder and to cut off connection between said port and the high pressure line 18. With the valves 20 and 22 in this position, the pump will at each stroke force an amount of water dependent on its length of stroke, into the cylinder, 14, the pump drawing water for this purpose from the reservoir 19. As the amount of water forced into the cylinder is dependent solely on the length of stroke of the plunger 24, the feed of the billet will be the same regardless of the rate of rotation of the rolls or the pump operating mechanism. After the billet has been reduced and it is desired to move the carriage back, the valve 22 is shifted to cut off the connection of the pump to the cylinder 14, and to connect the former with the line 18, so that the operation of the rolls and pump need not be stopped. While it is preferred that the pump should be kept in operation while the rolls are operating, the pump, or its operating mechanism may be detachably connected to the driving mechanism. After the valve 22 is shifted as stated, the stripper plate 29 is raised by the lever 30 to engage the completed article and the valve 20 is shifted to connect the line 18 with the forward end of the cylinder, 14, and the rear end of the latter with the reservoir 19.

In addition to the progressive or feed movement imparted to the billet it should be given a rotation around its axis, such rotary movement being preferably given between succeeding swaging operations, and preferably amounting to about ninety degrees. To this end a fluid pressure cylinder, 31, is mounted on the carriage in suitable relation to the rod 5, and the piston rod, 32, of said cylinder is provided with a toothed portion adapted to engage a pinion, 33, loosely mounted on the rod. A pawl, 34, is so pivotally mounted on the pinion as to engage a ratchet wheel 35 secured to the rod 5. By this construction a rotary movement will be imparted to the rod and billet when the piston rod 32 is shifted in one direction, but on the return movement of the latter, the pinion will rotate on the rod without imparting any movement thereto. The ratchet wheel is so connected to the rod 5, as to permit the rod to reciprocate back and forth through it, while it insures the rotation of the rod with it. The rotation of the rod 5 and billet should be effected during their backward movement or while the billet is free from the grip of the swaging portions of the rolls. To this end the valve mechanism 36 controlling the flow of fluid pressure to and from the cylinder, 31, is adapted to be operated by the piston rod 8 through the

medium of an arm 37 secured to the piston and operative on the rearward movement of the piston rod to shift the valve in one direction and to reverse the valve when the piston rod moves forward.

In order to check the reciprocation of the billet holder, without stopping the rolls, suitable means are employed for interrupting the connection between the rolls and the cylinder 7. A convenient construction to that end consists in interposing a four-way valve mechanism 38 in the connections 10 from cylinder 9 to cylinder 7. In one position of this valve the fluid in cylinder 9 will flow to and fro from one end of said cylinder through the valve to the opposite end. When the valve is shifted the fluid will flow to and from one cylinder to the other thereby reciprocating the billet holder.

I claim herein as my invention:

1. In a machine for swaging billets, etc., the combination of rolls having one or more swaging portions, means for reciprocating the billet, fluid pressure means for feeding the billet comprising a cylinder and piston, and synchronizing means for forcing a predetermined volume of fluid into the cylinder at intervals whereby said fluid pressure means feed the billet in timed relation to the rolls.

2. In a machine for swaging billets, etc., the combination of rolls having one or more swaging portions, means for reciprocating the billet, fluid pressure means for feeding the billet, fluid pressure means for controlling the feed mechanism and a suitable connection from the roll train for operating the fluid pressure means.

3. In a machine for swaging billets, etc., the combination of rolls having one or more swaging portions and reduced intermediate portion or portions, means having a resilient member for reciprocating the billet, hydraulic pressure means for feeding the billet, means for controlling the feed mechanism and a suitable connection from the roll train for operating the controlling means.

4. In a machine for swaging billets, etc., the combination of swaging rolls, operating means therefor, a billet holder, means for effecting a relative reciprocation between the rolls and billet holder, a feed mechanism including a fluid pressure cylinder and piston, means for intermittently forcing predetermined quantities of fluid into the cylinder and means permitting the uninterrupted flow of fluid pressure into the cylinder.

5. In a mill for swaging billets, etc., swaging rolls and operating means therefor, a billet holder and means for permitting a relative reciprocation between the rolls and billet holder, in combination with feed mechanism for the billet comprising a cylinder and piston and means in train with the roll operating means adapted to control the admission of fluid pressure to the cylinder.

6. A mill for swaging billets, swaging rolls and operating means therefor, a billet holder and means for permitting a relative reciprocation between the rolls and billet holder in combination with feed mechanism for the billet comprising a cylinder and piston, a pump connected to the cylinder, mechanism for operating the pump in such connection with the swaging rolls that the pump will operate in timed relation to the rolls.

7. In a machine for swaging billets the combination of rolls having one or more swaging portions and reduced intermediate portion or portions, fluid pressure means for reciprocating the billet and adapted to move in one direction at a speed equal to and in the direction of movement of the rolls, means for rotating the billet controlled by the reciprocating mechanism, fluid pressure means for feeding the billet and suitable connection from the roll train for operating the feed mechanism.

In testimony whereof, I have hereunto set my hand.

EMIL WINTER.

Witnesses:

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J. HERBERT BRADLEY.