J. L. WHITE & J. B. POLO.

AUTOMATIC WATER SYSTEM.

APPLICATION FILED SEPT. 8, 1909.

999,075.

Patented July 25, 1911.

5 SHEETS—SHEET 1.

FIG. 1.

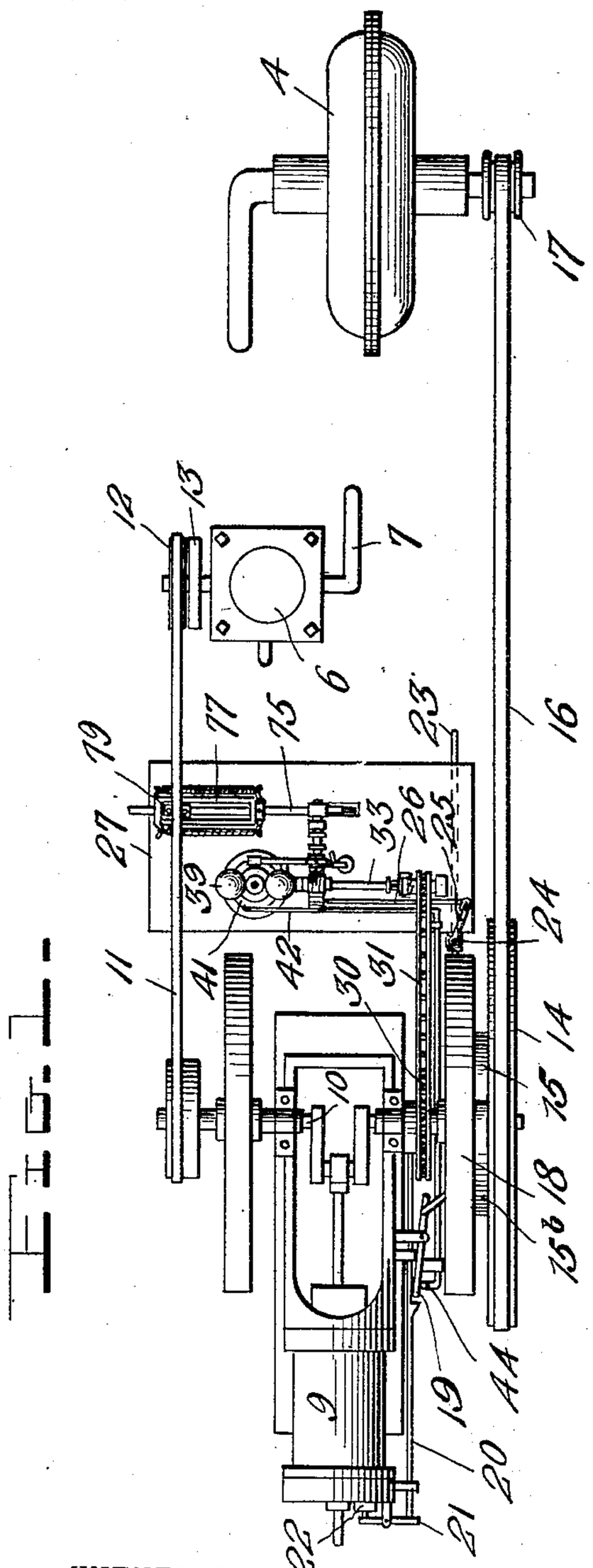
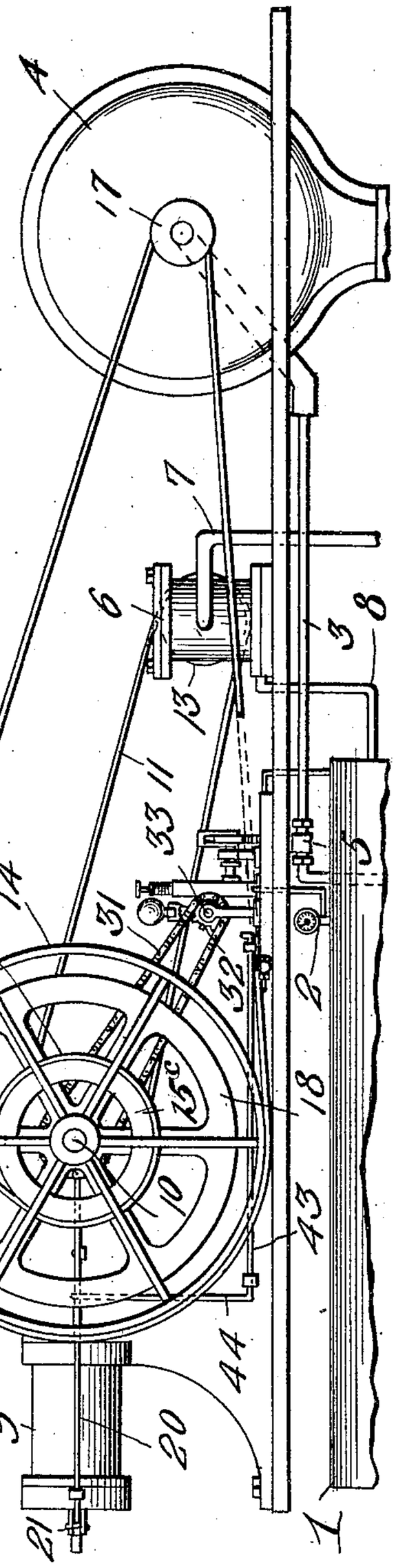


FIG. 2.



WITNESSES

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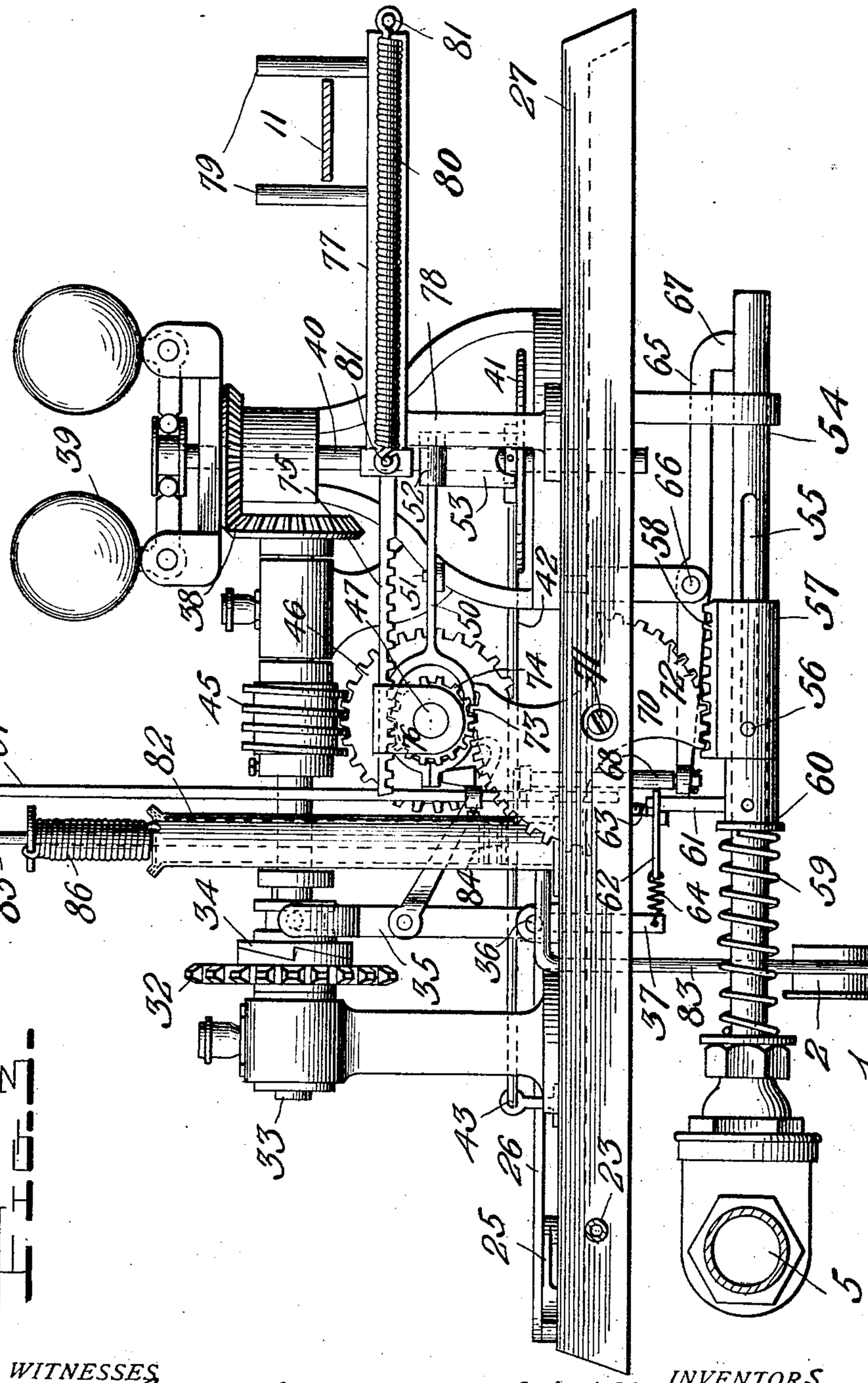

FIG. 2.

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5 SHEETS—SHEET 3.

FIG. 2.

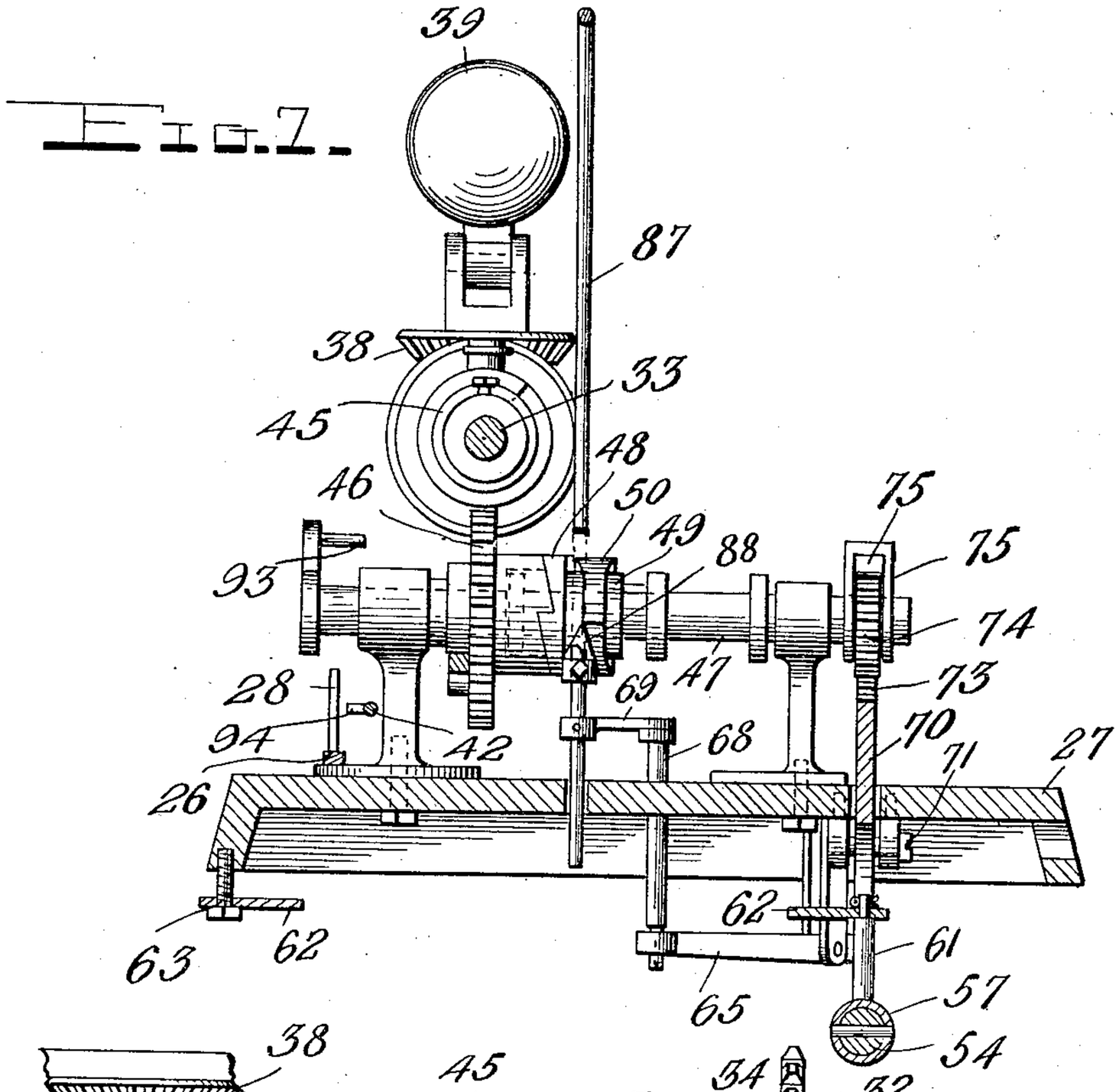
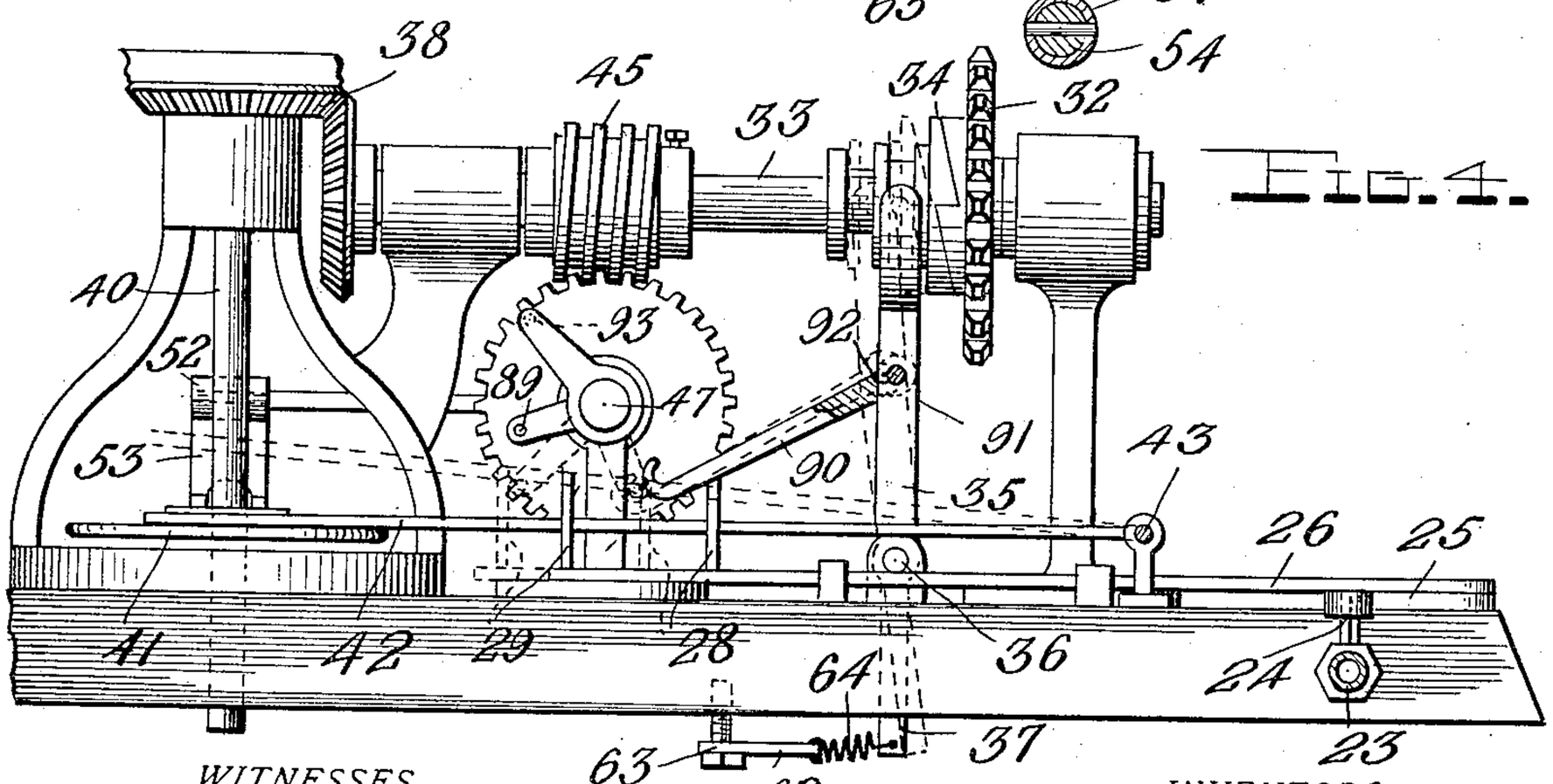


FIG. 4.



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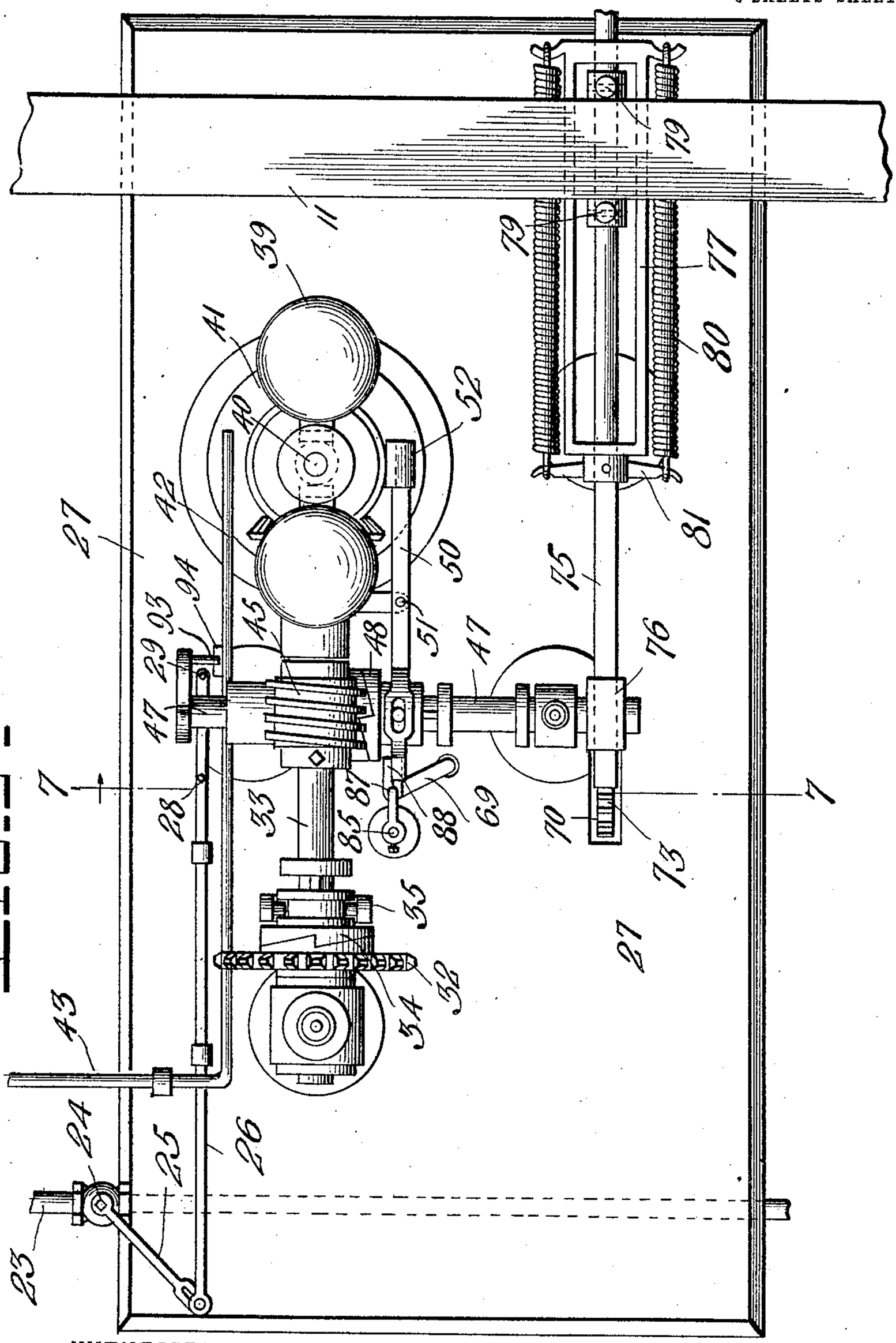
5 SHEETS—SHEET 4.

FIG. 5.



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5 SHEETS—SHEET 5.

FIG. 5.

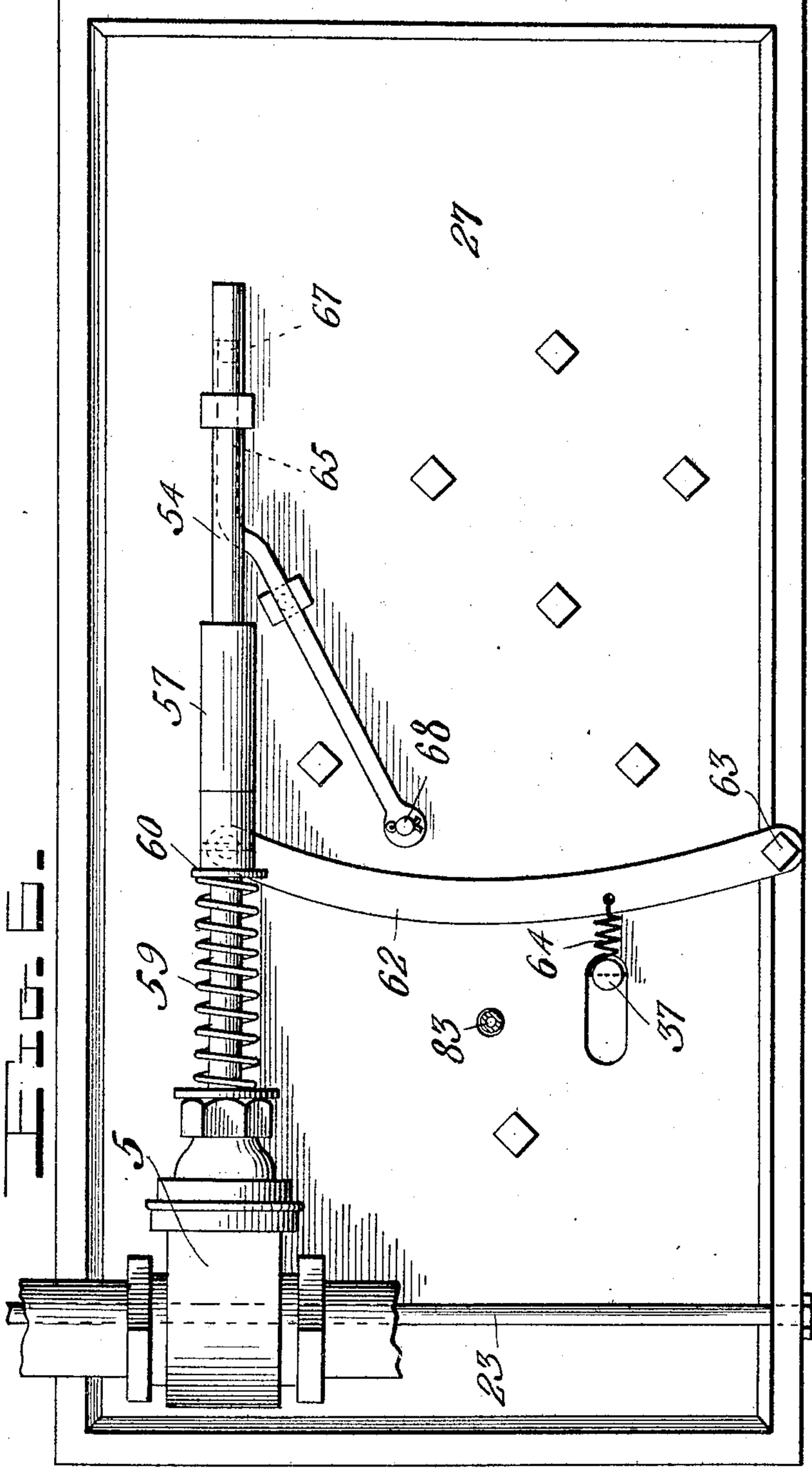


FIG. 6.

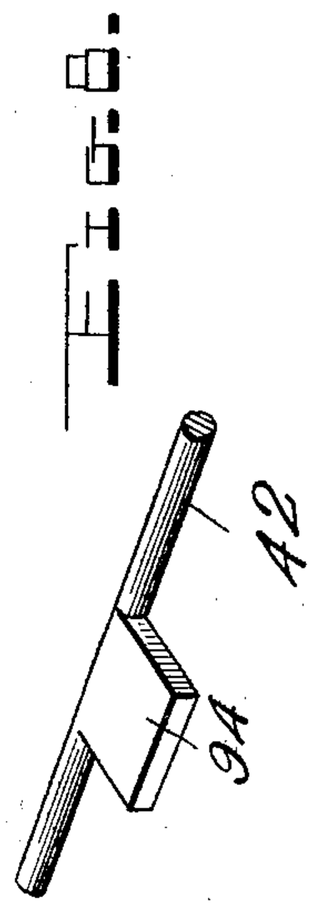
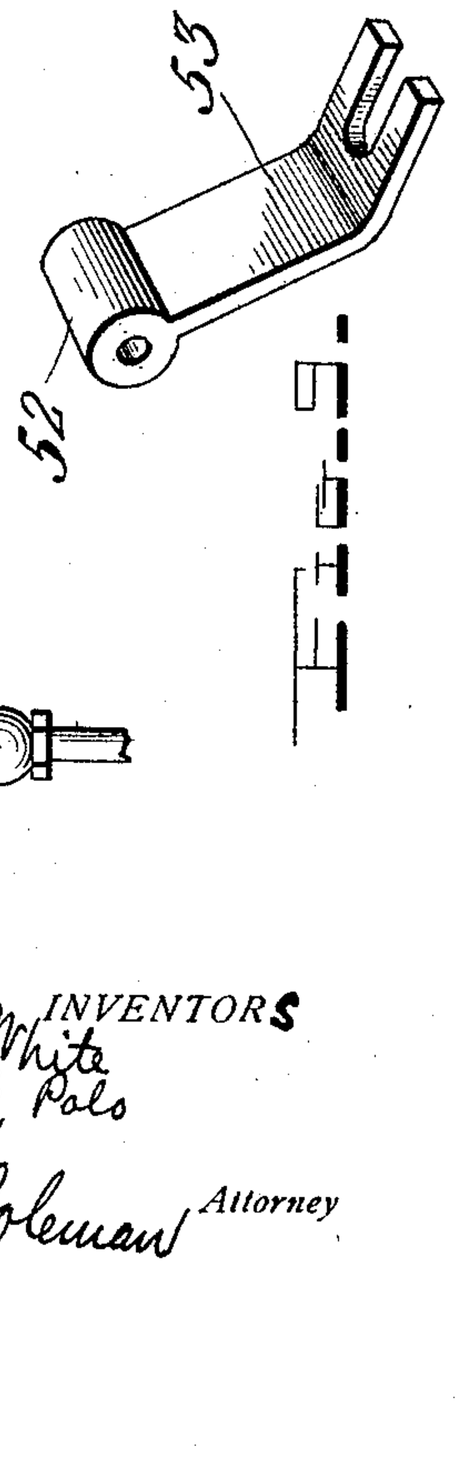


FIG. 7.



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UNITED STATES PATENT OFFICE.

JOHN L. WHITE, OF SIOUX FALLS, AND JOSEPH B. POLO, OF CLEAR LAKE, SOUTH DAKOTA.

AUTOMATIC WATER SYSTEM.

999,075. Specification of Letters Patent. Patented July 25, 1911.

Application filed September 8, 1909. Serial No. 516,807.

To all whom it may concern:

Be it known that we, JOHN L. WHITE, a citizen of the United States, residing at Sioux Falls, in the county of Minnehaha, State of South Dakota, and JOSEPH B. POLO, a subject of the Austro-Hungarian Empire, residing at Clear Lake, in the county of Deuel and State of South Dakota, have invented certain new and useful Improvements in Automatic Water Systems, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in automatic devices for maintaining a predetermined amount of water under pressure in a tank or other reservoir.

The object of the invention is to provide a simple and practical water system of this character which will be entirely automatic and reliable in operation and in which a gas engine for operating a pump will be automatically started and stopped according to the pressure in the tank.

With the above and other objects in view, the invention consists of the novel features of construction and the combination and arrangement of parts hereinafter fully described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of the improved automatic apparatus; Fig. 2 is a side elevation; Fig. 3 is an enlarged detail end view with parts broken away and in section; Fig. 4 is a detail view of the opposite end with parts omitted and in section; Fig. 5 is a top plan view of the parts shown in Fig. 3; Fig. 6 is a detail bottom plan view of certain of said parts; Fig. 7 is a detail section taken on the plane indicated by the line 7—7 in Fig. 5; and Figs. 8, and 9 are detail views of certain parts.

In the drawings 1 denotes a portion of a tank or other reservoir which is adapted to contain water and which is air tight so that a predetermined pressure may be maintained in it.

2 denotes a pressure gage suitably mounted on the tank and 3 denotes a water pipe extending from a point adjacent to the bottom of the tank to a suitable water motor 4. In the pipe 3 is an automatically operated cut off valve 5.

6 denotes a suitable water pump having an intake pipe 7 leading to a well or other source of supply for water and a discharge branch 8 leading to the tank 1, as shown in Fig. 2 of the drawings.

9 denotes a gasolene or similar explosive engine having upon its crank shaft 10 a pulley which is connected by a belt 11 to loose and tight pulleys 12, 13 on the shaft of the pump 6.

14 denotes a large belt wheel or pulley connected by a friction clutch 15, as shown more clearly in Fig. 2, to one end of the engine shaft 10. While the clutch 15 may be of any form and construction the one illustrated comprises a floating lever 15^a and friction strap 15^b carried by the pulley wheel, the strap being adapted to engage a friction disk or wheel 15^c fixed to the fly wheel 18. The lever 15^a has one of its ends pivotally connected at 15^d to the belt wheel 14, and the two ends of the strap are attached to said lever at the center and at its other end, as shown in Fig. 2. Owing to this construction it will be seen that when the wheel 14 is turned in one direction by the water motor the lever will be swung in a direction to tighten the strap or band upon the friction disk, and when said wheel 14 stops the strap will loosen and allow the friction disk to turn with the fly wheel of the engine. A belt 16 connects the pulley 14 to a smaller pulley 17 on the shaft of the water motor 4. The clutch 15 is of such construction that when the water motor starts the belt 16 will be caused to rotate the pulley 14 and hence the engine shaft but the latter will be free to run at a greater speed.

In one of the fly wheels 18 of the engine is arranged the usual centrifugal governor (not illustrated) which actuates a lever 19 arranged for movement into and out of the path of a projection on a slidable rod 20 adapted to be actuated by a cam on the engine shaft and to actuate a lever 21 which controls the exhaust valve 22 of the engine.

23 denotes a water cooling pipe which supplies cool water or other cooling fluid to the water jacket of the engine cylinder. In the pipe 23 is a cut off valve 24 having a lever 25 connected by a slidable rod 26 arranged in suitable guides on a base plate 27 or other support and having spaced upstanding pins 28, 29, as shown more clearly in Fig. 4, and the purpose of which will be hereinafter explained.

Fixed to the engine shaft 10 is a sprocket wheel 30 connected by a sprocket chain 31 to a sprocket wheel 32 loosely mounted on a shaft 33 journaled in suitable bearings on the base plate or support 27. The sprocket wheel 32 has on one side a clutch member adapted to be engaged by a similar clutch member 34 in the form of a sleeve keyed to rotate with the shaft but slidable longitudinally thereon and by means of which the sprocket 32 may be locked to said shaft for rotation therewith. The clutch 34 is controlled by a lever 35 pivoted intermediate its ends at 36 and having its lower end 37 projecting through an opening in the base plate.

Connected to the shaft 33 by beveled gears 38 is a centrifugal governor 39 the stem 40 of which slides vertically in a suitable guide and has fixed to its lower portion a circular plate or disk 41. Adapted to rest upon one side of the latter is an arm 42 on one end of a horizontal rock shaft 43 mounted in suitable bearings on the plate 27 and having at its other end an arm 44 adapted to engage and actuate the lever 19 of the speed regulating device on the engine.

Fixed to the intermediate portion of the shaft 33 is a worm 45 which meshes with a worm gear 46 loosely mounted on a shaft 47 disposed beneath and at right angles to the shaft 33 and mounted in suitable bearings on the plate 27. The worm gear 46, as shown more clearly in Fig. 7 of the drawings, has upon one of its sides a clutch member with which co-acts a similar clutch member 48 in the form of a collar or sleeve 49 keyed to the shaft 47 for rotation therewith but adapted to slide longitudinally thereon. The clutch 49 is controlled by a shifting lever 50 pivoted intermediate its ends on a vertical pivot 51 and having an open or loop-like end operatively connected with the clutch collar or member 49. The clutch lever 50 is disposed horizontally and pivoted on its other end, as shown at 52, is a dog 53 the lower end of which rests upon the governor disk 41. Owing to this construction it will be seen that when the disk 41 is raised, the dog 53 will cause the lever 50 to swing horizontally on its vertical pivot 51 and thereby shift the clutch 49 to lock the worm gear 46 to its shaft, said worm gear being normally loose or disconnected.

The valve 5 is arranged beneath the base plate 27 and has its stem 54 slidably arranged in suitable guides and formed with a longitudinal slot 55. The latter receives a cross pin 56 arranged in a sleeve 57 slidable on the valve stem and carrying a rack 58. The valve 5 is spring actuated to its open position by means of a coil spring 59 arranged upon it between the valve casing and a stop sleeve 60 secured to the stem and having an upstanding arm 61 loosely connected to one end of a lever 62. The latter is pivoted at its other end at 63 to the bottom of the base plate 27 and its intermediate portion is connected by a coil spring 64 to the depending end 37 of the clutch lever 35.

The valve 5 is adapted to be held in its closed position by means of a catch lever 65 pivoted intermediate its ends at 66 and having a shouldered, weighted end 67 adapted to engage the free end of the valve stem 54. The other end of said catch lever 65 has connected to it an upstanding rod 68 loosely arranged for sliding movement in an opening in the base plate 27 and having at its upper end a horizontally extending arm 69, as shown more clearly in Fig. 7.

70 denotes a double segmental gear pivotally mounted at 71 and having on one side a gear segment 72 adapted to mesh with and actuate the rack 58 for the purpose of closing the valve 5. The gear 70 has a second gear segment 73 which meshes with a pinion 74 fixed to the shaft 47. The segment 73 meshes with the lower portion of the pinion or gear 74 and in mesh with the upper portion of the latter is a rack bar 75 having one end slidably mounted in a guide 76 and its other end slidable in a guide frame 77 on a bracket 78 attached to the base plate 27. Said rack 75 forms a belt shipper and has secured upon it two upstanding arms 79 which receive the belt 11 between them and which are adapted to shift said belt from the loose pulley 12 to the tight one 13 and back again. Coil springs 80 attached at one end to the frame 77 and at their other end to a cross head 81 on the rack bar 75 are adapted to actuate said bar in one direction and to normally maintain the belt 11 on the loose pulley 12.

82 denotes a pressure cylinder arranged upon the base plate 27 and having its lower end connected by a pipe 83 to the tank 1. Arranged for reciprocation in the cylinder 82 is a piston 84 secured at the lower end of a piston rod 85 which is actuated downwardly by a coil spring 86 attached at one end to said rod and at its other end to the upper end of the cylinder. Adjustably secured to the piston rod 85 is an upright rod 87 having its lower end slidably arranged in the base plate 27 and also adjustably secured to the arm 69, as shown more clearly in Fig. 7. It will be seen, therefore, that when the pressure in the tank 1 lowers beyond a predetermined amount the downward movement of the piston 84 will cause the rod 87 to actuate the catch lever 65 so that the latter will release the stem 54 of the valve 5 and allow the spring 59 to open said valve. Adjustably secured on the rod 87 is a wedge-shaped trip arm or projection 88 so arranged as to engage the clutch lever 50 and shift the latter to cause the clutch 49 to unlock the worm gear 46 from its shaft

47. The trip 88 is so arranged as to actuate said clutch when the pressure in the tank 1 reaches a predetermined amount.

Fixed to the shaft 47 is an arm carrying a pin 89 adapted to engage the hook-shaped free end of an arm 90 pivoted at its other end at 91 on the upper portion of the clutch lever 35. Said pivoted end of the arm or link 90 is bifurcated so that a shoulder 92 is formed, as shown in Fig. 4, to limit the downward movement of said arm or link. Fixed to the shaft 47 is another arm provided with a pin 93 so arranged as to move under and engage a laterally projecting shoulder or plate 94 on the arm 42 of the rock shaft 43, when said arm has been lifted by the governor disk or plate 41, as hereinafter explained. The pin 93 is also adapted to co-act with the two upright pins 28, 29 on the valve operating rod 26, it being noted on reference to Fig. 4 that when the pin 93 moves in the direction of the arrow it will engage the pin 29 and shift it from its full line to its dotted line position, thereby opening the valve 24 and when said pin moves in the opposite direction it will engage and actuate the pin 28 to restore the valve 24 to its normal or closed position.

The operation of the invention is as follows: When the water in the tank 1 lowers and the pressure therein drops below a predetermined amount, the downward movement of the piston 84 will cause the rod 87 to trip the catch 65. When the weighted shouldered end 67 of said catch lever disengages the end of the stem 54 the spring 59 will actuate the stem to its position shown in Fig. 3, thereby opening the valve 5 so that water in the tank 1 will pass through the pipe 3 to the water motor 4. The movement of the latter will be imparted by the belt 16 to the crank shaft of the engine, thereby reciprocating the piston of the latter, but since the exhaust valve 22 of the engine is held normally open through the instrumentality of the arm 44 and lever 19 no charge will be sucked into the cylinder and hence no explosions will occur. The movement of the shaft 10 will be imparted by the sprocket chain 31 to the worm shaft 33, the sprocket wheel 32 being normally locked to said shaft by the clutch 34. The worm wheel 46 being normally loose on its shaft 47 will not rotate said shaft so that when the shaft 33 is thus rotated it will only actuate the governor 39. As the speed increases the stem 40 of the governor will be raised, thereby causing the plate 41 to elevate the arm 42 and the dog 53. As the arm 42 is elevated, the other arm 44 on the rock shaft 43 will be swung away from the lever 19, thereby allowing the latter to disengage the catch projection on the rod 20 and permitting the exhaust valve of the engine to close. When said valve is thus closed the charge is sucked into the cylinder and the engine starts up. When the disk 41 elevates the dog 53 the latter swings the clutch lever 50 on its pivot 51 and causes it to shift the clutch 48 into engagement with the worm gear 46 to lock the latter to its shaft, whereupon the motion of the worm 45 will be imparted to the shaft 47. As the latter rotates the pinion 74 upon it actuates the rack bar 75 against the tension of the springs 80 and shifts the belt 11 from the loose to the tight pulley 13, thereby starting the pump 6. Said pinion or gear 74 also actuates the double segmental gear 70 to cause its toothed portion 72 to actuate the rack 54 and hence the sleeve 57. This sleeve moves the stem 54 against the tension of the spring 59 to close the valve 5 and when said valve reaches its closed position the weighted end 67 of the catch lever 65 drops into engagement with the end of the stem 54 to hold the valve 5 in closed position. When said valve 5 closes the water motor will, of course, stop and, owing to the friction clutch 15, the engine shaft will continue to rotate without imparting movement to the pulley 14. As the shaft 47 is rotated the pin 93 on one of its arms moves in the direction of the arrow in Fig. 4 and engages and actuates the pin 29 to open the valve 24 so that the water or other cooling medium may circulate through the water jacket of the engine. The continued movement of the pin 93 brings it under the shoulder or plate 94 of the arm 42, thereby holding said arm in the position to which it is elevated by the governor disk 41 and thereby maintaining the other arm 44 on the rock shaft 43 out of engagement with the lever 19. Said movement of the shaft 47 also carries the pin 89 around in the direction of the arrow in Fig. 4 so that it engages the hook arm 90 and swings the clutch lever 35 from the full line to the dotted line position in said Fig. 4, thereby unlocking the sprocket wheel 32 from the shaft 33. When this occurs the motion of the shaft 33 will cease and the governor 39 in stopping will lower the disk 41. Since the worm gear 46 remains locked to the shaft 47 the worm 45 will prevent the reverse movement of the shaft 47 under the action of the springs 80 until the clutch lever 50 is shifted to release the gear 46. When the belt 11 is shifted to the fixed pulley 13 the motion of the engine will operate the pump 6 so that water will be supplied to the tank 1. As the pressure in the latter reaches a predetermined point the upward movement of the piston 84 will cause the rod 87 to be lifted and the wedge-shaped trip 88 on said rod 87 will engage and actuate the lever 50 to cause the clutch 49 to release the worm gear from the shaft 47. When these parts are thus released the springs 80 will reciprocate the rack bar 75, thereby shifting the belt 11 onto the loose

pulley and stopping the pump. Said rack 75 actuates the pinion 74 and hence the shaft 47. The return movement of the pin 89 releases the clutch lever 37 so that the sprocket wheel 32 is again locked to its shaft and the return movement of the pin 93 causes the valve 24 to be closed and allows the arm 42 to lower. When said arm 42 is thus released the other arm 44 on the rock shaft 43 will swing inwardly to move the lever 19 into the path of the projection on the rod 20 so that the exhaust valve of the engine will be held in open position. When this occurs the engine will stop.

While the preferred embodiment of the invention has been shown and described in detail, it will be understood that changes in the form, proportion and arrangement of parts and in the details of construction may be resorted to within the spirit and scope of the invention.

Having thus described the invention what is claimed is:

1. In a device of the character described, the combination of a pressure and storage tank, a pump for supplying water thereto, a water motor actuated by water from the tank, a valve for controlling the operation of said water motor, a driving means between the gas engine and the pump for operating the latter from the former, a driving means between the gas engine and the water motor for actuating the former from the latter, a pressure device connected to said tank, and means controlled by said pressure device for starting and stopping the engine and controlling said pump driving means.

2. In a device of the character described, the combination of a pressure and storage tank, a pump for supplying water thereto, a water motor actuated by water from the tank, a valve for controlling the operation of said water motor, a gas engine, a driving means between the gas engine and the pump for operating the latter from the former, a driving means between the gas engine and the water motor for operating the former from the latter, and a pressure controlled means connected to said tank and adapted to operate said valve, to start and stop the engine, and to control said pump driving means.

3. In a device of the character described, the combination of a pressure and storage tank, a pump for supplying water thereto, a water motor actuated by water from the tank, a valve for controlling the operation of said water motor, a gas engine, a driving means between the gas engine and the pump for operating the latter from the former, a driving means between the gas engine and the water motor for operating the former from the latter, a pressure device connected to said tank, a spring for opening said valve, a catch for holding said valve closed, means operated by said pressure device for actuating said catch and means for closing said valve.

4. In a device of the character described, the combination of a pressure and storage tank, a pump for supplying water thereto, a water motor actuated by water from the tank, a valve for controlling the operation of said water motor, a gas engine, a driving means between the gas engine and the pump for operating the latter from the former, a driving means between the gas engine and the water motor for operating the former from the latter, a pressure device connected to said tank, means actuated by said pressure device for controlling the opening of said valve and means for controlling the operativeness of the engine, for controlling the pump driving means and for closing said valve.

5. In a device of the character described, the combination of a pressure and storage tank, a pump for supplying water thereto, a water motor actuated by water from the tank, a valve for controlling the operation of said water motor, a gas engine, a driving means between the gas engine and the pump for operating the latter from the former, a driving means between the gas engine and the water motor for operating the former from the latter, a pressure device connected to said tank, means operated by said pressure device for controlling the opening of said valve, means actuated from the gas engine for simultaneously closing said valve and actuating said pump driving means and means actuated by said pressure device for actuating the last mentioned means.

6. In a device of the character described, the combination of a pressure and storage tank, a pump for supplying water thereto, a water motor actuated by water from the tank, a valve for controlling the operation of said water motor, a gas engine, a driving means between the gas engine and the pump for operating the latter from the former, a driving means between the gas engine and the water motor for operating the former from the latter, a pressure device connected to said tank, means operated by said pressure device for controlling the opening of said valve, a speed regulating device on the engine including a movable member adapted to maintain the exhaust valve in open position, a shaft actuated from the engine shaft, a speed governor connected to said shaft, means actuated by said governor for controlling the member of said speed regulating device of the engine and means actuated from said shaft for simultaneously closing said valve and actuating said pump driving means.

7. In a device of the character described, the combination of a pressure and storage

tank, a pump for supplying water thereto, a water motor actuated by water from the tank, a valve for controlling the operation of said water motor, a gas engine, a driving means between the gas engine and the pump for operating the latter from the former, a driving means between the gas engine and the water motor for operating the former from the latter, a pressure device connected to said tank, means operated by said pressure device for controlling the opening of said valve, a speed regulating device on the engine including a movable member adapted to maintain the exhaust valve in open position, a shaft actuated from the engine shaft, a speed governor connected to said shaft, means actuated by said governor for controlling the member of said speed regulating device of the engine, a worm upon said shaft, a second shaft having a worm gear to mesh with said worm, means actuated by the worm gear shaft for controlling said pump driving means, means actuated by the worm gear shaft for closing said valve, means actuated by the worm gear shaft for disconnecting the worm shaft from the engine shaft, a clutch connecting said worm gear to its shaft and controlled by said governor and means actuated by said pressure device for actuating said clutch.

8. In a device of the character described, the combination of a pressure and storage tank, a pump for supplying water thereto, a water motor actuated by water from said tank, a valve for controlling the operation of said water motor, a gas engine, a speed regulating device for said engine including a movable member for maintaining the exhaust valve of the engine in open position, a driving means between said gas engine and pump for operating the latter from the former, said driving means including a belt and tight and loose pulleys, a driving means between the gas engine and water motor for actuating the former from the latter, a pressure device connected to said tank, means actuated by said pressure device for controlling the opening of said valve, a worm shaft having a worm, a driving means between the worm shaft and the crank shaft of the engine, the last mentioned driving means including a clutch, a governor connected to said worm shaft, means actuated by said governor for controlling the member of the speed regulating device of the engine, a worm gear shaft having a worm gear in mesh with said worm, a clutch for locking said worm gear to its shaft, means operated by the governor for actuating said clutch, a shipper for said belt spring actuated in one direction and operatively connected to said worm gear, means actuated by said worm gear shaft for closing said valve, means actuated by said worm gear shaft for controlling the clutch for the driving means between the worm shaft and the engine shaft and means actuated by said pressure device and for operating the worm gear clutch.

9. In a device of the character described, the combination of a pressure and storage tank, a pump for supplying water thereto, a water motor actuated by water from said tank, a valve for controlling the operation of said water motor, a gas engine, a speed regulating device for said engine including a movable member for maintaining the exhaust valve of the engine in open position, a driving means between said gas engine and pump for operating the latter from the former, said driving means including a belt and tight and loose pulleys, a driving means between the gas engine and water motor for actuating the former from the latter, means actuated by said pressure device for controlling the opening of said valve, a worm shaft having a worm, a driving means between the worm shaft and the crank shaft of the engine, the last mentioned driving means including a clutch, a governor connected to said worm shaft, means actuated by said governor for controlling the member of the speed regulating device of the engine, a worm gear shaft having a worm gear in mesh with said worm, means actuated by the governor for operating said clutch, a shipper for said belt spring actuated in one direction and operatively connected to said worm gear shaft, means actuated by said worm gear shaft for closing said valve, a pipe for supplying a cooling fluid to the jacket of the engine, a valve in said pipe, means actuated from the worm gear shaft for opening and closing the last mentioned valve, means actuated from said worm gear shaft for controlling the clutch of the driving means between the worm shaft and the engine shaft and a pressure device connected to said tank for actuating the worm gear clutch.

10. In a device of the character described, the combination of a pressure and storage tank, a pump for supplying water thereto, a gas engine, a driving means between the pump and gas engine for operating the former from the latter, a water motor actuated by water from the tank, a valve for controlling the operation of said water motor, a driving means between the gas engine and the water motor, for operating the former from the latter, a pressure device connected to said tank for controlling the opening of said valve, a speed regulating device for the gas engine including a movable member for maintaining the exhaust valve of the engine in open position, a governor actuated from the engine shaft for controlling said member and means controlled by said governor for actuating said pump driving means to operative and inoperative positions.

11. In a tank filling apparatus, the combi-

nation of means to pump water to said tank including an explosive engine with means to start said engine comprising a water wheel, means to discharge water under pressure against said wheel, and clutch means responsive to the speeding up of said engine under its own power to automatically disconnect the water wheel from the explosive engine after the latter is started, substantially as described.

12. In a tank filling apparatus, the combination of means to pump water to said tank including an explosive engine with means to start said engine comprising a water wheel, means to discharge water under pressure against said wheel, clutch means to automatically disconnect the water wheel from the explosive engine when the latter is started and running under its own power and means to automatically cut said engine out of service when the tank is filled with water, substantially as described.

13. In an apparatus for maintaining water in tanks, the combination of an explosive engine driven pumping outfit, and a starting mechanism for the explosive engine comprising a water wheel, means to deliver a stream of water thereto, means to transmit motion from said water wheel to said engine to start same, means to automatically disconnect the water wheel from said engine when the latter is running under its own power, means to automatically cut off the flow of water to said water wheel as soon as said engine is started, and means to automatically stop said engine when the tank is filled.

14. In an apparatus for maintaining tanks filled with water, the combination of an explosive engine for driving a pump which supplies water to said tank, of a motor for starting up the explosive engine, speed responsive means to automatically disconnect said starting motor from said engine as soon as the latter is running under its own power, means to automatically stop said starting motor as soon as said engine is running under its own power, and means to automatically stop said engine when the tank is filled.

In testimony whereof we hereunto affix our signatures in presence of two witnesses.

JOHN L. WHITE.
JOSEPH B. POLO.

Witnesses to signature of John L. White:
JAMES W. CONE,
C. R. HEATH.

Witnesses to signature of Joseph B. Polo:
A. D. WILLIAMS,
A. J. LOCKHART.