(No Model.) 2 Sheets—Sheet 1.

F. H. RICHARDS.

HYDRAULIC APPARATUS.

No. 576,154. Patented Feb. 2, 1897.

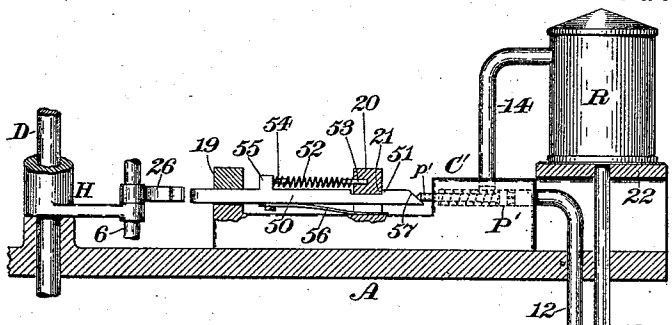


Fig. 1.

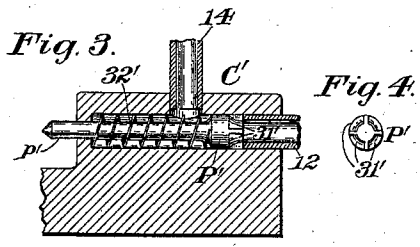


Fig. 3.

Fig. 4.

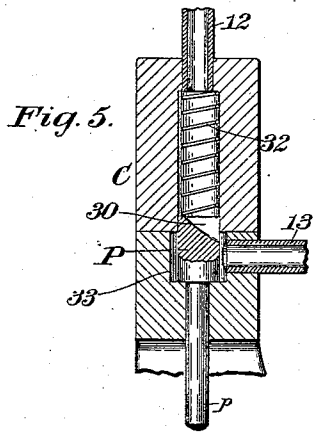


Fig. 5.

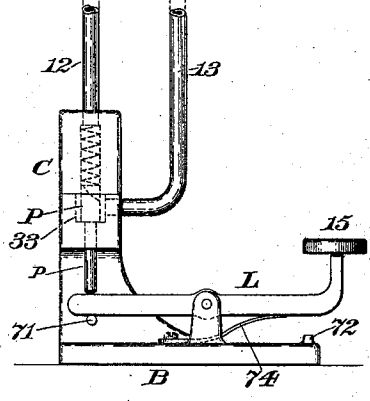
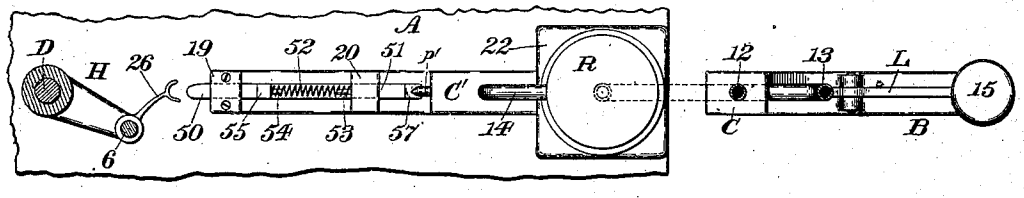


Fig. 2.



Witnesses:
F. L. Edwards Jr.
Fred. J. Dole.

Inventor:
F. H. Richards.

(No Model.)

2 Sheets—Sheet 2.

F. H. RICHARDS.

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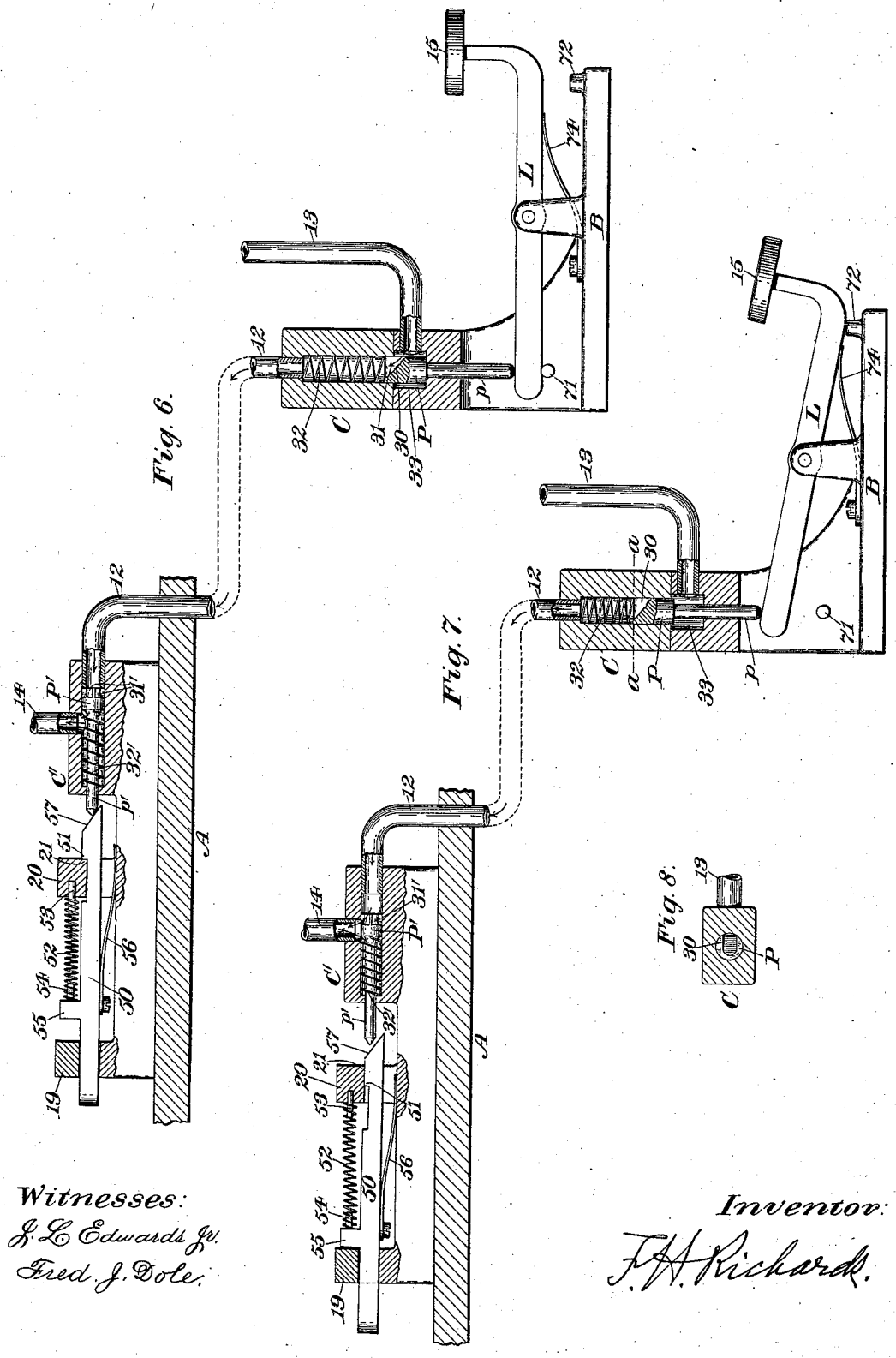

Witnesses:
J. L. Edwards Jr.
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Inventor:
F. H. Richards.

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

HYDRAULIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 576,154, dated February 2, 1897.

Application filed April 6, 1896. Serial No. 586,342. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Hydraulic Apparatus, of which the following is a specification.

This invention relates to fluid-operated mechanisms, the object being to furnish fluid-operated devices adapted for use in connection with apparatus such, for instance, as a type-writer or other key-operated machine.

More particularly, my invention is designed to form a simple and convenient means for actuating a latch of the general type shown, for example, in the latch mechanism illustrated in my prior patent, No. 401,371, granted April 16, 1889, and irrespective of the distance between the latch and its primary actuator.

In the drawings accompanying and forming part of this application, Figure 1 is a sectional side elevation of so much of a fluid-operated mechanism as is necessary for the illustration of my present invention and shows the parts at rest in position to be operated. Fig. 2 is a sectional plan view of the same. Fig. 3 is a detail longitudinal section, partly in side elevation and on an enlarged scale, of the secondary or latch-actuating piston and its coöperating devices. Fig. 4 is a detail rear end elevation of the secondary piston shown in Fig. 3. Fig. 5 is a detail vertical longitudinal section, partly in side elevation and on an enlarged scale, of the primary or actuating piston and its coöperating devices. Fig. 6 is a longitudinal sectional side elevation, on an enlarged scale, of a portion of the apparatus shown in Fig. 1 and illustrates the normal idle positions of the latch mechanism and the key-actuated mechanism for operating the same. Fig. 7 is a similar view showing the operation of forcing the fluid through the service-conduit to actuate the latch on the depression of a key, and also illustrates the action of the devices for cutting off the supply to the service-conduit and for permitting the escape of surplus fluid from the same; and Fig. 8 is a detail sectional plan view of the primary cylinder and its piston, the section being taken in line *a a*, Fig. 7.

Similar characters designate like parts in all the figures of the drawings.

My improved fluid-operated mechanism embodies some suitable secondary cylinder carrying a corresponding piston, a fluid-conveyer provided with a service-conduit which communicates at its forward end with the rear end of the secondary cylinder, and an actuator for forcing fluid through the service-conduit and the secondary cylinder for the purpose of actuating the secondary piston. A latch is also provided having suitable means for replacing the same, and this latch is positioned so as to be actuated and released by means of the secondary piston when this piston is operated. A primary or fluid-actuating cylinder is also preferably located so as to communicate at its forward end with the rear end of the service-conduit and is provided with a piston adapted to be operated by the actuator.

In carrying my invention into effect the actuating or key-operated mechanism may be disposed in any convenient position, and the devices which are operated thereby may be located relatively remotely therefrom, as best shown in Fig. 1, thus permitting the conveyance of power for operating the latch mechanism to a considerable distance from the operating point. Any suitable framework may be employed for carrying each of the two isolated mechanisms illustrated in the present case, or a single frame structure may be provided, if desired. In this instance I have represented the latch mechanism and coöperating parts as carried by a frame, such as A, having a pair of standards or supports, such as 19 and 20, to form a mounting for the latch, the frame being also illustrated as carrying a shaft D, operative for actuating a rotary frame or turret, such as H, which turret is represented as carrying a shaft 6, having an independent rotary movement controlled, in the present case, by a starting-arm, such as 26. Moreover, the frame A is also shown having formed in a part thereof a suitable cylinder, such as C′, for carrying the secondary piston and a support or shelf 22 for a reservoir.

The framework for carrying the key mechanism is illustrated at B, embodying an upright or standard, the upper part of which is represented, in this instance, forming part of a primary cylinder, such as C, for carrying the primary or key-actuated piston.

The support 19 is shown having adjacent to the upper end thereof a bearing or slideway within which the forward end of some suitable latch is adapted to be carried for longitudinal reciprocation, while the other upright or support 20 is represented having a bearing or slideway for supporting in a substantially similar manner the rear end of the latch, while at the same time permitting transverse movement of such rear end, it being understood that when the latch is thrown to its forward or projected position it is carried toward the left hand in the drawings. The forward movement of the latch may be limited in any desired manner—as, for instance, by the striking of a stop, such as 55—against the inner side of the fixed support 19.

The latch which I employ herein may, in its general features, be of any well-known construction, and is shown at 50 having a spring 52 coiled at its opposite ends around pins 53 and 54 and normally held under compression, so as to project the latch when this is released. The latch is also illustrated channeled on its upper side to form the usual rear stop or catch 51, while a spring is shown at 56 as positioned for engaging the lower wall of the slideway in the upright 20 to hold the latch in its upper position with the catch 51 in engagement with a corresponding catch 21 of the support. As a means for effecting the movement of the latch in transverse direction and the release of the same by an actuator operative longitudinally of the latch, said latch is also shown, in the present case, formed with a rear cam-face 57 in position to be engaged by the latch-tripper of the secondary piston on the depression of a key.

For the purpose of operating this secondary piston suitable means are employed, preferably controlled, as will be hereinafter described, by a primary or actuating piston, and this primary piston may be governed in turn by the operation of ordinary key-lever devices. For the purpose of actuating the primary piston I have illustrated herein a key-lever mechanism which, in the form shown, embodies a pivoted lever, such as L, operated by a key 15, and limited in its movements by suitable stops, such as 71 and 72, while a spring 74 is represented for returning the key-lever to its normal position in the well-known manner.

The fluid, by means of which motion is transmitted from the primary piston to the secondary piston or latch-tripper, is contained in a suitable single conveyer or system of fluid-conveyers. One of these fluid-conveyers is illustrated herein at 12 in the form of a pipe having a service-conduit communicating at one end with the forward end of the cylinder C and at the other end with the rear end of the cylinder C′, while a similar conveyer or pipe is represented at 13, having a fluid-supply conduit communicating at one end with a reservoir R and at the other end with the primary cylinder at a point between the ends of such cylinder.

It will be obvious that the piston of the primary cylinder controls the transmission through the service-pipe of pressure to the cylinder C′, and this primary piston is illustrated at P reciprocatory within the cylinder C and having a projecting arm or piston-rod, such as *p*, in position to be engaged and operated by the key-lever. This piston also constitutes, in the present case, a means for permitting communication between the supply and service conduits, and is represented embodying a valve having a port 30, normally permitting the flow of the fluid from the supply-conduit into the service-conduit, as illustrated by the arrow 31. (See Fig. 6.) The piston is also shown as reactive, and is preferably held at the end of its return movement by means of a light spring, such as 32.

In a substantially similar manner the secondary piston is mounted within the cylinder C′. This piston is represented at P′, also longitudinally reciprocatory, and held normally at the end of its range of rearward movement by a spring 32′, so as to be reactive. In this case, also, the piston preferably embodies a valve having one or more ports, such as 31′. Between the ends of the secondary cylinder I may also form a discharge-port—such, for instance, as that illustrated herein as leading into a fluid-return conduit in connection with the reservoir. Such an outlet and conduit are represented herein as embodied in a conveyer or pipe 14, similar to the conveyer-pipe hereinbefore referred to.

By reference to Figs. 3 and 6 it will be noticed that in the normal positions of the parts the outlet-port is closed by the piston P′, and hence at this time there is no passage of communication open for permitting any part of the fluid in the service-conduit to return to the reservoir.

The piston P′ is also illustrated provided with a piston-rod *p*′, projecting through the forward end of the cylinder C′, and in the present case this piston-rod constitutes a latch-tripper which is disposed in normal operative relation with the latch and is adapted to ride up the cam-face 57 by forcing down the rear end of the latch when the piston is projected to its forward position.

I may employ any desired fluid in the several conduits and ways of the conveyer system, and hence I do not limit myself to the use of any particular fluid or to any particular means for introducing the same into the conveyer system; but I prefer, as best suited to the purposes of my present invention, to make use of a liquid lubricant—such, for example, as cotton-seed oil—and to supply the same by gravity to the primary cylinder from a suitable tank or reservoir, such as that previously described.

It will be evident from the foregoing that I employ in connection with a mechanism of

the general class specified a cylinder, a fluid-conveyer provided with a pair of fluid-conveying conduits communicating with the cylinder at longitudinally-separated points in the same, a reciprocatory piston operative in the cylinder and embodying a valve which is adapted during one stroke of the piston to open communication between the respective conduits and during the other stroke to cut off communication, together with suitable means for reciprocating the piston.

The operation of my fluid-operated mechanism, in connection with a mechanism of the class specified, is as follows: With the parts in their normal positions the oil or other fluid will pass through the supply-conduit and through the port in the piston P into the service-conduit, and the closure of the forward end of the service-conduit by the piston P' will prevent the exit of the fluid from this passage. At this time the latch and the two pistons are in their retracted positions, as shown in Fig. 6, the tripper *p'*, carried by the piston P', being in engagement with the cam-face 57 and the end of the piston-rod *p* being in engagement with the rear end of the key-lever. If now the key 15 is depressed, it is obvious that the piston P will be forced up and will close the passage of the primary cylinder against communication with the supply-pipe, while at the same time the body of the fluid in the service-pipe in advance of the primary piston P will be forced forward and will carry with it the secondary piston P', as indicated by arrows in Fig. 7. The advancing fluid will operate the secondary piston, and this will be actuated until the port of its valve comes opposite the mouth of the fluid-return conduit, when the excess of fluid, that is, the advancing portion of the medium adjacent to the rear end of the secondary piston, will be carried through the valve-port and into the fluid-return conduit, by which it will be returned to the reservoir.

It being understood that each of the conduits and cylinders is filled with fluid at the beginning of the operation of the mechanism, it will be apparent that at each depression of the key the primary piston will force forward a confined body of fluid, a portion of which will be utilized to reciprocate the secondary piston and thus cause its tripper to release the latch, while another portion of the medium, preferably the portion advancing during the last part of the stroke of the primary piston, will be caused to flow through one or more of the ports 31', and will thus propel the body of fluid in the pipe 14 to cause a portion of the same to return to the reservoir. Hence it will be evident that the valve of the secondary piston is in the nature of a relief-valve, and that by adjusting the length of the stroke of the piston in rearward direction the force by which the tripper is actuated and the amount of projection of the tripper may be perfectly regulated. Moreover, it will be noticed that a continuous operation may be maintained with the mechanism herein illustrated as the fluid is delivered to the primary cylinder by gravity, while the bodies of fluid in the service and return conduits, respectively, are forced forward by a positive or lifting pressure and gradually returned to the reservoir, so that the fluid employed moves in a circuit through the conveyer system.

In order to maintain the ports of the valves in their proper positions, I have shown the secondary piston having a circuit of ports at 31', as hereinbefore described, so that one or more of the same will always be presented opposite the mouth of the return-conduit for permitting the escape of the excess of fluid when the secondary piston is projected, while the rear end of the cylinder-chamber in the cylinder C is represented at 33, Figs. 5, 6, and 7, enlarged so as to maintain communication at all times with the supply-conduit if the port 31 is not adjacent to the mouth of the supply-pipe.

When the latch is projected by its spring on its release by the tripper, the revolving starting-arm will be engaged by the forward end of the latch and will be rotated in the manner described in my prior patent, hereinbefore referred to, the latch being pushed back by the replacing finger or portion of the starting-arm just before the disengagement of these parts, so that when the latch is returned to its normal rearward position the spring 56 will cause the engagement of the catches 21 and 51, and thus reset the latch.

Having thus described my invention, what I claim is—

1. The combination with a latch, of a fluid-actuated device for releasing the same; an oscillatory key or lever; connections operated by said key-lever for conveying fluid to the latch-actuating device; and means for resetting the latch.

2. The combination with a latch, and with means for projecting the same; of a latch-releasing piston; a service-conduit; a piston for forcing fluid against said latch-releasing piston and a key-lever for operating the piston.

3. The combination with a secondary cylinder, and with a secondary piston in said secondary cylinder; of a fluid-conveyer having a service-conduit communicating at its forward end with the rear end of said secondary cylinder; a primary cylinder communicating at its forward end with the rear end of said service-conduit; a primary piston carried in said primary cylinder for forcing fluid through the conduit and the secondary cylinder and thereby actuating the secondary piston; and an actuator for the primary piston.

4. The combination with a secondary cylinder, and with a secondary piston in said secondary cylinder; of a fluid-conduit communicating at its forward end with the rear end of the secondary cylinder; a fluid-conveyer having a fluid-supply conduit normally in communication with said service-conduit; a primary cylinder communicating at its for-

ward end with the rear end of said service-conduit; a primary piston carried in said primary cylinder for forcing fluid through said service-conduit and the secondary cylinder and thereby actuating the secondary piston, and embodying a valve operative for cutting off the flow from the supply-conduit during the working stroke of the primary piston; and an actuator for operating the primary piston.

5. The combination with a secondary cylinder, and with a secondary piston in said secondary cylinder; of a fluid-conveyer having a service-conduit communicating at its forward end with the rear end of the secondary cylinder; a fluid-conveyer having a fluid-supply conduit opening into the primary cylinder and normally in communication with said service-conduit through the valve of the primary piston; a primary cylinder communicating at its forward end with the rear end of said service-conduit; a primary piston carried in said primary cylinder for forcing fluid through said service-conduit and the secondary cylinder and thereby actuating the secondary piston, and embodying a valve normally connecting the fluid-supply conduit and the service-conduit and operative for cutting off the flow from the supply-conduit during the working stroke of the primary piston; and an actuator for operating the primary piston.

6. The combination with a secondary cylinder, and with a reactive secondary piston in said secondary cylinder; of a fluid-conveyer having a service-conduit communicating at its forward end with the rear end of the secondary cylinder; a fluid-conveyer having a fluid-supply conduit opening into the primary cylinder, and normally in communication with said service-conduit; a primary cylinder communicating at its forward end with the rear end of said service-conduit; a reactive primary piston carried in said primary cylinder for forcing fluid through said service-conduit and the secondary cylinder and thereby actuating the secondary piston, and embodying a valve operative for cutting off the flow from the supply-conduit during the working stroke of the primary piston; and an actuator for operating the primary piston.

7. The combination of a cylinder; a fluid-conveyer provided with a pair of fluid-conveying conduits communicating with the cylinder at longitudinally-separated points respectively in said cylinder; a reciprocatory piston operative in said cylinder, and embodying a valve adapted during one stroke of the piston to permit communication between the aforesaid fluid-conveying conduits, and during the other stroke of the piston to cut off communication between said conduits; and means for reciprocating said piston.

8. The combination with a cylinder; of a fluid-conveyer having a service-conduit communicating at one end with the cylinder at a point in the rear of the piston, and also having an outlet-port between the ends of said cylinder; a piston operative in said cylinder, and embodying a relief-valve adapted for connecting the service-conduit and the outlet-port at a predetermined point in the working stroke of the piston; and means for forcing fluid through the conduit and the cylinder for actuating the piston.

9. The combination with a secondary cylinder; of a fluid-conveyer having a service-conduit communicating at its forward end with the secondary cylinder at a point in the rear of the secondary piston, and also having an outlet-port between the ends of said cylinder; a secondary piston operative in said secondary cylinder, and embodying a relief-valve adapted for connecting the service-conduit and the outlet-port at a predetermined point in the working stroke of the secondary piston; a primary cylinder communicating at its forward end with the rearward end of the service-conduit; a primary piston carried in said primary cylinder for forcing fluid through said service-conduit and secondary cylinder and thereby actuating the secondary piston; and an actuator for operating the primary piston.

10. The combination with a secondary cylinder; and a service-conduit communicating at its forward end with the secondary cylinder at a point in the rear of the secondary piston, and also having an outlet-port between the ends of the secondary cylinder; of a secondary piston operative in said secondary cylinder, and embodying a relief-valve adapted for connecting the service-conduit and the outlet-port during the last part of the working stroke of the secondary piston; a primary cylinder communicating at its forward end with the rearward end of the service-conduit; a primary piston carried in said primary cylinder for forcing fluid through said service-conduit and the secondary cylinder and thereby actuating the secondary piston; and an actuator for operating the primary piston.

11. The combination with a latch, and with means for replacing the same; of a secondary cylinder; a piston carried in said cylinder and adapted for actuating said latch; a fluid-conveyer having a service-conduit communicating with the secondary cylinder; a primary cylinder communicating with the service-conduit; a piston carried in said primary cylinder for forcing fluid through the conduit and the secondary cylinder and thereby actuating the secondary piston; and an actuator for operating the primary piston.

12. The combination with a latch having a cam-face; and with means for replacing the latch; of a secondary cylinder; a piston carried in said cylinder and provided with a tripper adapted for riding over said cam-face to actuate the latch; a fluid-conveyer having a service-conduit communicating with the secondary cylinder; a primary cylinder communicating with the service-conduit; a primary piston carried in said primary cylinder

for forcing fluid through the conduit and the secondary cylinder and thereby actuating the secondary piston; and an actuator for operating the primary piston.

13. The combination with a latch having a cam-face, and with means for replacing the latch; of a secondary cylinder; a reactive secondary piston carried in said cylinder, and provided with a tripper in position and adapted for riding over said cam-face to actuate the latch; a fluid-conveyer having a service-conduit communicating at its forward end with the rear end of the secondary cylinder; a primary cylinder communicating at its forward end with the rear end of the service-conduit; a reactive primary piston carried in said primary cylinder for forcing fluid through the conduit and the secondary cylinder and thereby actuating the secondary piston; and an actuator for operating the primary piston.

14. The combination with a secondary cylinder; of a fluid-conveyer having a service-conduit communicating at its forward end with the secondary cylinder at a point in the rear of the secondary piston; a fluid-conveyer having a fluid-return conduit communicating with the reservoir, and also communicating with the secondary cylinder at a point between the ends of said cylinder; a secondary piston operative in said secondary cylinder, and having a relief-valve adapted for connecting the service-conduit and the fluid-return conduit at a predetermined point in the working stroke of the secondary piston; a fluid-conveyer having a fluid-supply conduit leading from the reservoir and opening into the primary cylinder, and normally in communication with the service-conduit; a fluid-reservoir for supplying fluid to the fluid-supply conduit; a primary cylinder communicating at its forward end with the rear end of the service-conduit; a primary piston carried in said primary cylinder for forcing fluid through the service-conduit and the secondary cylinder and thereby actuating the secondary piston, and embodying a valve adapted for cutting off the flow from the supply-conduit during the working stroke of the primary piston; and an actuator for operating the primary piston.

FRANCIS H. RICHARDS.

Witnesses:
FRED. J. DOLE,
BENTON N. PARKER.