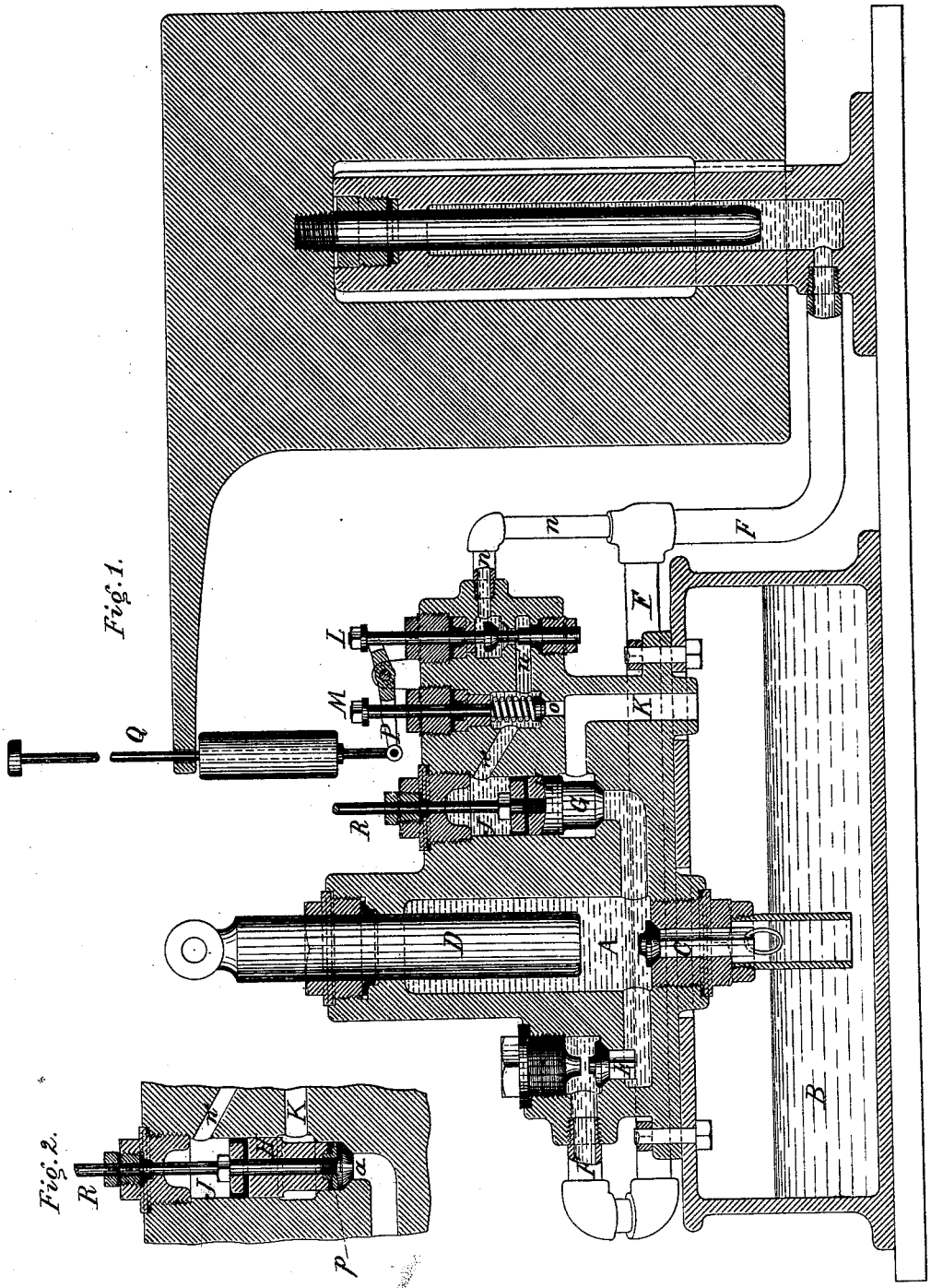
C. SELLERS.

RELIEF VALVES FOR HYDRAULIC MACHINES.

No. 185,975. Patented Jan. 2, 1877.



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IMPROVEMENT IN RELIEF-VALVES FOR HYDRAULIC MACHINES.

Specification forming part of Letters Patent No. **185,975**, dated January 2, 1877; application filed May 31, 1876.

To all whom it may concern:

Be it known that I, COLEMAN SELLERS, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Relief-Valves for Hydraulic Machines, of which improvements the following is a specification:

My invention relates to that class of hydraulic machines in which the power is produced by a pump operating continuously; but is applied through mechanism operating intermittently, and consequently requiring provision for wasting the fluid during the intermissions.

Various devices, more or less effective, have been employed for thus wasting the fluid; but they fall short of economical perfection, in that the waste takes place under pressure requiring the same labor of the pump, and involving the same wear when wasting as when using the power.

It is the object of my invention while maintaining the pump in continuous operation, and at all times ready to meet the demands upon it from the mechanism, to relieve it from work at all other times, and while thus relieved to maintain a circulation of water through the pump-chamber; and to these ends my invention consists in combining with the pump and the mechanism a relief system of valves, arranged and operating so that the defined movements of the mechanism determine the duration of the pressure upon the pump, while the pump, although relieved from pressure, shall continue to maintain a water-circulation through the pump-chamber.

The accompanying drawings, which form part of this specification, show in vertical section a plunger-pump, its receiving and discharging valves, with my improved system of valves; and as an exemplification of my invention I have combined them with an accumulator.

Figure 1 represents in vertical section a plunger-pump, its receiving and discharging valves, my improved system of valves, and an accumulator. Fig. 2 shows in vertical section a modification of my relief-valve.

The pump-chamber A is filled from tank B through valve C as the plunger D rises. As it descends the water in the chamber A is forced out, lifting valve E, and passes to the accumulator through pipe F. The valve G I designate as the relief-valve. Above it, and forming part of the same, is a piston, H, provided with cup-leather packing, this piston fitting a cylinder, J, of larger diameter than the largest diameter of the valve-seat under valve G, so that if water is admitted to the cylinder at J above H, and under the same pressure as the water in the pump-chamber A, the valve G will be seated by the superior pressure upon the piston H. If, however, the pressure be removed from above the piston H the valve G will lift at each stroke of the pump, the valve E being held down by the pressure of the accumulator, and thus the water will be discharged past valve G and through the passage K into the tank, and under these conditions the pump merely maintains a water circulation.

To operate the relief-valve G I have in the drawing shown a well-known and much-used form of the hydraulic poppet-valve. Of this part of the mechanism the induction-valve L is shown open and the exhaust-valve M is shown closed. Water under the accumulator pressure passes through pipe *n* and passages *n' n'* into cylinder J, and by pressure on the piston H holds the valve G down. By closing valve L and raising the exhaust-valve M the pressure is shut off from the passage *n' n'*, and the water in cylinder J can then escape through passage O into the tank. To insure the seating of the valves L and M they are so arranged as to close by pressure when not held open. Thus, valve L is carried by a stem extending through cup-leather packings above and below the valve. The lower end on this stem being larger than the upper end, when the valve is open, as shown in the drawing, the pressure in the passage *n'* being the same as in the accumulator, the enlarged lower end of the valve-stem will cause the valve L to close unless held open. The exhaust-valve M is free from pressure when open, and must be closed as by the spring shown, the spring being strong enough to overcome the friction of the packing. The lever P, pivoted on the fulcrum midway between valves

L and M, if tilted in one direction will lift valve L, leaving valve M to remain seated, as shown in the drawing. If tilted in the opposite direction it will lower and seat valve L, and then lift valve M, opening the exhaust-passage O. A weighted rod, Q, is attached to the long end of the lever P, and this rod is so connected that when the accumulator is nearly full it raises the rod Q, so as to bring the lever P horizontal, and allow the valve L to close, and as the accumulator continues to fill it lifts the valve M and frees valve G of the pressure that had previously held it down, thus relieving the pump, as before described. When water is drawn from the accumulator, and it descends, the weighted rod Q will descend with it, allowing the exhaust-valve M to close, and opening the valve L, when the relief-valve G will be closed and the pump will force into the accumulator. I have shown, in connection with valve G, a rod, R, passing through a stuffing-box in the cap of cylinder J. This rod may be connected to any regulating-valve of a pumping-engine, so that when the valve G is relieved of pressure a counter-weight attached to the regulating-valve will lift the valve G from its seat, allowing a free escape of water from the pump-chamber, and at the same time can be made to close the regulating-valve of the pumping-engine, and thus slow down its speed while it is doing no work.

The modification of the relief-valve G (shown in Fig. 2) is designed to avoid the use of a counter-weight, as above described; and it consists in extending the lower end of the valve G, and providing it with suitable packing *p*, working in a chamber of any required length, in such manner that the pump cannot waste after the valve has been lifted from its seat, until the packing *p* has passed out of its chamber, by which means I am enabled to give, by the pump itself, a positive movement to the valve G sufficient to move the regulating-valve of the pumping-engine the amount required to slow it to the desired velocity while the pump is wasting. This is of great value when the pump is driven by steam-cylinders direct, or by an engine used only for driving the pump.

For convenience of illustration I have shown my relief-valve G and its operating-valves L and M made as part of the pump proper, all being included in one casting.

This arrangement is not always convenient. I preferably arrange the relief-valve G and its operating valves L and M in a separate case and place it near to the accumulator, leading the water by a pipe from the pump to it and thence into the accumulator. I contemplate applying my relief-valve to a variety of hydraulic machines, not only to determine the quantity of water to be admitted, as in the instance shown, but also to determine the pressure at which the pump shall cease to supply—as, for example, a weighted plunger or a hollow curved spring, which the required pressure will cause to move, may be arranged to operate the lever P and relieve the pump from pressure; and in place of valves L and M I contemplate using other well-known forms of valves or a double-seated valve, and I also contemplate using my relief-valve to control the speed of a pumping-engine, as hereinbefore described. I, therefore, do not confine myself to the use of my relief-valve in connection with an accumulator, nor to the particular construction of operating-valves connected therewith; but

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

1. The combination of a pump, operating continuously, hydraulic mechanism through which the power is intermittently applied, and a relief-valve, the combination being and operating substantially as described, and for the purposes set forth.

2. The combination, with the reflex-valve G, or its equivalent, of the cylinder J, and piston H, the combination being and operating substantially as described.

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Witnesses:
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