No. 870,685. PATENTED NOV. 12, 1907.

C. PRÖTT.

MEANS FOR MAINTAINING FLOW IN WATER COLUMNS.

APPLICATION FILED MAR. 26, 1907.

2 SHEETS—SHEET 1.

Fig. 3.

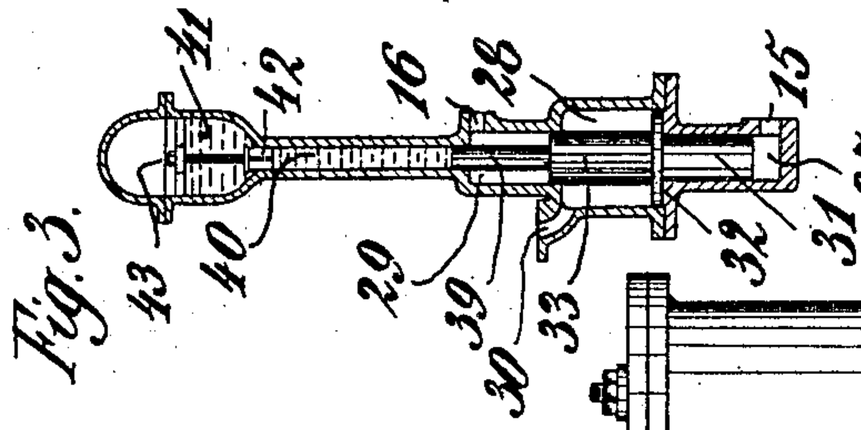

Fig. 1.

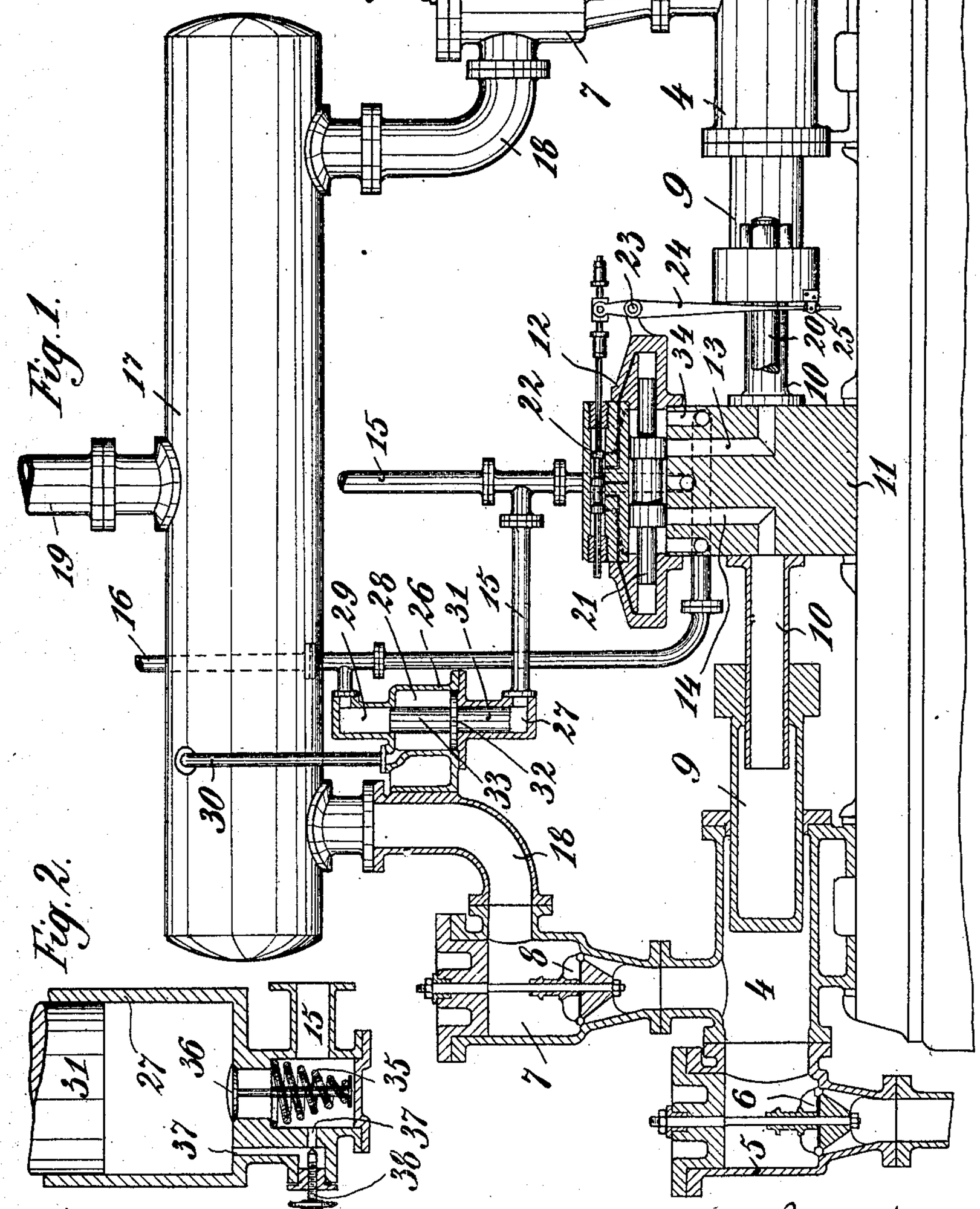

Fig. 2.

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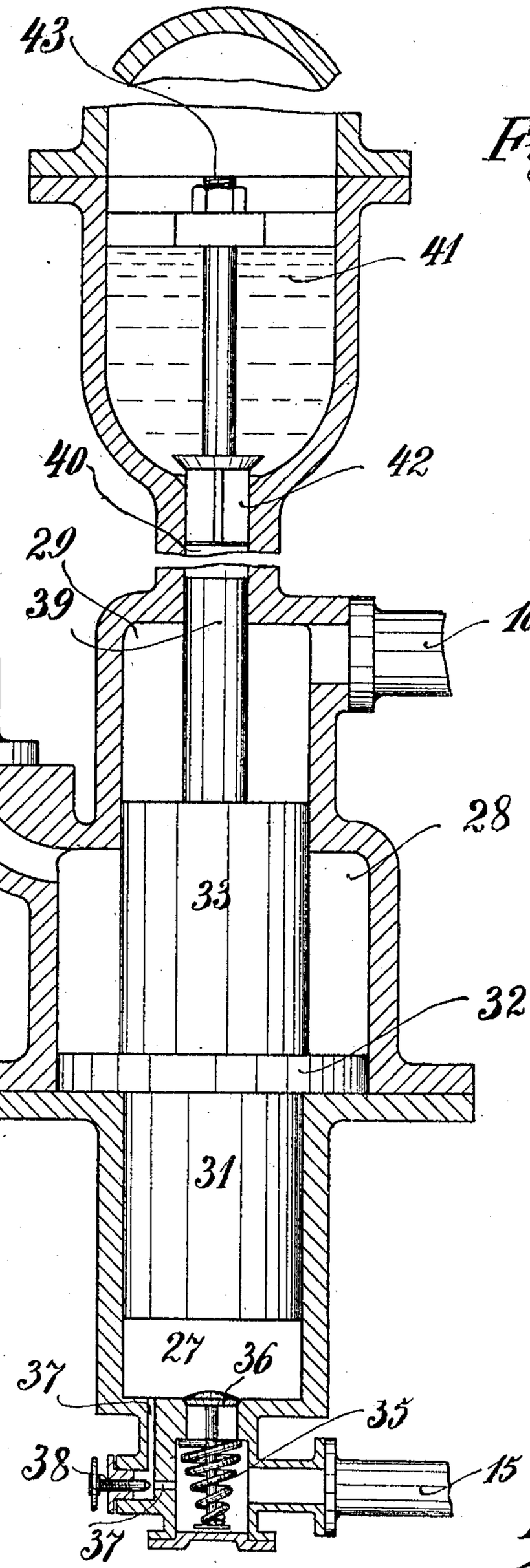

Fig 4.

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UNITED STATES PATENT OFFICE.

CARL PRÖTT, OF HAGEN, GERMANY.

MEANS FOR MAINTAINING FLOW IN WATER-COLUMNS.

No. 870,685. Specification of Letters Patent. Patented Nov. 12, 1907.

Application filed March 26, 1907. Serial No. 364,704.

To all whom it may concern:

Be it known that I, CARL PRÖTT, a subject of the German Emperor, and resident of Hagen, Westphalia, Germany, have invented certain new and useful Improvements in Means for Maintaining Flow in Water-Columns, of which the following is a specification.

In order so far as possible, to maintain a uniform flow of the water in the water columns of hydraulically operated pumps, it has generally been the custom to use double-action pumps arranged side by side in such manner as to adapt one pump to reverse the other or in other cases, two single acting pumps having connection by a rod with a sliding pivot. The former are objectionable on account of there being two double-action pumps required, of which one of them remains at rest during the greater portion of the stroke of the other. The consequence of this is that the pumps must of necessity be larger than required under other conditions. In the case of the single action pumps, on the other hand, the plungers cannot be connected directly nor on a single axis but must be positioned side by side and provided with rods for transmitting motion from one to the other, which arrangement necessitates an excessive amount of space. It is also known that with a single action pump the movement in the drawing-conduit during the suction-stroke is maintained by using the drawing conduit during the suction stroke as backward conduit for water under pressure.

This invention has for its object a device for preventing with single-action hydraulic pumps lying side by side, or in one axis, or with a double action or differential pump, an interruption in the movement of the water-columns during the change of the stroke. This is attained by actuating by the driving-water an auxiliary piston during the change of the stroke, which presses the water in one or several cylinders standing in communication with the waste-water conduit and the drawing conduit, into these conduits, so that the water columns keep on moving in the same direction until the movement is continued by the return of the pump piston.

The drawing illustrates in Figure 1 a construction of such a pump partly in a front view, partly in a longitudinal section. Figs. 2 and 3 show two other forms of construction of the invention in a longitudinal section. Fig. 4 is a view on a longitudinal section, of an embodiment of my invention involving the combination of the several features shown in Figs. 2 and 3.

Similar numerals refer to similar parts throughout the several views.

In Fig. 1 4 are the two pump-cylinders, 5 the suction-valve boxes, 6 the suction-valves, 7 the head-valve boxes, 8 the head-valves, and 9 the pump-plungers, which serve at the same time as cylinders for the stationary driving plungers 10, and are connected by bars 20. 11 is the regulating-jack, connected with the driving plungers, on which is arranged the regulating-box 12. The same is connected through the ports 13 and 14 with the hollow driving plungers 10. 15 is the conduit for the driving water. 16 the conduit for the waste-water and 17 the air-chamber connected by tubes 18 with the head-valve box 7, with which air-chamber the drawing conduit 19 is connected.

In the regulating box is arranged a hydraulically moved piston-slide 21, which is moved at the same time by the driving-water admitted through the conduit 15 and regulates the admission of the driving-water through the ports 13, 14 to the interior of the pump plunger 9. But in order to accurately regulate the movement of this piston-slide 21, there has been provided an auxiliary regulating-device 22, which is moved by a lever 24 turning on 23, which is connected at 25 with one of the pump-plungers 9. The construction of the hereinbefore described pump, or of its parts, is however a secondary matter for the present invention, for the device which is the essential feature of this invention is as follows. In any part of the pump is arranged a cylinder 26 with three rooms, with three working-chambers 27, 28 and 29. The chamber 27 stands in communication with the conduit for the driving-water 15, the chamber 28 through a conduit 30 with the water-chamber or air-chamber of the forcing-pump, and the chamber 29 with the conduit 16 for the waste-water. The chamber 28 has a proportionately larger diameter than the two other cylinder-chambers. In this cylinder with three chambers moves a triple piston 31, 32, 33. The difference of the pressing surfaces of the two piston parts 31 and 32 approximately corresponds with the pressing difference of the driving-water and the drawing-water.

The invention works as follows: In order to show the arrangement more clearly the two regulating-pistons 21 and 22 are shown in their medium position, and the valves 6 and 8 in their position of rest. If they are in their left position, driving-water is admitted through the conduit 15 and the port 14 into the left hand pump-plunger 9, while the water which is to be driven out of the right hand pump-plunger 9 can pass through the ports 13 and 34 into the conduit 16 for the waste-water. If the two pump-plungers 9, in consequence of their connection, get into the left dead point position, the piston 22 of the auxiliary regulating-device is moved to the right by the lever 24, which at 25 is connected with the bars 20 and, as a result, the piston-slide 21 is influenced by the driving-water from the left side, so that it conveys driving-water to the right-hand pump-plunger 9 and causes it to move to the right. But before this change of the strokes of the two pump-plungers

takes place, the driving-water, which has entered into the cylinder-chamber 27 from the conduit 15, acts on the piston 31 in a manner that the same is moved upwards. But as the parts 32 and 33 participate in this movement, the water in the cylinder-chamber 28 is, in the dead-point position of the pump-plunger, when no forward movement takes place, pressed through the conduit 30 into the air-chamber of the pump, and the waste-water in the cylinder-chamber 29 into the conduit 16, that is to say the water-columns remain constantly in motion. But after the reversing of the piston-slide 21 has taken place, and the inertia of the moving parts has been overcome, and the pump is set in motion again, the triple piston 31—33 returns into its original position, so that the chambers 28 and 29 can be filled with drawing-water and waste-water, while the driving-water, which has entered into the chamber 27, is pressed back into the conduit 15. But in order that the return movement of the triple piston does not take place too suddenly one of the cylinder-chambers 27, 28 or 29, preferably cylinder 27, may be provided with a throttling-device as shown in Figs. 2 and 4 of the drawing. The throttling-device consists of a return-valve 36 standing under the action of a spring 35 and a throttling-channel 37 leading from the cylinder-chamber 27 to the box of this throttling-valve, the passage or cross section of which throttling-chamber can be regulated by a valve 38 provided with screws. The driving-water coming from the conduit 15 can lift the throttling-valve 36 and freely enter into the cylinder-chamber 27, but can only get back into the conduit 15 through the regulatable throttling-channel 37, so that in consequence of this arrangement a rapid or sudden descent of the triple piston is prevented. But in order to overcome with precision and rapidly the inertia of the pumps after the reversing of the piston-slide 21, the cross section of the piston 32 may be a little larger than required by the relative sizes of the drawing-plunger and driving plunger, that is to say the load on the triple piston from the cylinder-chamber 28 will be correspondingly greater than from the cylinder-chamber 27.

The device forming the subject of this invention may however also be of the construction shown in Fig. 3, by connecting to the piston 33 a weaker piston 39, which passes through the upper cylinder-chamber 29 and enters into a cylindrical tube 40, which is of a suitable height, and is connected with an air-chamber 41. The water which is in the tube 40 remains constantly in it and acts as a load on the piston 39 and thereby on the other pistons 31—33. This load may also be further increased by pumping air under pressure into the air chamber 41, the tension of which may be regulated at will. There may also be arranged here between 40 and 41 a regulatable throttling-valve 42, the object of which is the same as the arrangement shown in Fig. 2. The throttling is effected by preventing for instance the valve 42, by means of a screw or the like, from fully descending on its seat.

The arrangement of parts shown in Figs. 1, 2, and 3, in which the three cylindrical chambers 27, 28 and 29, lie on the same axis, is the preferred form in which my invention may be embodied but it will be readily understood that the cylinders might be arranged on parallel non-coincident axes or with their axes at angles one with the other without departing from the spirit of my invention. To provide for such an arrangement, it would only be necessary to replace the triple piston by a system of three pistons moving with constrained motion in such manner as to accomplish the same results. It will furthermore be evident that the modification of the piston loading means is but a preferred form of piston loading as the same results could be effected by means of a spring or weight acting directly upon the piston.

What I claim as my invention and desire to secure by United States Letters Patent is:—

1. In a device for maintaining the movement of the water-columns on changing the stroke of hydraulically worked pumps, the combination of three independent cylinders 27 28 29, of which one stands in communication with the conduit 15 for the driving-water, the second with the conduit 30 for the drawing-water and the third with the conduit 16 for the waste-water, in each of these cylinders a piston, and the connection of the pistons in a manner that by any one of them the two others are moved and drive out the water from the respective cylinder-chambers or into the same, substantially as set forth.

2. In a device for maintaining the movement of the water-columns on changing the stroke of hydraulically worked pumps, the combination of three cylinders working independently of each other but being arranged in one axis and connected with each other, of which one stands in communication with the conduit for the driving-water, the second with the conduit for the drawing-water and the third with the conduit for the waste-water, and with a triple piston, 31 32 33, which works in each of the three cylinders, substantially as set forth.

3. In a device for maintaining the movement of the water-columns on changing the stroke of hydraulically worked pumps, the combination of three cylinders working independently of each other but being arranged in one axis and connected with each other, of which one stands in communication with the conduit for the driving-water, the second with the conduit for the drawing-water and the third with the conduit for the waste-water, and with a triple piston, 31 32 33, which works in each of the three cylinders, and of which the piston 32 has a greater pressing surface than the piston 31, substantially as set forth.

4. In a device for maintaining the movement of the water-columns on changing the stroke of hydraulically worked pumps, the combination of three independent cylinders connected with the conduits for the driving-water, the drawing-water and the waste-water and pistons working in the same, a return-valve 36 intercalated between one of these cylinders and its corresponding conduit and a throttling-channel 37 to effect a rapid entering of the water and a slow leaving, or vice versa, substantially as set forth.

5. In a device for maintaining the movement of the water-columns on changing the stroke of hydraulically worked pumps, the combination of three independent cylinders connected with the conduits for the driving-water, the drawing-water and the waste-water and pistons working in the same, and an additional piston 39 branching off from the piston for the conduit for the waste-water which additional piston works in a gage-glass 40 connected with the cylinder for the conduit for the waste-water in which gage-glass the column of water exerts a pressure on the additional piston, substantially as set forth.

6. In a device for maintaining the movement of the water-columns on changing the stroke of hydraulically worked pumps, the combination of three independent cylinders connected with the conduits for the driving-water, the drawing-water and the waste-water and pistons working in the same, and an additional piston 39 branching off from the piston for the conduit for the waste-water with additional piston works in a gage-glass 40 connected with the cylinder for the conduit for the waste-water, and an air-chamber 41 connected with the gage-glass, substantially as set forth.

7. In a device for maintaining the movement of the water-columns on changing the stroke of hydraulically worked pumps, the combination of three independent cylinders connected with the conduits for the driving-water, the drawing-water and the waste-water and pistons working in the same, and an additional piston 39 branching off from the piston for the conduit for the waste-water with additional piston works in a gage-glass 40 connected with the cylinder for the conduit for the waste-water, and an air-chamber 41 connected with the gage-glass, and a throttling valve 42 intercalated between the gage-glass or tube 40 and the said air-chamber, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CARL PRÖTT.

Witnesses:

OTTO KÖNIG,

F. A. RITTERSHAUS.