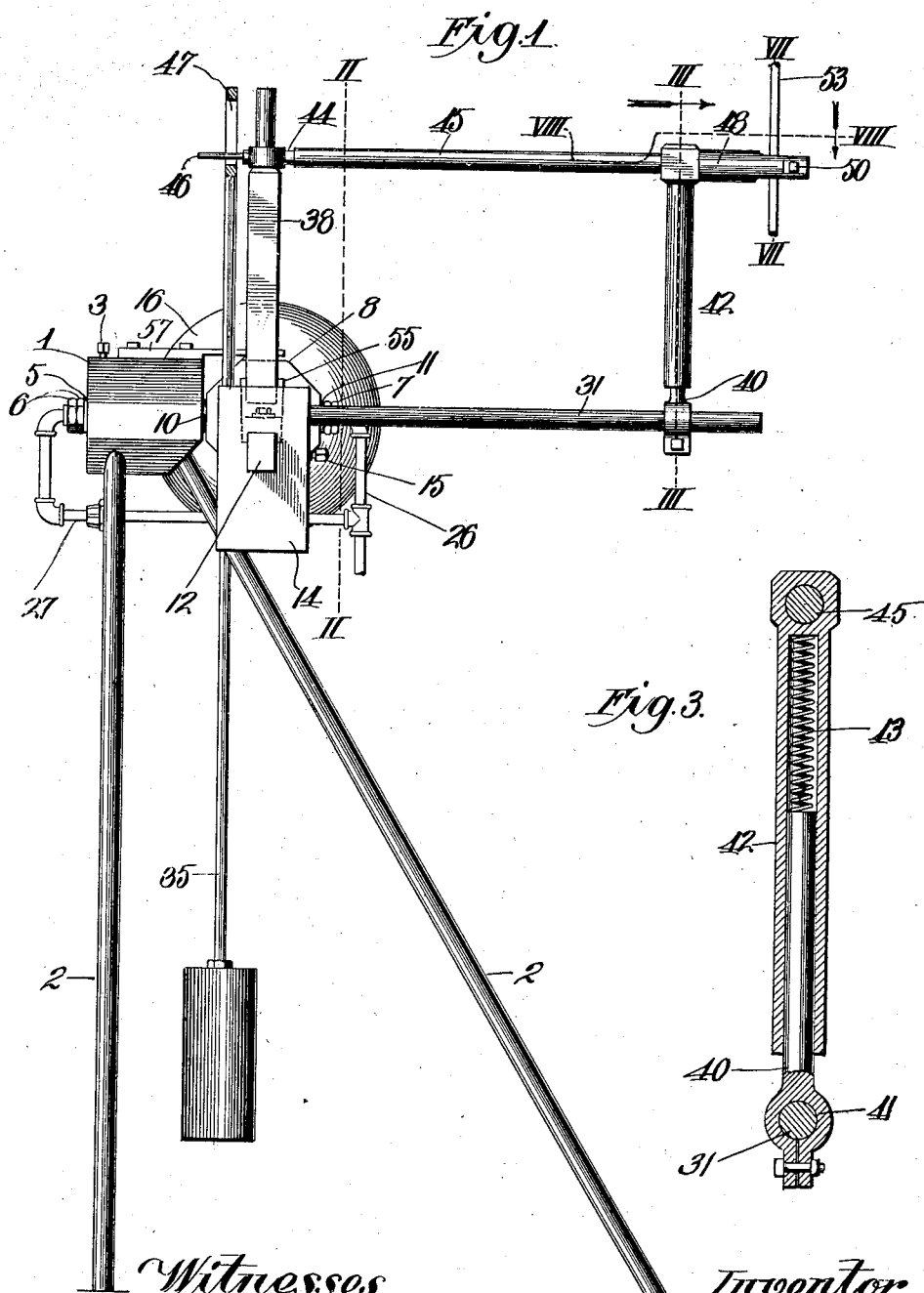


W. K. RICHARDSON.
REGULATOR FOR PUMPING ENGINES.
APPLICATION FILED MAR. 27, 1909.

1,009,343.

Patented Nov. 21, 1911.

3 SHEETS—SHEET 1.



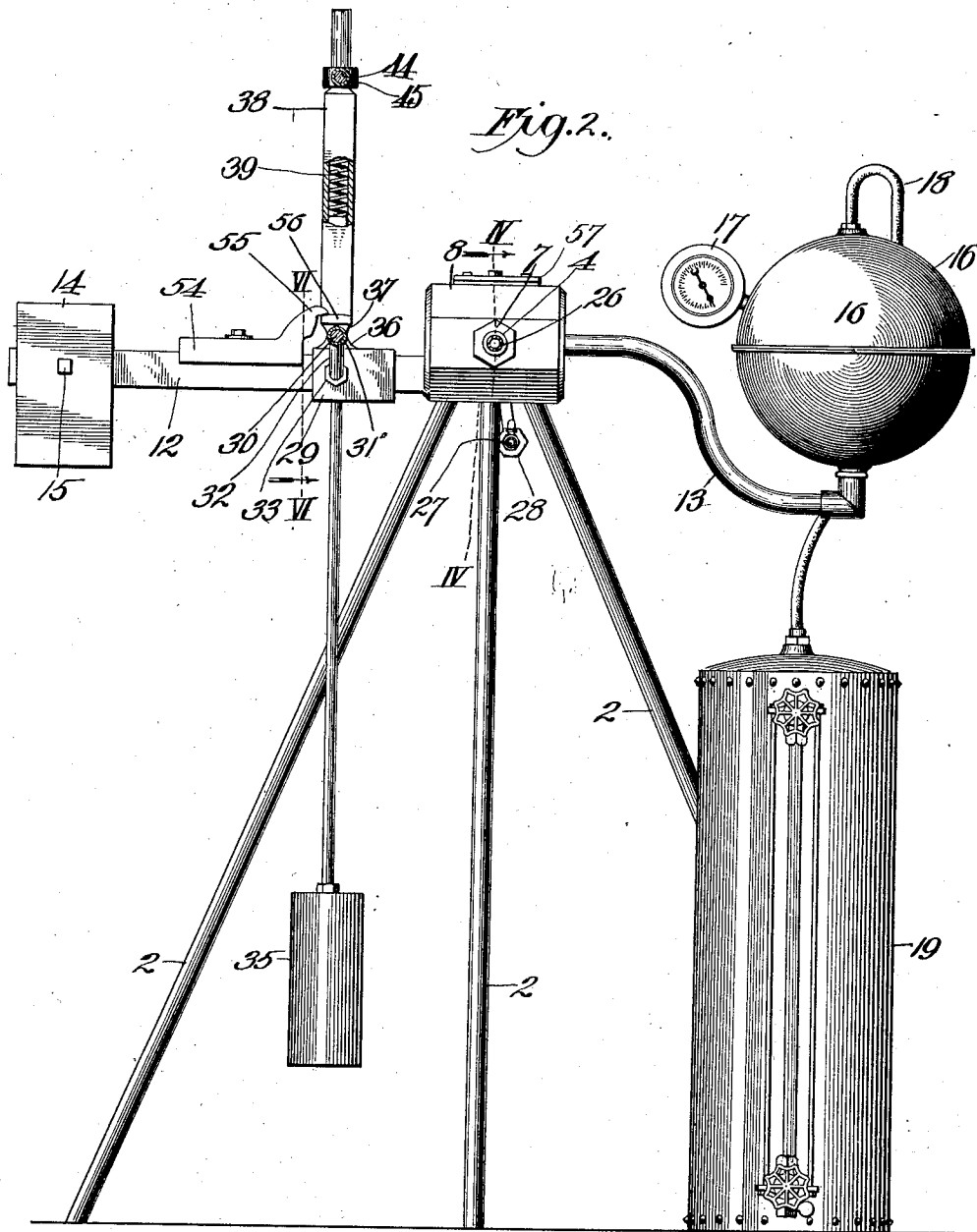
Witnesses
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Inventor
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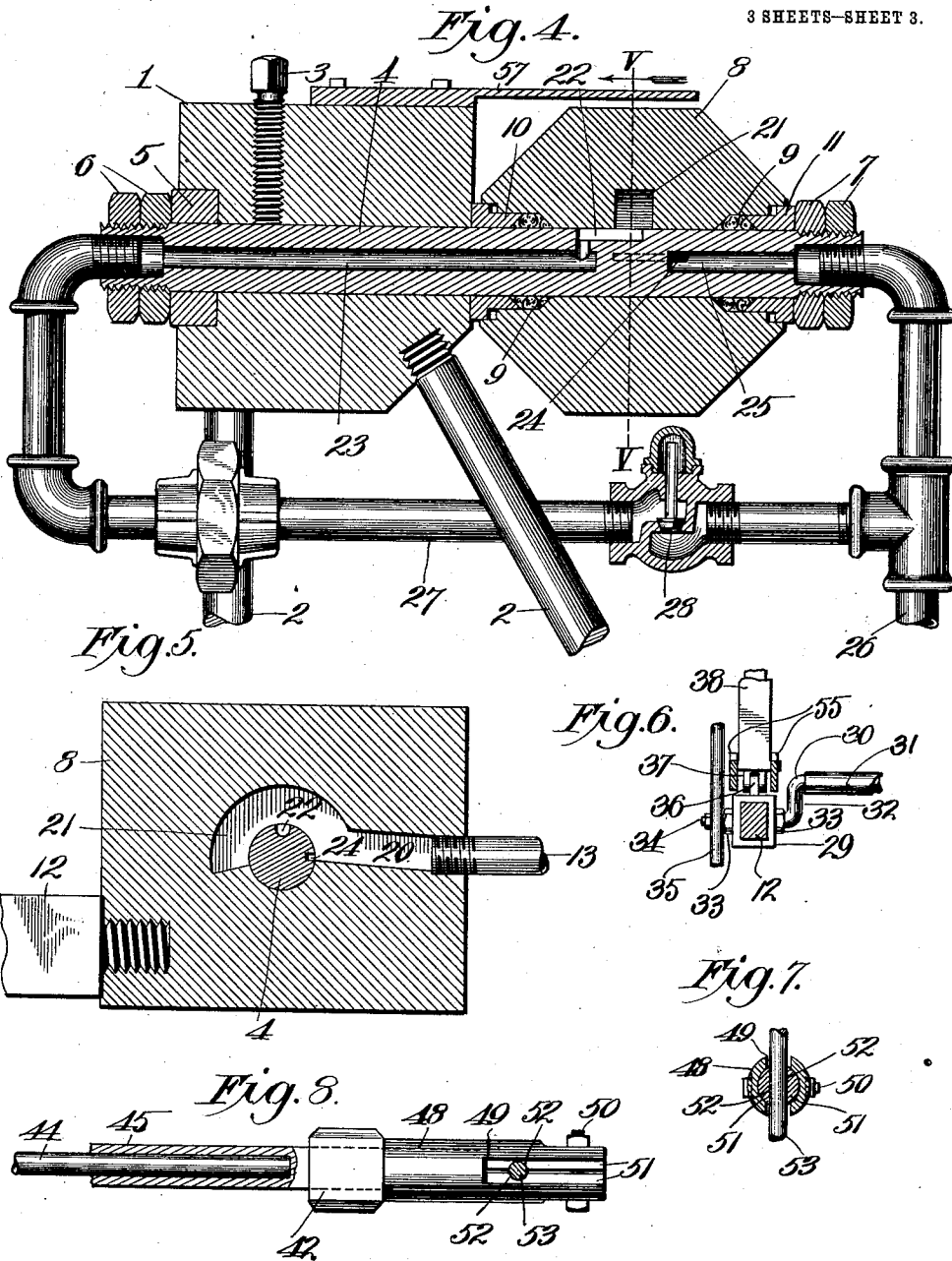
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By George Thompson, Atty.

UNITED STATES PATENT OFFICE.

WILLIAM K. RICHARDSON, OF LEAVENWORTH, KANSAS.

REGULATOR FOR PUMPING-ENGINES.

1,009,343.

Specification of Letters Patent. Patented Nov. 21, 1911.

Application filed March 27, 1909. Serial No. 486,215.

To all whom it may concern:

Be it known that I, WILLIAM K. RICHARDSON, a citizen of the United States, residing at Leavenworth, in the county of Leavenworth and State of Kansas, have invented certain new and useful Improvements in Regulators for Pumping-Engines, of which the following is a specification.

This invention relates to pumping engine regulators and has for its object to produce an efficient and reliable regulator susceptible of use in connection with engines of varying types and sizes and capable of accommodating the pump capacity.

A further object is the production of a regulator which utilizes air under pressure to regulate the speed of the engine and maintain a predetermined pressure in the pump by instantly effecting reduction in the supply of steam to the engine cylinder under a low consumption of water, or an increase in the supply of steam to the cylinder in the event of a more rapid consumption of water.

Another object is to provide a balanced regulator adapted to swing through a greater arc and effect the closure of the valve of the engine and the consequent arrest of the latter, in the event of the supply of water to the globe being cut off.

Another object is to produce a governor of the character outlined, a vertically-movable frame to respond to ordinary fluctuations in the pressure of the water and impart closing or opening movement to the valve as the case may be, and means to expand such frame vertically and cause it to completely close the engine in the event that the pump "throws its valve" or loses its priming accordingly as it is of the reciprocatory or rotary type and thus or from any other cause, fails to supply water to the regulator.

With these and such other objects in view as hereinafter appear, the invention consists in certain novel and peculiar features of construction and organization as hereinafter described and claimed; and in order that it may be fully understood reference is to be had to the accompanying drawings, in which;

Figure 1, is an end view of an attachment embodying my invention for regulating the pressure of pumping engines. Fig. 2, is a section on the line II—II of Fig. 1. Fig. 3, is an enlarged section on the line III—III of Fig. 1. Fig. 4, is an enlarged section on

the line IV—IV of Fig. 2. Fig. 5, is a section on the line V—V of Fig. 4. Fig. 6, is a section on the line VI—VI of Fig. 2. Fig. 7, is an enlarged section on the line VII—VII of Fig. 1. Fig. 8, is a section on the line VIII—VIII of Fig. 1.

Referring now to the drawings in which like reference characters identify corresponding parts throughout the several views, there is provided a stand or support consisting of the head 1 and a plurality of supporting legs 2, and secured rigidly in the head by means of a set-screw 3 or otherwise, is a horizontal shaft 4, fixed as regards longitudinal movement by a collar 5 engaging one end of and preferably set in head 1, and lock-nuts 6 screwed upon the shaft and tending to clamp said collar firmly against said head. Screwed upon the opposite end of the shaft 4 are lock-nuts 7 and rotatably mounted on the shaft between said lock-nuts and head 1, is a block 8 having sockets 9 in its opposite sides in which packing is adapted to be clamped by packing glands 10 and 11, gland 10 bearing against the adjacent side of head 1 and gland 11 against the inner lock-nut 7.

The block 8 forms the central portion of a rock-lever, a bar 12 forming one end of said rock-lever and a pipe 13 the other end of said lever. The end 12 of the lever carries a poise 14 adapted to be secured at the desired point of adjustment by a set-screw 15. Pipe 13 of said rock-lever carries at its outer end and communicates with an airtight globe 16 provided with a pressure-gage 17 and connected by a flexible tube 18 with a compressed air-tank 19. The inner end of the pipe portion 13 of the rock-lever, communicates with a passage 20 in block 8, and said passage connects at its inner end with a semi-circular passage 21 communicating with a passage 22 in stationary shaft 4, passage 22 communicating with a long bore or passage 23 in said shaft. Communicating at times with passage 21 of the block is a passage 24 in shaft 4,—viz.; when the lever is balanced or its globe-carrying end is depressed below the opposite or weighted end. Said passage 24 connects with a longitudinal bore or passage 25 of shaft 4.

26 is a pipe secured in one end of shaft 4 to supply water to passage 25, and 27 is a by-pass pipe connecting pipe 26 with the opposite end of shaft 4 and the passage 23 thereof, the by-pass pipe being equipped

with a check-valve 28 to permit water to flow from pipe 26 through pipe 27 to passage 23 but not in the opposite direction.

29 is a sleeve mounted on end 12 of the rock-lever (or it may be an integral enlargement of said end), and projecting laterally from said sleeve or enlargement is a preferably extensible arm, consisting of a rod 30 and a tube 31 fitting telescopically together, said extensible arm preferably occupying the same horizontal plane as shaft 4. The rod 30 terminates at its inner end in a step-shaped portion 32 extending through the sleeve or enlargement 29 and through the lever 12 and secured rigidly with relation to said parts by jam-nuts 33 fitting against opposite sides of the said sleeve or enlargement. Pivoted on a horizontal bolt or cap-screw 34 secured to and projecting from the end of the step-shaped portion at the opposite side of the lever from tube 31 is a pendulum 35. Pivoted in axial alinement with the tube 31 of the said extensible arm to a lug 36 projecting upward from sleeve or enlargement 29, is a vertical bar 37, and fitting telescopically and nonrotatably on bar 37 is a tube 38, a coiled spring 39 fitting in said tube and bearing at its upper and lower ends respectively against the same and the top of bar 37 and tending to force said tube vertically upward.

A vertical extensible-arm is mounted on the outer end of the previously-described extensible-arm of the rock-lever, and consists of a vertical rod 40 pivotally secured at its lower end at 41 on tube 31, and a tube 42 fitting telescopically on rod 40. A spring 43 fits in tube 42 and bears at its upper and lower ends respectively against said tube and the upper end of said rod, as shown clearly in Fig. 3.

A horizontal extensible-arm connects the vertical extensible-arms at their upper ends, consisting of a rod 44 secured on the upper end of tube 38 and a tube 45 fitting telescopically on rod 44 and secured in the upper end of tube 42. Rod 44 is provided with an extension 46 projecting slidably through a slot 47 in the upper end of the pendulum so as to be capable of vertical movement therein and for another purpose, as hereinafter appears. A tubular arm 48 projects outward from the upper end of tube 42 and is mounted on tube 45 and provided with a vertical longitudinal slot 49 in its outer end, and secured in the slotted end of tube 48 on a bolt 50 carried thereby, is a pair of clamp-plates 51 provided with notches 52 conjointly forming a vertical opening for the reception of the stem 53 of the governor (not shown) of the engine with which the attachment is associated.

The expansive frame pivotally carried by

the lever and constituted by rod 30 and tube 31, rod 44 and tube 45, bar 37 and tube 32 and rod 40 and tube 42 is maintained in a vertical position through its engagement with the stem of the governor and the slot of the pendulum, and to prevent springs 39 and 43 from expanding said frame vertically, a dog 54 is secured on the end 12 of the rock-lever and is bifurcated at its inner end to form a pair of lips 55 slidably engaging the upper faces of a pair of outwardly-projecting lugs 56 at the lower end of tube 38. Under ordinary conditions the lever never rocks sufficiently to withdraw lugs 56 from under lips 55, but when it does the frame is vertically extended, that is springs 39 and 43 slide tubes 38 and 42 upward and consequently through the connection between said tubes, and the governor stem, imparts like movement to the latter to cause the same to effect the closure of the engine-valve, not shown, and thus arrest the engine.

The expansive frame hereinbefore referred to, is extensible horizontally in order that the attachment may be readily secured in operative relation to engines of varying sizes. For instance, if the engine has a narrow base the attachment may be properly arranged with said frame contracted to its shortest length. If the base of the engine is a wide one tube 42 is grasped and pulled outward to extend the length of said frame so that slot 49 may receive the governor stem, but before said stem is thus extended the plates 51 are fitted loosely on said stem, and adjusted thereon until in line with tube 48. The said frame is then extended until tube 48 receives said plates and said stem, as shown in Fig. 8, which purpose is accomplished without interfering with the operation of the machine. Bolt 50 is then manipulated to spring the slotted ends of tube 48 inward and thus cause plates 51 to clamp stem 53 tightly between them, so that fluctuations in speed of the engine which cause the stem to move up and down shall result in a slight rocking of the rock-lever, such movement of said lever being so slight that lips 55 will remain engaged with lugs 56.

The pipe 26 is connected to the pump, and when the latter is operating at a predetermined or desired pressure the rock-lever is in equilibrium, and passage 25 communicating with pipe 26 is also in communication through passage 24 with passages 21 and 20 and therefore through the tubular or pipe end of the rock-lever, with the hollow globe so as to supply water to the latter, the air in the globe being subjected to the pressure of the water supplied by the pump.

Assuming that the attachment is connected through pipe 26 with the pump and

through clamping plates 51 or equivalent means with the stem of the governor of the engine and that the latter and the pump are operating normally, it will be understood that the rock-shaft will be standing substantially as shown, with passage 24 in communication with passage 21, to provide for the free passage of water from pipe 26 to the globe, the latter containing air under a predetermined pressure so as to be capable of expelling water from the globe if supplied thereto under a lower pressure than that of the air, and of yielding if the pressure of the water supplied to the globe exceeds such predetermined pressure, to permit the supply of water in the globe to be augmented. In the first instance the globe-carrying end of the lever moves upward be- weight of the same counterbalances that of the poise end of the lever.

Should the pressure of the water in the pump exceed that of the air in the latter, the volume of water in the globe is augmented and thus increases the weight of the same and causes it to overbalance the poise and move downward. As a result of this operation of the lever, the governor stem is forced upward and imparts closing movement to the valve stem and thus effects a reduction in the speed of the engine and in the volume of water pumped, and the re-elevation of the globe and governor stem to normal position as hereinbefore explained. If the pressure of the water in the pump falls slightly below that of the air in the globe, such air forces water out of the globe by way of pipe 13, passages 20, 21, 24 and 25, and pipe 26, the expulsion of this water diminishes the weight of the globe. As a result the poise overbalances and raises the globe, the valve action due to the movement of the lever cuts off communication between passages 21 and 24. The downward movement of the poise effects downward movement of the steam valve and the supply of a greater quantity of steam to the engine, this result being of course followed by restoring the pressure of the water in the pump to normal. As soon as this occurs water passes from the pump to pipe 26 and thence through the by-pass pipe and passages 23 and 22 to passage 21, and thence as previously traced to the globe, until the weight of the same counterbalances that of the poise, and causes the lever to rock back to normal position, after which the water will take the shorter and more natural path through passages 25 and 24. The reverse movement of the lever reëlevates the governor stem and imparts closing movement to the valve of the engine. It will thus be seen that the fluctuations in the volume of water pumped and the consequent changes in speed of the engine, result in downward or upward movement of the globe, communi-

cation between passage 21 of the lever and the supply pipe 26 being always open either through passages 24 and 25 or the by-pass pipe and passages 22 and 23.

Should the pump throw a valve or lose its priming and the engine begin to race, the pressure in the pump is quickly reduced, the effect being a very quick expulsion of water from the globe by the air therein and the rising of the globe through a greater arc than usual, that is, the rock-lever rocks sufficiently to withdraw lips 55 from engagement with lugs 56. As a consequence, springs 39 and 43 increase the height of the expansible frame sufficiently to cause the governor stem to effect the complete closing movement of the valve and the consequent arrest of the engine, and before the engine can be restarted the said frame must be reduced to its normal height and so secured by the reëngagement of lips 55 with the upper face of the lugs 56 of tube 38.

To prevent the lever rocking through a greater arc than that necessary to effect disengagement between lips 55 and lugs 56 and thus impart an unnecessary shock or jar on the governor stem, stop-plate 57 secured to the head 1, overlies the block or central portion 8 of the lever so that said central portion shall strike against the underside of said stop-plate at the proper time for the purpose explained.

The tank 19 is not an indispensable element and is employed only as a convenient reservoir from which to charge the globe with additional air in the event it is desired to operate the pump at a higher pressure without increasing the predetermined volume of water with which the globe is charged.

From the above description it will be apparent that I have produced a regulator for pumping engines embodying the desirable features of advantage enumerated in the statement of the object of the invention and I wish it to be understood that the invention is susceptible of modification in various particulars without departing from the essential spirit and scope of the appended claims.

Having thus described the invention what I claim as new and desire to secure by Letters-Patent, is:

1. The combination of a rock lever journaled upon a valve, a receptacle at one side of its pivotal point, adapted to contain an elastic fluid under a pressure exceeding that of the atmosphere, and also adapted to contain a liquid under pressure, a by-pass and a supply pipe connected to the journal support of the rock lever, a supply pipe in communication with the journal support of the rock lever and the receptacle, whereby additional liquids under pressure may pass into said receptacle to augment its weight and cause it to balance or overbalance the

end of the lever at the opposite side of the pivotal point thereof, or permit liquid to escape from said receptacle until the end of the lever at the opposite side of the pivotal point from the receptacle balances or over-

balances the latter.
 2. The combination of a rock-lever, a receptacle carried thereby containing air under pressure, means for weighting the receptacle by conducting water thereto to balance or overbalance the opposite end of the lever or for lightening the receptacle by conducting water therefrom until it balances or is of less weight than said opposite end of the lever, a frame pivotally carried by the lever, and means for maintaining said frame in an upright position irrespective of the rocking movements of the lever.

3. The combination of a rock-lever, a receptacle carried thereby containing air under pressure, means for weighting the receptacle by conducting water thereto to balance or overbalance the opposite end of the lever or for lightening the receptacle by conducting water therefrom until it balances or is of less weight than said opposite end of the lever, a frame pivotally carried by the lever, a pendulum bearing a pivoted relation to the lever and connected to said frame to hold the latter upright irrespective of the tilting movements of the lever.

4. The combination of a rock-lever, a receptacle carried thereby containing air under pressure, means for weighting the receptacle by conducting water thereto to balance or overbalance the opposite end of the lever or for lightening the receptacle by conducting water therefrom until it balances or is of less weight than said opposite end of the lever, a vertically-extensible frame pivotally carried by the lever, means movable with the lever for normally holding said frame contracted and adapted to release said frame when the lever describes an arc of abnormal length, and means to extend said frame when thus released.

5. The combination of a rock-lever, a receptacle carried thereby containing air under pressure, means for weighting the receptacle by conducting water thereto to balance or overbalance the opposite end of the lever or for lightening the receptacle by conducting water therefrom until it balances or is of less weight than said opposite end of the lever, a vertically-extensible frame pivotally carried by the lever, means movable with the lever for normally holding said frame contracted and adapted to release said frame when the lever describes an arc of abnormal length, means to extend said frame when thus released, and means pivotally carried by the lever, for holding said extensible frame in an upright position without interfering with its extension movement.

6. The combination of a rock-lever, a receptacle carried thereby containing air under pressure, means for weighting the receptacle by conducting water thereto to balance or overbalance the opposite end of the lever or for lightening the receptacle by conducting water therefrom until it balances or is of less weight than said opposite end of the lever, a vertically-extensible frame carried by and projecting laterally from and bearing a pivotal relation to said lever, and a pendulum bearing a pivotal relation to the lever and a sliding relation to the upper part of the extensible frame.

7. The combination of a rock-lever, a receptacle carried thereby containing air under pressure, means for weighting the receptacle by conducting water thereto to balance or overbalance the opposite end of the lever or for lightening the receptacle by conducting water therefrom until it balances or is of less weight than said opposite end of the lever, a vertically and laterally extensible frame carried by and projecting laterally from and bearing a pivotal relation to said lever, and a pendulum bearing a pivotal relation to the lever and a sliding relation to the upper part of the extensible frame.

8. The combination of a rock-lever, a receptacle carried thereby containing air under pressure, means for weighting the receptacle by conducting water thereto to balance or overbalance the opposite end of the lever or for lightening the receptacle by conducting water therefrom until it balances or is of less weight than said opposite end of the lever, a rod secured to and projecting laterally from the lever, a tube fitting telescopically thereon, a rod secured to and projecting upward from said tube, a tube mounted slidably on said last-named rod, an upright bar bearing a pivotal relation at its lower end to the lever, a tube fitting slidably on said pivoted bar, springs interposed between said upright rod and bar and the tubes fitting slidably thereon, a rod carried by the tube on the pivoted bar, a tube carried by the tube of the upright rod and fitting telescopically on the rod carried by the tube of the pivoted bar, and means bearing a pivoted relation to the lever and a sliding relation to the rod carried by the tube of the pivoted bar, to maintain said frame in an upright position.

9. The combination of a suitable support, a shaft carried thereby and provided with a pair of passages, a rock-lever mounted on said shaft and provided with a passage normally communicating with the said passages of the shaft, a weight carried at one end of the lever, a receptacle mounted on the other end of the lever and containing air under pressure and communicating with said passage of the lever, a pipe communicating with one of the passages of the rock-shaft, a by-

pass pipe connecting the first-named pipe with the other passage of the rock-shaft and provided with a check-valve to permit water to pass from the first-named pipe through the by-pass pipe but not in the opposite direction, means pivotally carried by and movable up and down with the lever at the opposite side of its pivotal point from said receptacle, and means bearing a pivotal relation to the lever for holding said first-named means in an upright position.

10. The combination of a suitable support, a shaft carried thereby and provided with a pair of passages, a rock-lever mounted on said shaft and provided with a passage normally communicating with the said passages of the said shaft, a weight carried at one end of the lever, a receptacle mounted on the other end of the lever containing air under pressure and communicating with the said passage of the lever, a pipe communicating with one of the passages of the rock-shaft, a by-pass pipe connecting the first-named pipe with the other passage of the rock-shaft and provided with a check-valve to permit water to pass from the first-named pipe through the by-pass pipe but not in the opposite direction, extensible means pivotally carried by the lever at the opposite side of its pivotal point from said receptacle, means for holding said frame upright, means movable with the lever for normally holding the extensible means contracted, and means to extend said extensible frame in the event that the lever rocks through an arc sufficiently great to withdraw the means movable with

the lever from engagement with the extensible frame.

11. The combination of a suitable support, a shaft carried thereby and provided with a pair of passages, a rock lever mounted on said shaft and provided with a passage normally communicating with the said passages of the said shaft, a weight carried at one end of the lever, a receptacle mounted on the other end of the lever containing air under pressure and communicating with the said passage of the lever, a pipe communicating with one of the passages of the rock-shaft, a by-pass pipe connecting the first-named pipe with the other passage of the rock-shaft and provided with a check-valve to permit the water to pass from the first-named pipe through the by-pass pipe but not in the opposite direction, extensible means pivotally carried by the lever at the opposite side of its pivotal point from said receptacle, means for holding said frame upright, means movable with the lever for normally holding the extensible means contracted, means to extend said extensible frame in the event that the lever rocks through an arc sufficiently great to withdraw the means movable with the lever from engagement with the extensible frame, and means to positively limit the rocking movement of the lever.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM K. RICHARDSON.

Witnesses:

M. L. RICHARDSON,
M. K. RICHARDSON.