A. H. EMERY.

HYDRAULIC ACCUMULATOR.

APPLICATION FILED FEB. 13, 1913.

1,121,237.

Patented Dec. 15, 1914.

3 SHEETS—SHEET 1.

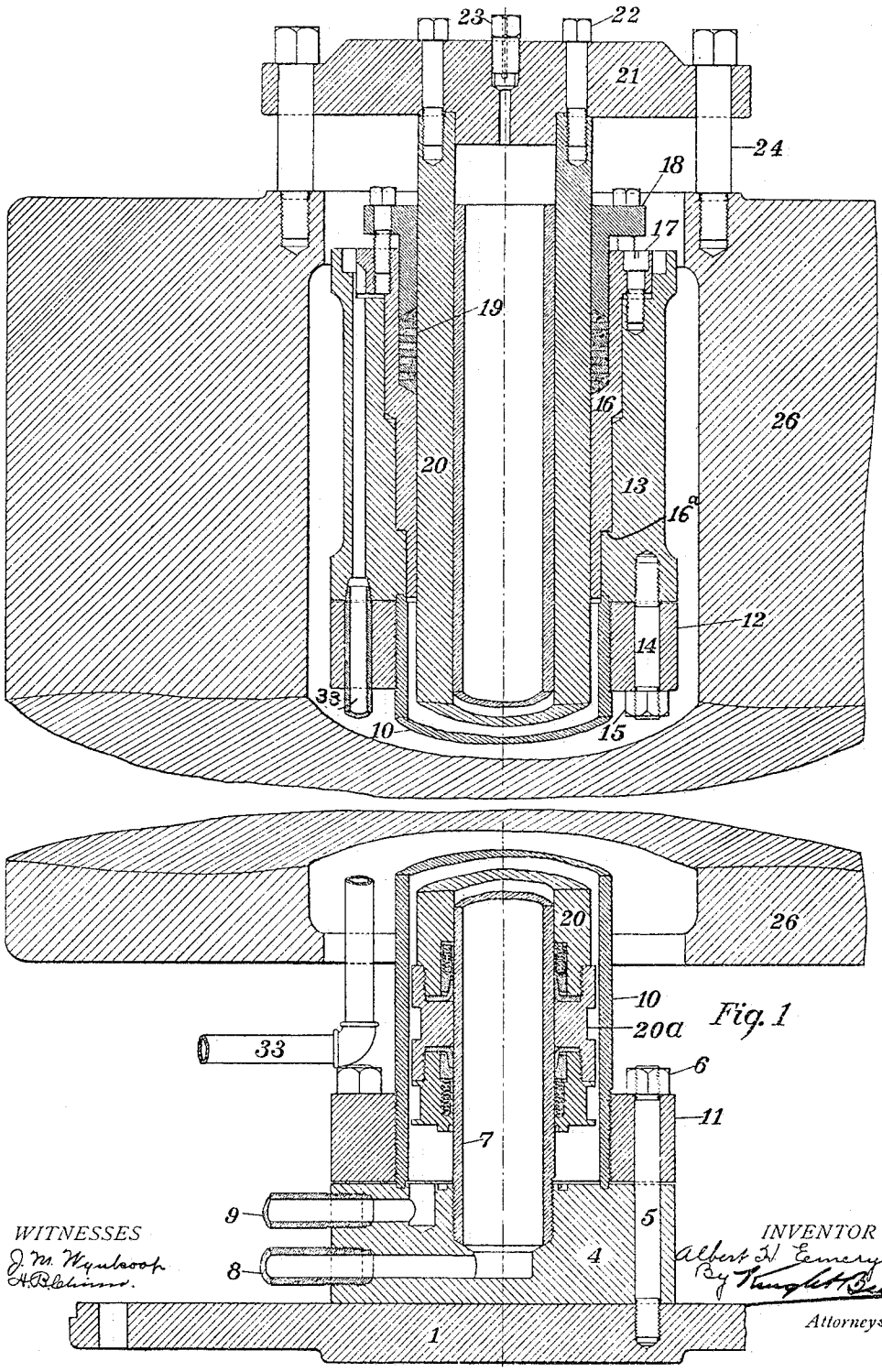

Fig. 1

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3 SHEETS—SHEET 2.

Fig. 2

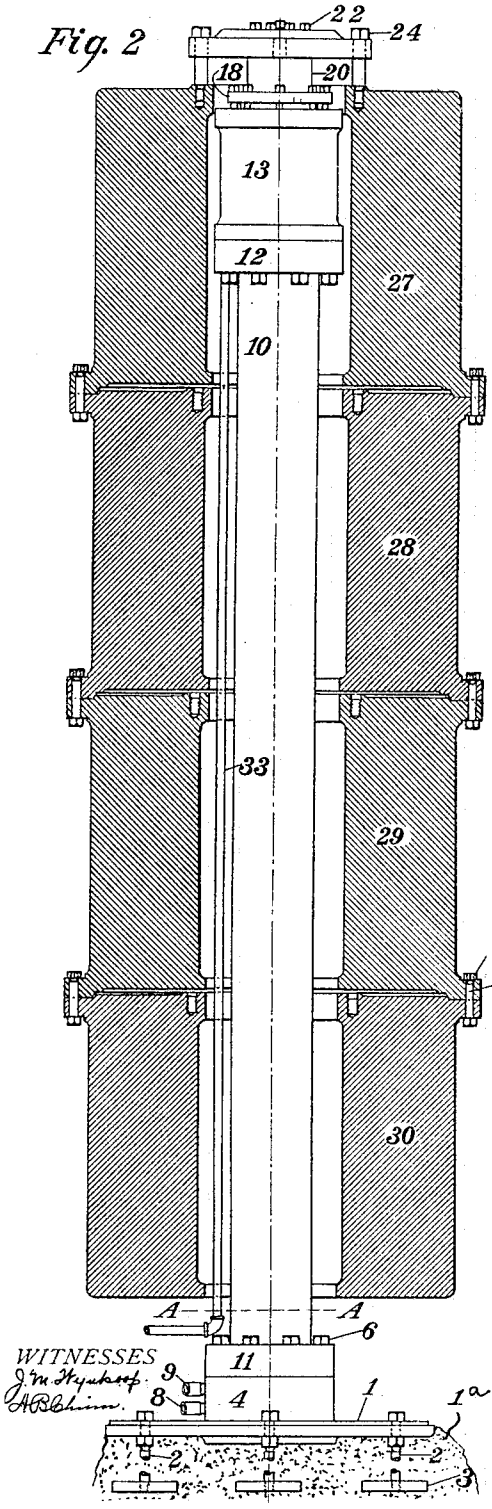


Fig. 3

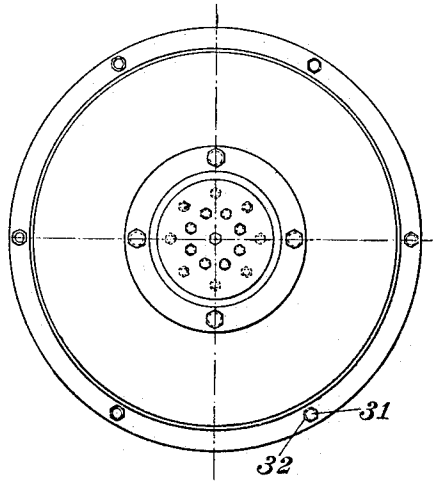
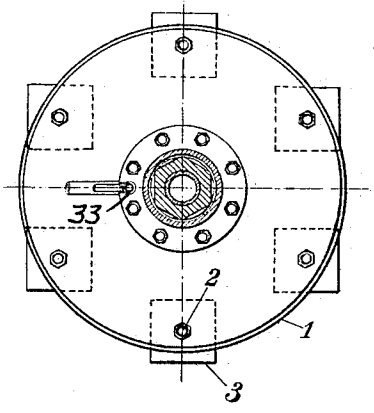


Fig. 4



WITNESSES

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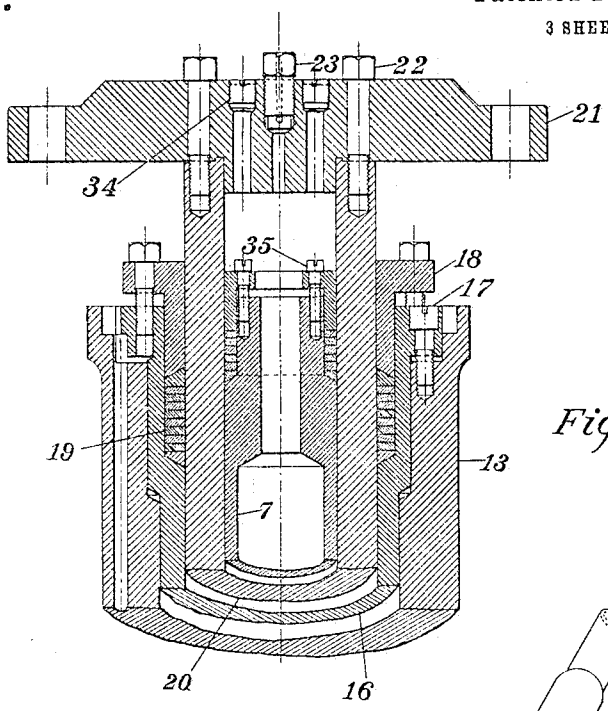

Fig. 5

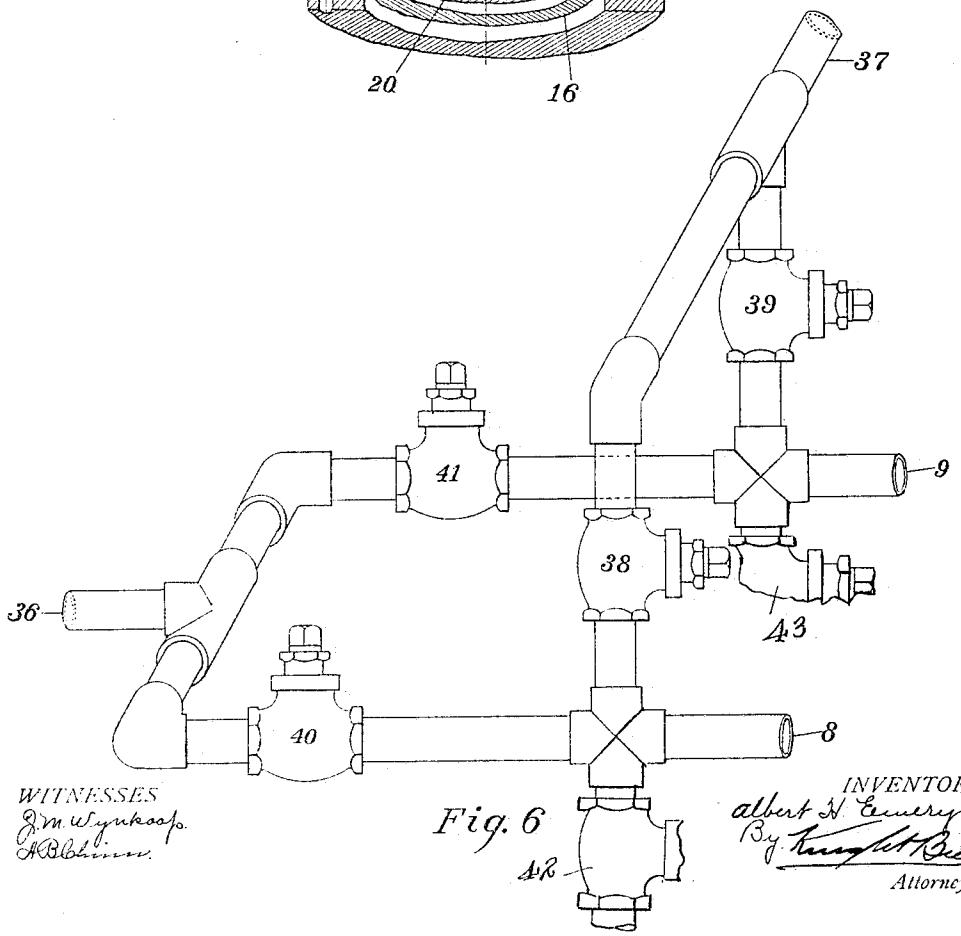

Fig. 6

WITNESSES

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UNITED STATES PATENT OFFICE.

ALBERT H. EMERY, OF STAMFORD, CONNECTICUT.

HYDRAULIC ACCUMULATOR.

1,121,237. Specification of Letters Patent. Patented Dec. 15, 1914.

Application filed February 13, 1913. Serial No. 748,262.

To all whom it may concern:

Be it known that I, ALBERT H. EMERY, a citizen of the United States, and a resident of Stamford, in the county of Fairfield and the State of Connecticut, have invented certain new and useful Improvements in Hydraulic Accumulators, of which the following is a specification.

This invention relates to a construction of accumulators capable of giving a plurality of pressures when using a single weight or other constant load.

Figure 1 shows a vertical section of the accumulator and its weights, with the central portion removed to allow the drawing to be made to a larger scale; Fig. 2 shows a side elevation of the accumulator shown in Fig. 1, with the weights only in section; Fig. 3 is a plan of the accumulator and weights shown in Figs. 1 and 2; Fig. 4 is a cross section of the accumulator taken on a line A A just below the weights; Fig. 5 is a cross section of the upper end of the accumulator showing an alternative form of packing; Fig. 6 shows the arrangement of valves used for the proper control of the accumulator.

In the figures, 1 is a bed casting or plate fastened to the foundation 1^a by the anchor bolts 2, and plates 3. The lower head 4 of the accumulator is fastened to the bed by the studs 5 and nuts 6 and a pipe or ram 7 screws into this head and makes a sealed joint on its lower end. This pipe 7 forms the inner ram of the accumulator. Pipes 8 and 9 also screw into this head 4 and make sealed joints at their ends. One of these pipes 8, leads to the inside of pipe 7 and the other 9 to the annular space around the pipe 7. Pipe 10 forms the outer casing of the accumulator and this is screwed into an annular ring 11. The pressure applied by screwing down the nuts 6 sealing the joint between the outer pipe 10 and the lower head 4 and holds the accumulator upright on the bed. The upper end of pipe 10 has a ring 12 similar to ring 11 screwed to it.

#13 is the upper head of the accumulator and it is fastened to ring 12 by studs 14 and the nuts 15 which produce the pressure to seal the joint between the pipe 10 and the upper head 13. This head 13 is provided with a gland 16, preferably of bronze or brass, held by screws 17 which seal the shouldered sealing joint 16^a between it and #13. This gland carries a packing gland 18 and packing 19. #20 is the outer or annular ram of the accumulator and it fits and slides in the glands 16 and 18 and in the packing 19 and is preferably made of steel with a polished exterior surface. This ram carries a head 20^a and a compound packing on its lower end which acts to stop liquid flowing by it in either direction. This packing may be of the form shown here or of any of the usual forms of hydraulic packing. This head 20^a is larger in diameter than the outside of #20 and forms a stop for the accumulator when the ram reaches the upper limit of its motion. This annular ram 20 carries on its upper end a circular head 21 fastened to it by bolts 22 which also give the pressure to seal the joint between it and #20. An air plug 23 is provided to allow the easy removal of air rising above the liquid used. The bolts 24 carry the accumulator weight which may be a single annular casting as shown by #26, Fig. 1, or a series of annular castings as shown by pieces 27, 28, 29, and 30, Fig. 2, held together by bolts 31 and nuts 32.

The construction of this accumulator permits a plurality of pressures obtainable at any time without changing the load carried at that time. This accumulator weight might be made in any of the usual forms such as an annular tank filled with water, sand, or cement, but in any case the load is carried by the head 21, whether made up of all the weights shown connected as in Fig. 2, or any part of them. This accumulator, as constructed, with its three cylinders and three different pressures, and its series of weights is a massive structure, and to disassemble it would involve great expense. Yet its packings may have to be replaced quite frequently. To permit this without disturbing much of the accumulator, the head 21 which carries the weights through the bolts 24 is made readily removable, and the ram 20 with its enlarged head 20^a made readily removable by taking out the bolts 17 and gland 16 with its contained packing

gland 18 and packing 19, after which the ram or cylinder 20 can be lifted out with the enlarged head 20ª and packings carried thereby and these packings then replaced. All this can be done without disturbing the loading weights, or the inner or outer cylinders or the contained liquid. Pipe 33 provides a means for the easy removal of the leakage at the packing 19.

Referring to Fig. 5, we have an alternate form of construction wherein the packings are removed from the lower end of #20 and placed at the upper end of #7, act on the inner surface of #20. By removing the plugs 34, the screws 35 can be reached with a screw driver when the accumulator is closed and the packing tightened. By using the packing between rams 7 and 20 at the upper end of 7 as shown in Fig. 5, instead of at the lower end of 20 as shown in Fig. 1, one can more easily get at the packing to tighten it when necessary, and the enlarged head 20ª may be used as a stop whichever way we may use the packing between 7 and 20.

Fig. 6 shows the valve system used in connection with this accumulator. Pipe 36 leads to the cistern or source of supply of the liquid, and pipe 37 leads to the press or other apparatus which is to be operated. Valve 38 closes the connection from pipe 8 to 37; valve 39 from pipe 9 to pipe 37; valve 40 from pipe 8 to pipe 36, and valve 41 closes or opens pipe 9 to pipe 36. The object of this design is to give three convenient and available pressures of liquid for a given load on the ram, and this is done by carrying the load on either the combined area of rams 20 and 7, or on ram 20 alone, or on ram 7 alone, with results which may be termed low, intermediate and high pressure. In the first case both valves 40 and 41 are closed and valves 38 and 39 open, and the load due to the weights and the ram 20 is carried on the combined area, ram 20 sliding in packing 19. In the second case, valves 38 and 41 are closed and 39 and 40 open so that the effective weight acts only on the area of ram 20. In the third case, valves 39 and 40 are closed and 38 and 41 open so that the effective weight acts on the area of ram 7; that is on the area of its outside diameter corresponding to the inside diameter of ram 20. In charging the accumulator, valves 38 and 39 are closed and liquid comes from the pump through either or both of valves 42 and 43. When through 42 only, valves 40 and 43 are closed, and the pump charges ram 7 only, the ram 20 being filled by liquid directly from the cistern through valve 41. Or one may charge the accumulator by running the pump with valves 41 and 42 closed, while valves 40 and 43 are open, in which case the pump runs much easier but takes longer to raise the weights. Neglecting the effect of the cistern pressure on the rams, and calling the total load carried at any time =W, the area of ram 20=A, and area of ram 7=a, then the pressure (low) in the first case $=\frac{W}{Aa}$; in the second case (intermediate pressure) $=\frac{W}{A}$, and in the third case (high) $=\frac{W}{a}$.

In use I prefer to have the intensity of the three pressures obtainable by any load W, approximately in the proportion of 1, 2 and 3, and this is accomplished by making A=2a. The load on 21 could be supplied by springs, or a steam, hydraulic, or pneumatic cylinder and piston. It is obvious that we can use part of the weights 27, 28, 29 and 30 at any time or all of them as we may choose by disconnecting such as we do not use at any particular time.

What I claim is:

1. In a hydraulic accumulator, the combination with a cylinder 13 and its ram 20 of the guiding gland 16 having an outer shouldered sealed joint 16ª, with the cylinder 13 sealing screws 17 for said guiding gland, and the packing gland 18 with its packing 19, said guiding gland 16 having an extension below its sealing shoulder 16ª forming an elongation of the guide for the ram 20.

2. In a hydraulic accumulator, the combination with a cylinder 13 and its ram 20 of the guiding gland 16 having an outer shouldered sealing joint 16ª, with the cylinder 13 sealing screws 17 for said guiding gland, and the packing gland 18 with its packing 19; said ram having an enlarged head 20ª; and said guiding gland being of smaller diameter than the enlarged head and thereby providing a stop shoulder against which the enlarged head of the ram strikes when at the limit of its upward movement.

3. A hydraulic accumulator comprising three concentric cylinders, two of which are fixed, the intermediate cylinder being movable and adapted to act as a ram, the outer and inner cylinders acting as a cylinder for the intermediate cylinder when it is acting as the ram, said inner cylinder being also adapted to act as a ram, and the intermediate cylinder acting as a cylinder for the inner cylinder when it is acting as a ram, this intermediate cylinder having a removable head which closes the pressure-chamber of the inner ram, and extends beyond the walls of the outer cylinder and carries a weight concentric therewith.

4. In a hydraulic accumulator, the combination of the bed plate 1, the lower head 4, the cylinder 10, having a small bearing on its lower end for sealing its joint with said head, flange 11 spaced from the head 4 and

secured on the cylinder, and the fixing bolts 5 passing through said flange 11 and head 4 and secured in the base 1; said bolts drawing said cylinder 10 firmly to said head and thereby sealing the joint between the cylinder and head and holding the cylinder in upright position on the bed.

The foregoing specification signed at Washington, D. C., this 12th day of February, 1913.

ALBERT H. EMERY.

In presence of two witnesses—
EDWIN S. CLARKSON,
J. M. WYNKOOP.