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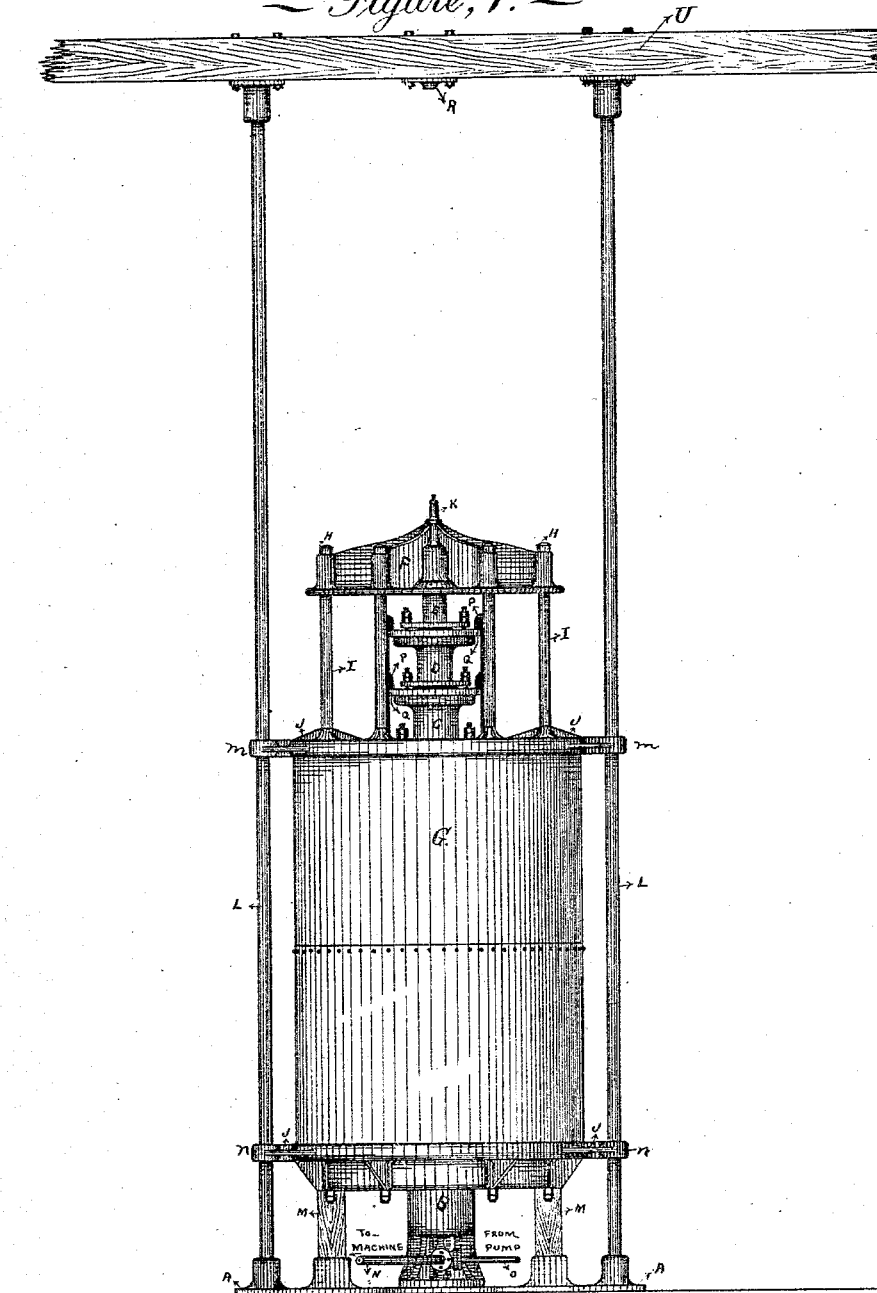
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J. R. MORGAN.
ACCUMULATOR.

No. 305,835.

Patented Sept. 30, 1884.

— Figure, 1. —



Witnesses } John H. Lloyd, Inventor
W. H. Morgan, Jno. R. Morgan
B. H. Symmon

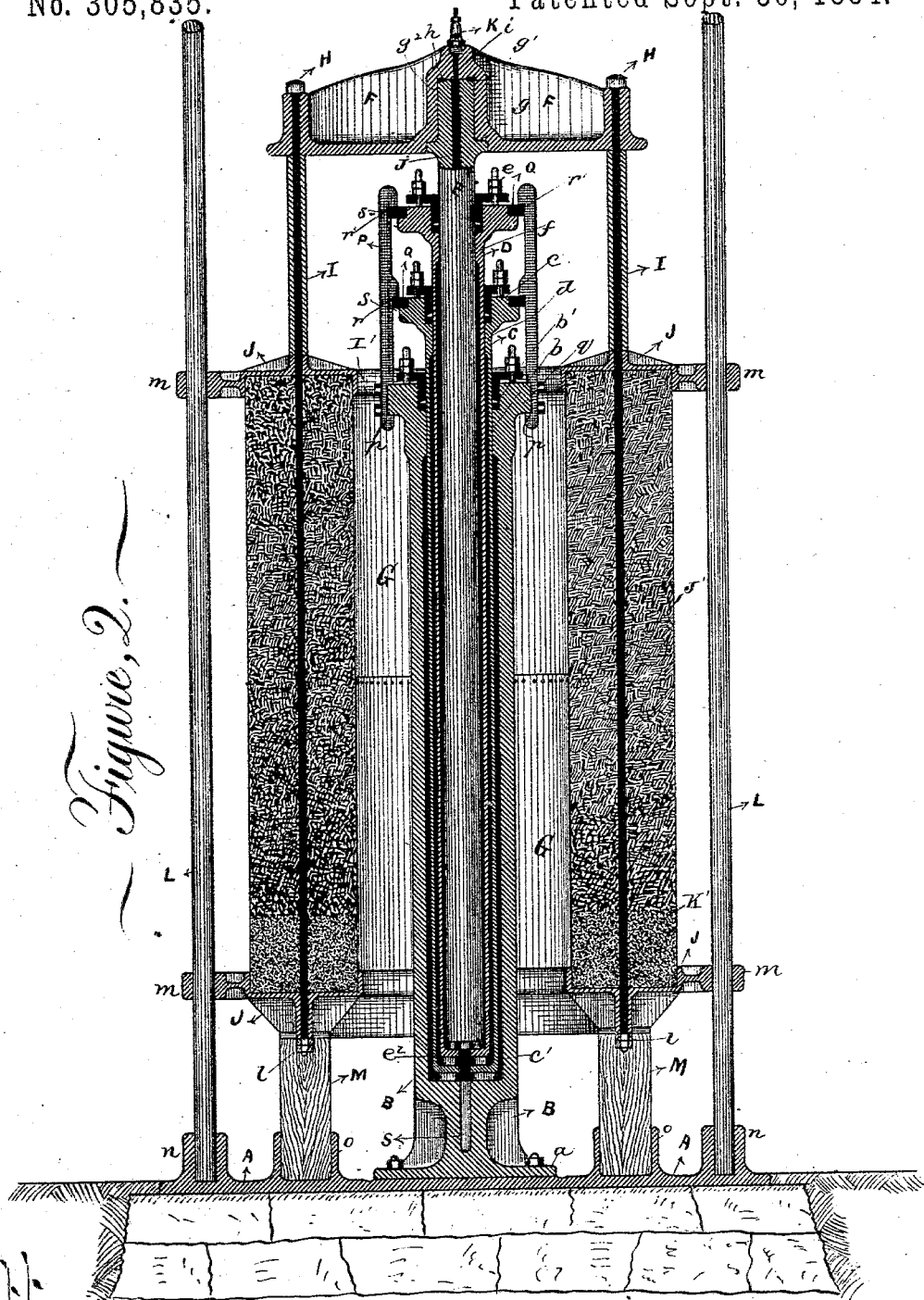
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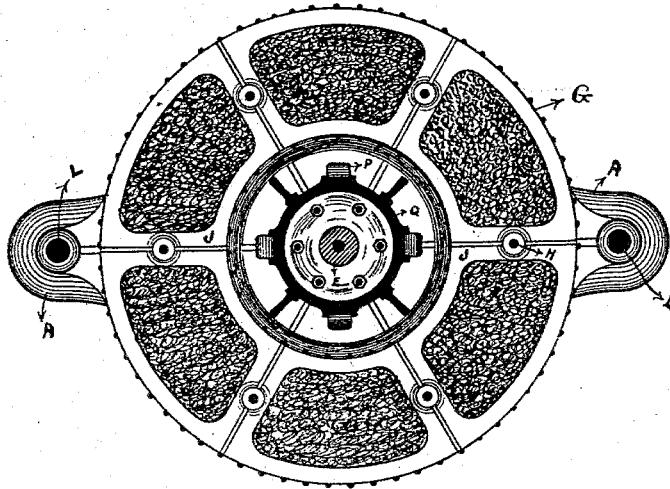
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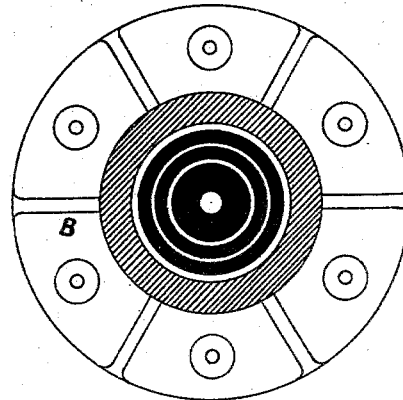
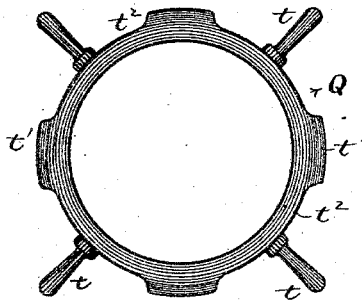
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Figure, 3.



Fig, 5.



Fig, 4.

Fig, 6.

Witnesses { John H. Lloyd.
J. R. Morgan. Inventor Jno. R. Morgan
By M. S. Symmon.

UNITED STATES PATENT OFFICE.

JOHN R. MORGAN, OF ALLIANCE, OHIO.

ACCUMULATOR.

SPECIFICATION forming part of Letters Patent No. 305,835, dated September 30, 1884.

Application filed October 30, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. MORGAN, of Alliance, in the county of Stark and State of Ohio, have invented certain new and useful

5 Improvements in Accumulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

10 My invention relates to an improvement in hydraulic accumulators, the object being to provide an accumulator of such construction that the pressure may be readily and easily varied for the difference kinds of work requiring varying pressures; and with this end

15 in view my invention consists in certain features of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

20 In the accompanying drawings, Figure 1 is a view in side elevation of my improved accumulator. Fig. 2 is a view partly in side elevation and partly in vertical section of the same. Fig. 3 is a transverse section. Fig. 4

25 is a transverse section of the main hydraulic cylinder and its plungers. Fig. 5 is a plan view of the locking-ring, and Fig. 6 is a plan view of one of the locking-bars.

30 A represents the base-plate, upon which stands and is bolted the base *a* of the main hydraulic cylinder B, which is provided at its upper end with a bearing, *b*, and a stuffing-box, *b'*.

35 Within the cylinder B is located the ram or plunger C, which snugly fits the bearing *b* of the cylinder B, and is provided at its upper end with a stuffing-box, *c*, and at its lower end with an opening, *c'*, equal to half its diameter. The ram or plunger C is also furnished near

40 its upper end with a bearing, *d*, within which snugly fits the ram or plunger D, which is provided at its upper end with a stuffing-box, *e*, bearing *f*, and at its lower end with an opening, *e'*, equal to half its diameter.

45 Within the ram or plunger D is located the small ram or plunger E, which fits within the bearing *f* of the plunger D. The upper end of the ram E is constructed with a shoulder, *g*, and an extension, *g'*, which fits in a corresponding recess or cavity, *g''*, in the disk-

50 bracket F, a suitable leather packing, *h*, be-

ing interposed between the upper end of the ram E and the cavity in the disk-bracket, whereby a tight joint is insured between such parts. A small opening, *i*, extends from the 55 top of the disk-bracket through to the cavity formed therein, and communicates with the small opening or bore *j*, which extends throughout the entire length of the ram E. A safety-valve, K, is located over the upper end of the 60 bore *i* in the disk-bracket F. By this construction the entire pressure of the accumulator may be allowed to pass through the ram E to the safety-valve K, which latter is automatic in its movements, and relieves the press- 65 ure in the event that the gear for stopping the pump or engine should fail when the accumulator is filled. The water escaping from the safety-valve when an undue pressure is exerted in the accumulator may be wasted, or by 70 return-pipes be conveyed to the lower end of the accumulator-cylinder or pump, suitable valves being employed for that purpose.

As the construction and arrangement of valves for effecting the same result in other 75 types of hydraulic apparatus is old and no claim is made thereto in this application, it is not deemed necessary to illustrate or give a detailed description of such parts.

From the bracket-disk F is suspended the 80 main load G, which latter consists of an annular tank formed of light sheet metal, with a central opening, *l'*, of sufficient diameter to enable the tank to encircle the main cylinder B. This tank is provided with cast-iron frames 85 secured, respectively, to its upper and lower ends, which are bolted or riveted to the body of the tank. The top frame has openings, as shown in Fig. 3, through which is inserted metal scrap, *J'*, of such quantity as will insure 90 the desired weight. The bottom of the tank is provided with a layer of sand or small gravel, *l*, which serves as a cushion to the metal scrap should the tank fall by reason of any accident or breakage of any part. Tank G is suspend- 95 ed from the disk-bracket F by means of the suspension-bolts H, which pass through the cast-iron frames J, and are secured at their lower ends by means of nuts *l*. Suitable distance-pieces, *I*, encircle the suspension-bolts or 100 bars H between the disk-bracket F and the upper cast-iron frame J. Both the upper and

lower frames J J are provided with perforated lugs *m*, which encircle the guide-rods L L, the lower ends of which are firmly secured in the lugs *n n* on the base-plate, and at their upper ends secured in any desired manner to the roof or to bearings attached to the side walls of the building. This construction and arrangement of parts serves to retain the tank G in place throughout its vertical movement.

Base-plate A is also provided with recesses *o*, in which are secured the wooden blocks M, which serve as cushions, and also sustain the total weight of the tank G when not in use, thereby relieving the suspension-bolts H from all strain. Four steel bars, P, are firmly bolted at their lower ends to the upper end of the cylinder B, the lower ends of said bars being provided with recesses *p*, for the reception of the flange *q* on the upper end of the cylinder B, thus insuring the bars against endwise displacement. Each one of the bars P is provided with two shoulders, *r r'*, for a purpose to be hereinafter explained. Plungers C D are each provided at their upper ends with an annular shoulder, *s*, against which is placed a steel locking-ring, Q, the latter being provided with handles *t*, and with wide portions *t'* and narrow portions *t''*; said wide portions serving as locking-flanges. The upper cross-bar, U, to which the upper ends of the guide-bars L are secured, is provided with a recess-plate, R, with which engages the stem of the safety-valve K, and thereby automatically opening said valve when the ram E has been raised to its highest limit of movement.

To the lower end of the cylinder B is connected a pipe, O, which leads from the pump, for supplying water to cylinder B, while a pipe, N, is connected therewith for supplying water to the machine.

Having described the construction and arrangement of parts of one form of accumulator embodying my invention, I will now proceed to describe its operation.

It will be assumed that the accumulator shown and described is capable of producing three different pressures—namely, fifteen hundred, seven hundred and seventy-seven, and four hundred pounds per square inch—on the piston of the machine or apparatus to be operated.

In order to secure the lowest pressure—namely, four hundred pounds per square inch—the plungers C D are disconnected from the locking-bars P, which is effected by rotating the locking-rings Q until the wide locking-flanges *t'* are moved from beneath the shoulders *r r'* of the locking-bars P, and causing the narrow portions *t''* of said locking-rings to be brought in vertical alignment with said shoulders. When the locking-rings are in the position last described, the plungers C D and their locking-rings Q are free to move upwardly and downwardly without engaging the locking-bars P. The pumps are then allowed to charge the accumulator by forcing water into

the lower end of the cylinder B, which has the effect of raising the three rams or plungers C D E and the weight G. The internal pressure from the pump, acting on all surfaces, retains the plungers against any lateral movement or displacement, and also prevents the rams from telescoping. When the valve is opened to conduct water, under pressure, through pipe N to the machine to be operated upon, the weight G and all the plungers will descend, thereby subjecting the column in the cylinder B to the maximum area of the plungers or rams, which will produce the minimum pressure—namely, four hundred pounds to the square inch.

To secure a pressure of seven hundred and seventy-seven pounds to the square inch, the ram or plunger C is locked against vertical movement, which is effected by rotating the steel ring Q on said ram a sufficient distance to cause the locking lugs or flanges *t'* on the ring to engage the shoulders *r* on the locking-bars P. The pump is then operated and water forced into the lower end of the cylinder B, causing the plungers D and E to ascend and raise the weight G, and in their descent the column of water in the cylinder B will be subjected to a pressure equal to the maximum area of the two plungers D E, thereby insuring the increased pressure, as specified.

To insure a pressure of fifteen hundred pounds per square inch, the plungers C and D are locked to the steel bars P by the locking-rings Q, as hereinbefore described, so that when the pump is put into operation the ram or plunger E and weight G will be caused to ascend, and in their descent the column of water in the cylinder B will be subjected to a pressure equal to the transverse area of the ram E, thereby insuring the maximum pressure per square inch on the piston of the machine or apparatus to be operated upon.

It will be observed that in adjusting the machine for its varying pressures the load or weight G is not disturbed, but remains constant, while the adjustment of parts to secure the varying pressures is effected in a ready manner and at a slight outlay of time and power. Should any of the plungers or cylinders become broken, it does not necessitate emptying of the cylinder of its contents, as it may be allowed to rest upon its supporting-blocks M, and by removing the nuts from the suspension-bolts H and raising the disk-bracket F the cylinders and plungers may be readily removed and replaced. Again, it is not necessary to disturb or block up the weight G to pack the stuffing-boxes, as they are all located at the upper ends of the plungers, and are readily accessible for repacking when desired.

While I have shown and described an accumulator provided with three rams or plungers for securing three different pressures, I do not limit myself to this number, because the accumulator may be provided with any number of rams or plungers, and thus insure any desired wide range of work. Again, the weight G, in-

stead of being formed of a tank filled with scrap or other material, may consist of a series of metal weights attached or suspended in any desired manner to a rack or other suitable frame. This method will readily allow different pressures by taking off or adding on loose weights; or, in other words, different pressures could be attained between the given four hundred pounds and the seven hundred and seventy-seven pounds, or between seven hundred and seventy-seven pounds and fifteen hundred pounds.

As it is evident that many changes in the construction and relative arrangement of parts might be devised without involving a departure from my invention, I would have it understood that I do not limit myself to the exact construction and arrangement of parts shown and described; but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an accumulator, the combination, with a cylinder, two or more rams or plungers located within the cylinder, a disk-bracket or cross-bar secured to the upper end of one of the plungers, and a weight encircling the cylinder, suspended from the disk-bracket, of means for detachably connecting one or more of the other rams or plungers with the weight, substantially as set forth.

2. In an accumulator, the combination, with

a cylinder, two or more rams or plungers located within the cylinder, a disk-bracket or cross-bar secured to the upper end of one of the plungers, and a weight encircling the cylinder and suspended from the cross-bar or disk-bracket, of shouldered locking-bars secured to the cylinder, and locking-rings supported in the annular shoulders of the rams, and provided with lugs or flanges and handles, substantially as set forth.

3. In an accumulator, the combination, with a cylinder, of two or more rams located within the cylinder, one ram being arranged to move within another, the inner ram being provided with a bore extending longitudinally throughout its length, and a safety-valve communicating with said bore, substantially as and for the purpose set forth.

4. In an accumulator, the combination, with a cylinder and rams or plungers, of an annular weight, G, provided with end frame, J, having perforated lugs m, and the guide-rods L, substantially as and for the purpose set forth.

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

JNO. R. MORGAN.

Witnesses:

JOHN H. LLOYD,
SAM. S. WEBB.