(No Model.)

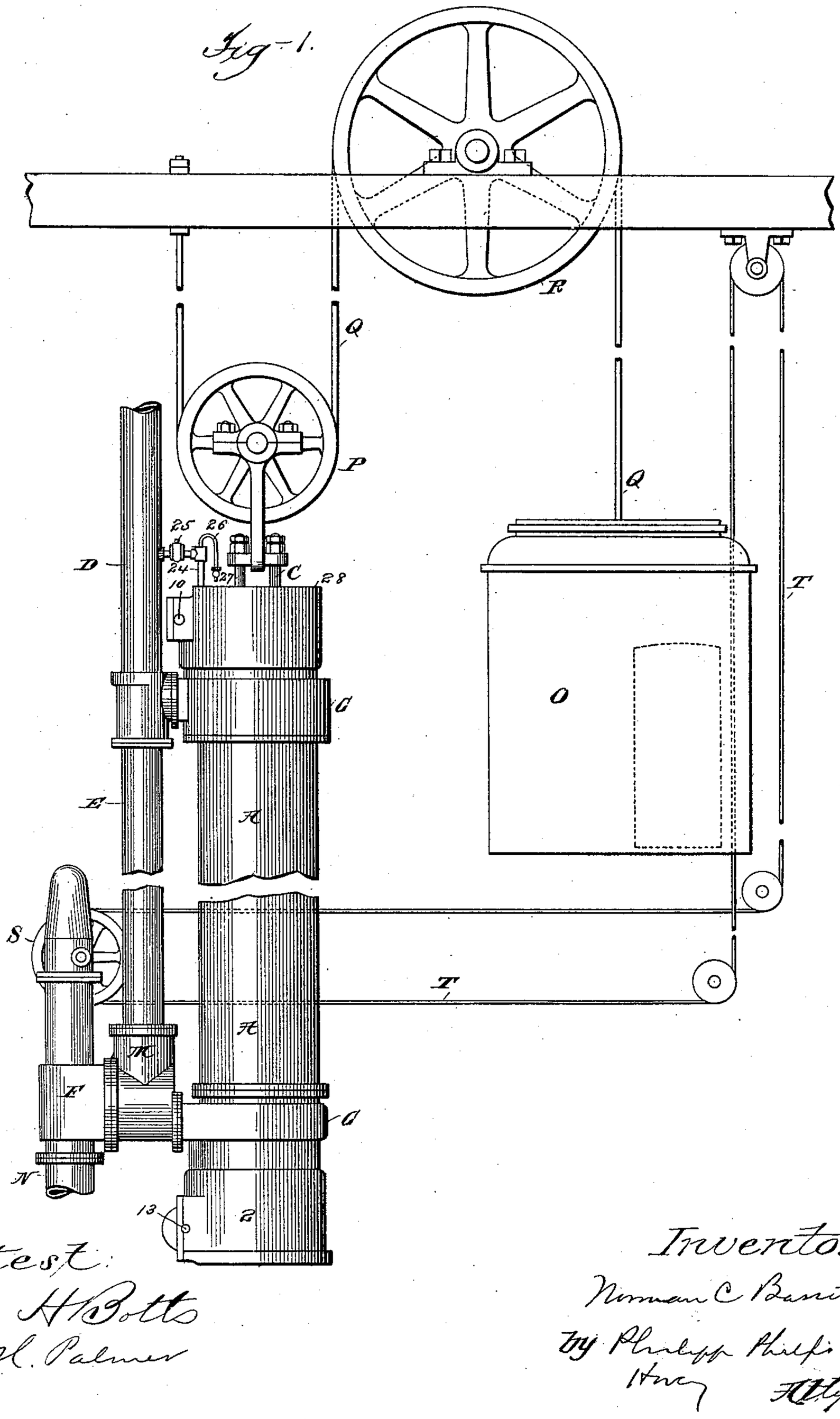
4 Sheets—Sheet 1.

N. C. BASSETT.

HYDRAULIC ELEVATOR.

No. 594,590. Patented Nov. 30, 1897.

Fig. 1.



Attest:
Geo. H. Botts
T. H. Palmer

Inventor:
Norman C. Bassett
by Philipp Philipp
Their Attys

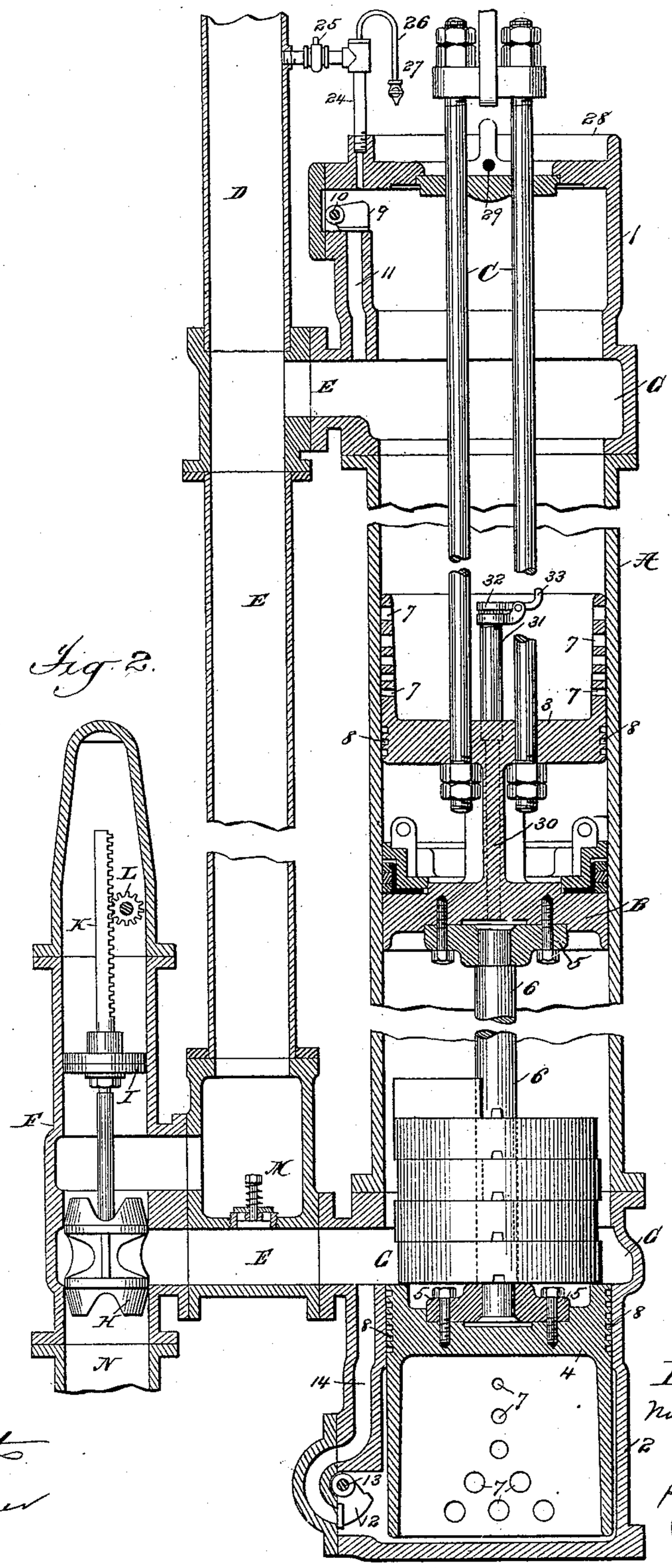
(No Model.) 4 Sheets—Sheet 2.

N. C. BASSETT.

HYDRAULIC ELEVATOR.

No. 594,590. Patented Nov. 30, 1897.

Fig. 2.



Attest:
Geo. H. Lotts.
T. H. Palmer

Inventor
Norman C. Bassett
By
Philipp Phelps
Atty

(No Model.) 4 Sheets—Sheet 3.

N. C. BASSETT.

HYDRAULIC ELEVATOR.

No. 594,590. Patented Nov. 30, 1897.

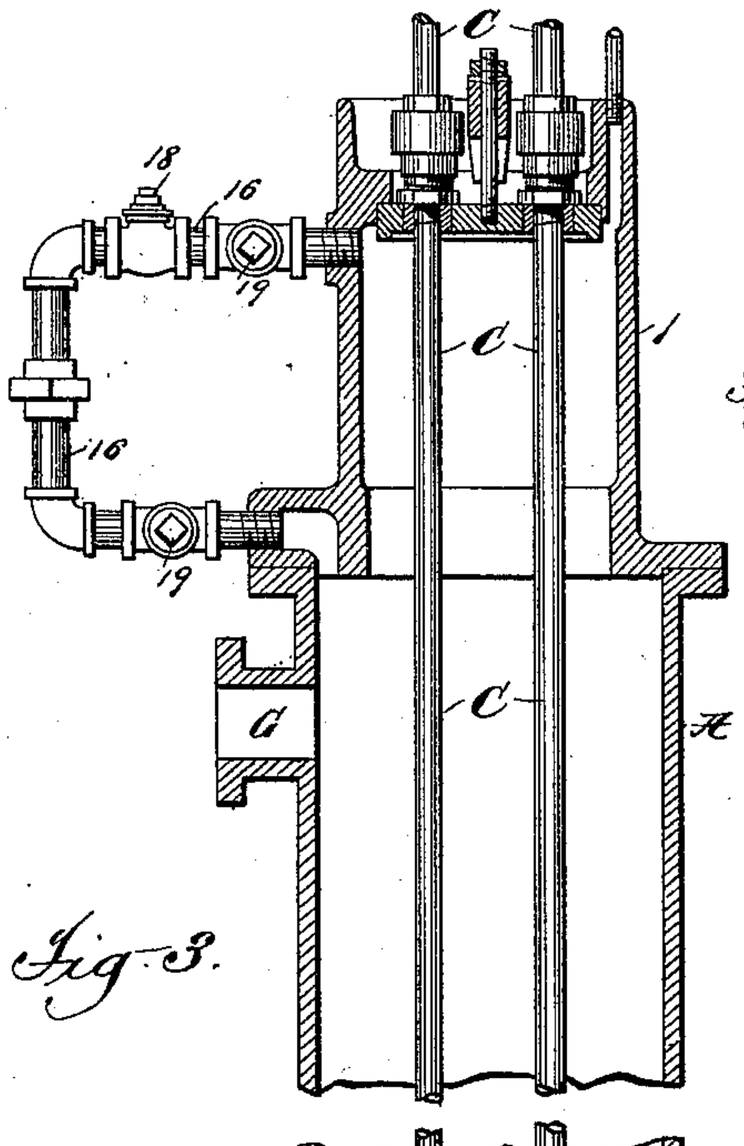


Fig. 3.

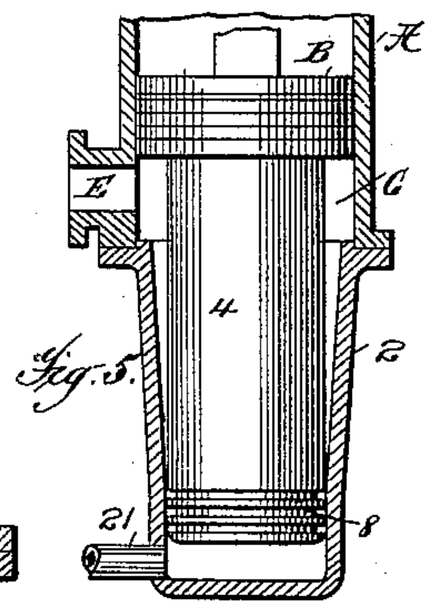


Fig. 5.

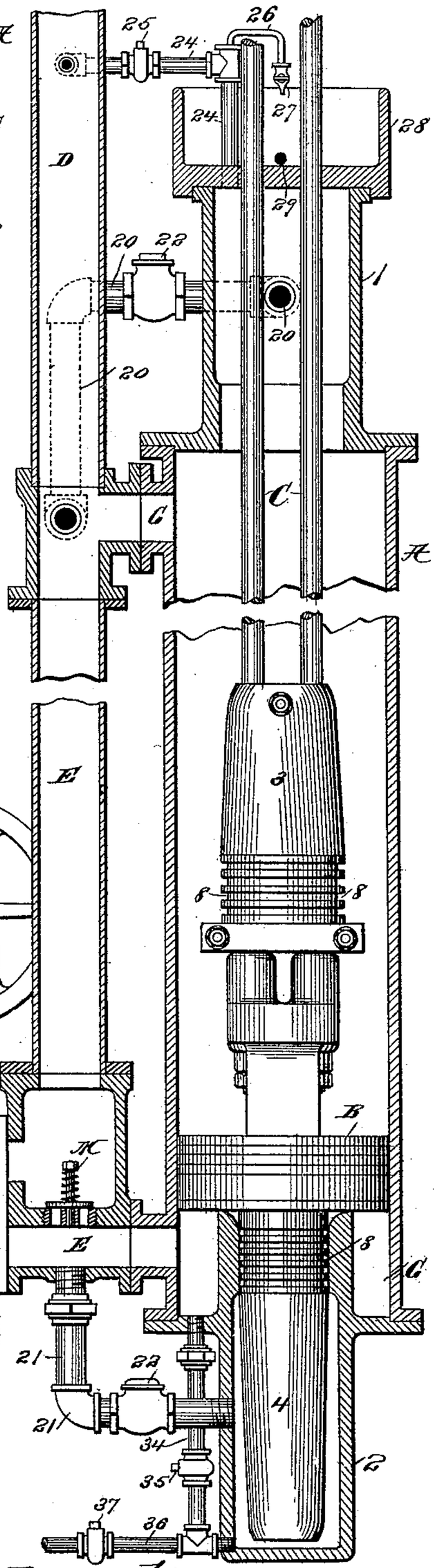
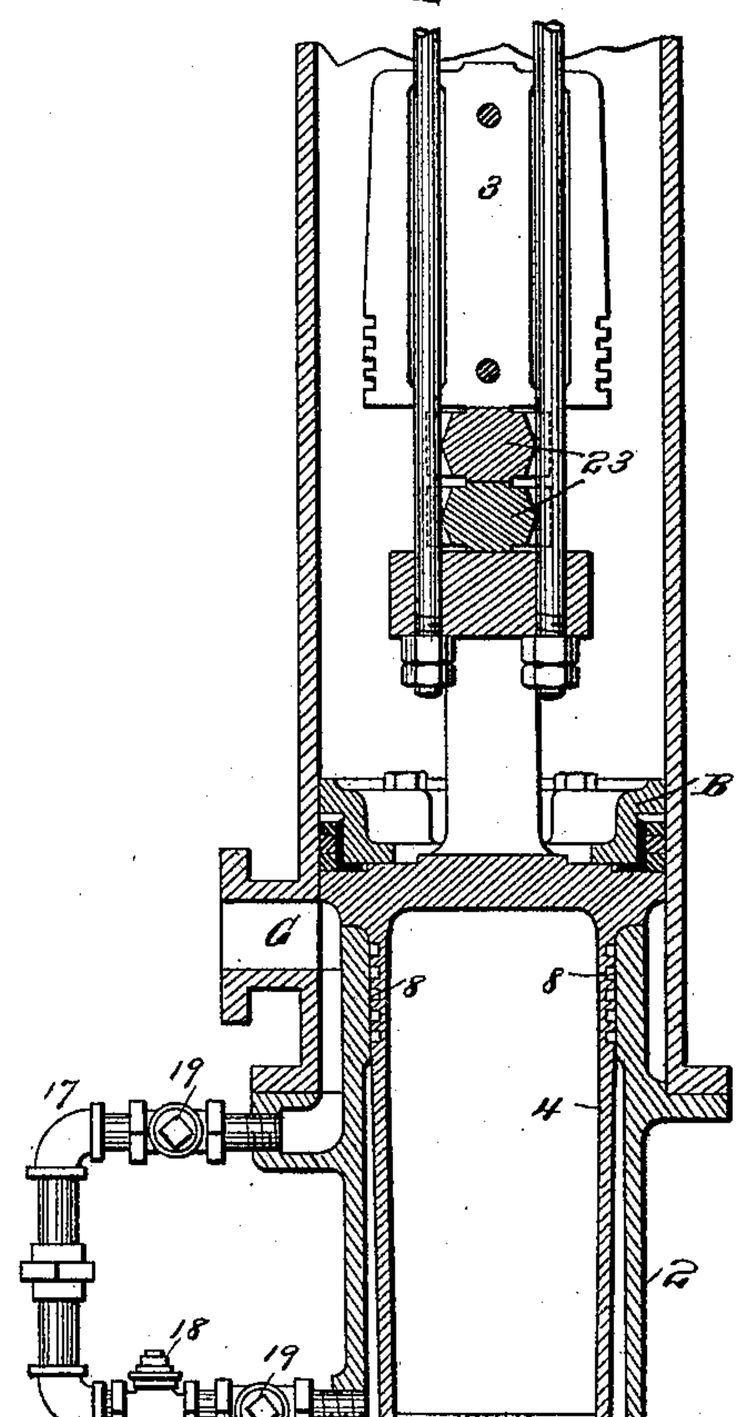


Fig. 4.



Attest:
Geo. H. Botts.
T. H. Palmer

Inventor
Norman C. Bassett
By Philipp Philipp & Tony
Attys.

(No Model.) 4 Sheets—Sheet 4.

N. C. BASSETT.

HYDRAULIC ELEVATOR.

No. 594,590. Patented Nov. 30, 1897.

Fig. 6.

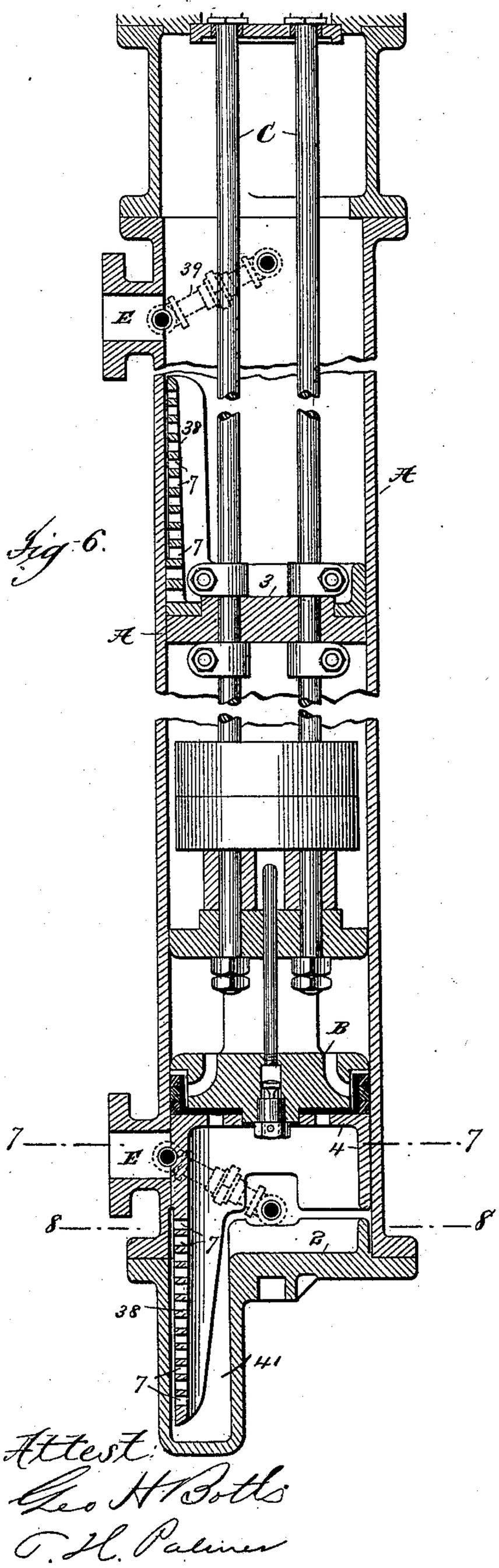


Fig. 7.

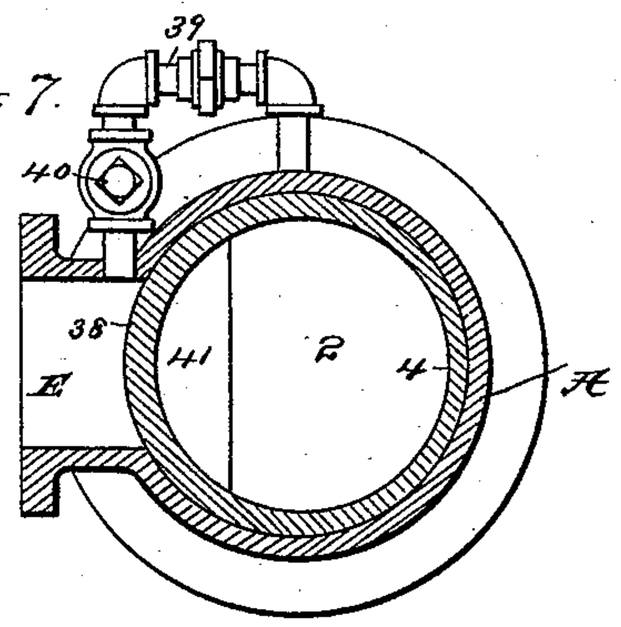


Fig. 8.

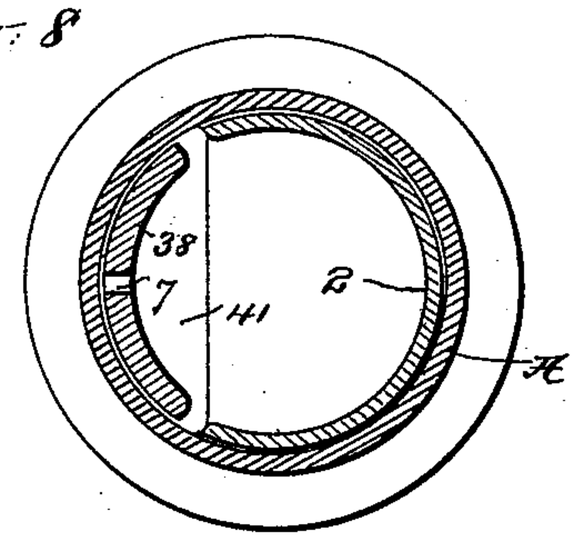
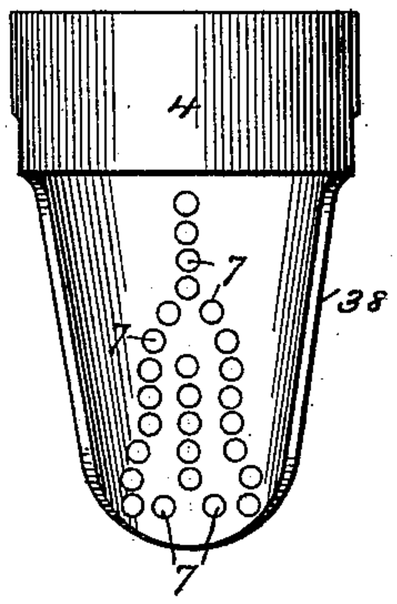


Fig. 9.



Attest:
Geo H Botts
T. H. Palmer

Inventor
Norman C Bassett
by Philipp Philipp & Hay
Attys

UNITED STATES PATENT OFFICE.

NORMAN C. BASSETT, OF YONKERS, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE NATIONAL COMPANY, OF ILLINOIS.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 594,590, dated November 30, 1897.

Application filed April 17, 1890. Serial No. 348,413. (No model.)

To all whom it may concern:

Be it known that I, NORMAN C. BASSETT, a citizen of the United States, residing at Yonkers, county of Westchester, and State of New York, have invented certain new and useful Improvements in Hydraulic Elevators, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to hydraulic elevators and other hydraulic-motor apparatus, its general object being to improve the construction of this class of mechanism and to render its action more uniform and reliable.

One of the specific objects of the invention is to provide a means whereby the motor-piston may be automatically stopped at the end of its stroke without shock or jar to the motor or elevator-car and without interfering with the return of the piston at full speed as the valves are shifted for movement in the opposite direction.

Another object is to provide means for automatically relieving the cylinder from air which may be carried into it by the inflowing water.

With these objects in view my invention consists in various constructions and combinations of parts, all of which will be more particularly described in the specification and pointed out in the claims.

A full description of my invention will now be given, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a general view of a hydraulic elevator, showing the car and its connections in outline and my improved hydraulic motor in elevation. Fig. 2 is a longitudinal section of the motor apparatus, showing the preferred form of my improvements. Fig. 3 is a similar section showing another form of my automatic stop and of the means for adjusting the length of the piston. Fig. 4 is a sectional elevation showing another form of automatic stop and of the means for removing the air from the lower part of the cylinder. Fig. 5 is a detail of a modification of the constructions shown in Figs. 3 and 4. Fig. 6 is a section showing another form of automatic stop in which the plunger is provided with a perforated apron closing the discharge-port. Figs. 7 and 8 are sections on Fig. 6 at lines 7 and 8, respectively. Fig. 9 is a detail of the apron.

Referring to said drawings, A is the motor-cylinder; B, the piston; C, the piston rod or rods; D, the supply-pipe; E, the circulating-pipe, and F the valve apparatus.

The circulating-pipe E is formed of two pipes communicating with each other through the valve-chest and with opposite ends of the motor-cylinder through the circular ports G, opening into the upper and lower ends of the circulating-pipe. The valve H carries a balancing-piston I and is operated through the usual rack and pinion K L, pulley S, and rope T, extending to the car. A check-valve M, opening upward, connects the two parts of the circulating-pipe outside of the valve-chest. The discharge-pipe N connects with the valve-chest F. The car O may be attached to the piston rod or rods C by the movable pulley P and cable Q, extending over fixed pulley R, as shown, or in any other suitable manner. All these parts are of the usual construction and need not be further described herein, it being understood that the circulating-pipe G forms alternately an induction and eduction pipe for the two ends of the cylinder.

Referring now to the parts forming the automatic stop constituting one part of my invention, the cylinder A is provided with a partition and an opening adjacent to each end, and the piston provided with a projection adapted to fit said opening and arranged to enter the same as the piston approaches the limit of its movement in one or the other direction, thus forming dash-pots at the opposite ends of the cylinder. The cylinder A and projection on the plunger may be formed in any suitable manner and secure this result. In the construction shown the cylinder is composed of one or more sections flanged at their ends, as shown, and has secured to its upper and lower ends, respectively, by bolts or in any other suitable manner, the dash-pots 1 2. The piston B has cast with it or secured thereto in any suitable manner the upper plunger 3 and has secured to its lower side a rod 6, which at its lower end is attached to and carries the lower plunger 4, which en-

ters the lower dash-pot 2. The connections between the rod 6 and the piston and plunger may be of any form. As shown, the rod is flanged at each end and secured to the piston and plunger by blocks 5, bolted to the piston and plunger, which are recessed to receive the ends of the rod.

The plungers 3 4 are preferably made hollow, and their outer walls are provided with a series of perforations 7, decreasing in total area from the outer end of the plungers inward. The bodies of these plungers are provided, preferably, with a series of water-grooves 8, these grooves serving to retard the passage of the water from the dash-pots past the plungers.

The dash-pot 1 is provided with a check-valve 9, mounted on a pin 10 and held closed by its weight and the pressure of the water upon it as the piston ascends. Cored or cast in the wall of the dash-pot is the by-pass 11, controlled by the valve 9 and forming a means of communication between the end of the dash-pot and the circulating-pipe E or circular port G, by which the water enters and passes from the cylinder, this by-pass thus forming a passage or channel between the parts of the cylinder on the opposite sides of the partition by which the dash-pot is formed. The lower dash-pot 2 is provided with a similar valve 12, mounted on a pin 13, and a similar by-pass 14 forms a means of communication between the lower end of the cylinder and the circulating-pipe E or circular port G and thus forms a passage or channel connecting the parts of the cylinder on the opposite sides of the partition by which the dash-pot at this end of the cylinder is formed. It will be seen that the valves 9 and 12 are closed as the plungers enter the respective dash-pots, but upon the reversal of the valve open inwardly to allow the water to enter the ends of the cylinder inside the plungers.

The parts thus far described form the first part of my invention, by which the piston is stopped at each end of the cylinder without shock and without interfering with the return of the piston at full speed on the reversal of the valve.

In Fig. 3 is shown a modification of the construction in which the dash-pots 1 2 are provided with pipes 16 17, forming the by-passes between the dash-pots and the circular port G, as shown at the lower end of the cylinder, or with the cylinder A above the port G, as shown at the upper end of the cylinder. Each of the pipes 16 17 is provided with a check-valve 18, opening inwardly similarly to valves 9 12, and with a cock 19, by which the pipe forming the by-pass may be closed when it is desired to repair the valve 18, the dash-pots and plungers then operating to stop the car without shock, but the return of the piston being retarded by the cutting out of the by-pass. In this construction also the hollow plungers 3 4 are tapered inwardly from their bodies to their outer ends instead of being provided with perforations, as in Fig. 2, the function and operation of the tapered and perforated plungers being the same, as will presently be described.

In Fig. 4 another modification is shown, in which the dash-pots 1 2 are provided, respectively, with pipes 20 21, connecting the dash-pots and circulating-pipe and provided with check-valves 22 similar to those of Fig. 3, the plunger being tapered, as in the construction just described.

It is evident that instead of the plunger being tapered, as shown in Figs. 3 and 4, the dash-pot may be tapered and the plunger formed with straight sides. Such a construction is shown in Fig. 5, in which the by-pass 21 connects with the end of the dash-pot, as in Fig. 3, and the plunger is cushioned by the gradual retardation of the escape of the water from the tapered dash-pot.

In Figs. 6 to 9 a modification is shown in which the plungers 3 4 are shortened and provided with aprons 38, in which are placed the perforations 7, arranged as previously described, these aprons thus operating to gradually close the port G, as in the construction shown in Fig. 1. The dash-pots are connected to the circulating-pipe E by the pipes 39, forming by-passes and controlled by check-valves 40, as in the constructions previously described.

It is evident that the plunger shown in Figs. 6 to 9 is equivalent in effect to that of Fig. 1, but the use of the apron in place of the plunger-rim extending through the full circumference of the cylinder or dash-pot lessens the amount of metal to be used for the plunger. A further economy of material may be obtained by constructing one or both of the dash-pots with a pocket 41 to receive the apron, as shown in dash-pot 2 of Figs. 6 to 8, instead of extending the dash-pot full size. This construction permits also of a shorter and more direct connection between the dash-pot and circulating-pipe.

The aprons 38 may of course be imperforate and tapered inwardly similarly to the plungers of Figs. 3 and 4, but the construction shown is preferable.

The operation of the automatic stop will now be described. In the construction shown in Fig. 2 as the piston B descends and the plunger 4 commences to enter the dash-pot 2 the passage of the water from the cylinder and dash-pot will be gradually stopped by the outer wall of the plunger closing the port G, connecting with the circulating-pipe E, now acting as an eduction-pipe. If the plunger 4 were made solid and a close fit to the cylinder A and dash-pot, it is evident that the escape of the water would be prevented so quickly as to cause a shock to the piston and car, and it is desirable to provide some passage or channel by which the gradual escape of the water from the dash-pot shall be secured as the plunger enters the dash-pot, so as to gradually stop and cushion the pis-

ton. This result may be secured by passages or channels arranged in any suitable manner; but in the preferred construction shown I make the plunger hollow and provide it with the series of openings 7, which are largest and most in number at the outer end of the plunger, which first passes and closes the port G, and gradually decrease in size and number until the port G is entirely closed as the body or inner end of the plunger passes the port. By this means the water within the cylinder and dash-pot will pass through the perforations in the hollow plunger into the port G and circulating-pipe, the flow of water being retarded as the plunger descends, thus causing a gradual retention of the water within the dash-pot and bringing the plunger and piston to a stop without shock or jar.

The water-grooves 8, previously referred to, are not absolutely essential, but assist in cushioning the piston, as follows: All the water retained within the dash-pot after the plunger 7 has fully entered the same is retained therein, except such as passes upward between the sides of the plunger and the inner wall of the cylinder. This flow of water is greatly retarded by the water-grooves 8, which, moreover, enable the plunger 4 to be made a much looser fit in the dash-pot 2 and cylinder A without allowing the water to escape upward, so as to interfere with the cushioning effect of the dash-pot.

It will be seen that on the shifting of the valve for the reversal of the piston the plunger 4 in rising would again close the circulating-pipe E, now acting as an induction-pipe, and prevent the full pressure of the water from the supply-pipe being exerted upon the piston, the piston and plunger thereby failing to return at full speed. This difficulty, however, is avoided by the by-pass between the lower end of the dash-pot and the circulating-pipe or port G. As the piston descends the check-valve 12 is forced to its seat by the pressure of the water closing the by-pass and preventing the escape of the water through it. As the valve is shifted and the piston ascends the pressure of the water from the circulating-pipe E forces open the valve 12 and permits the flow of water to the end of the dash-pot below the plunger, the full pressure of the water from the supply-pipe thereby being exerted below the plunger and returning the piston at full speed. The action at the upper end of the cylinder is the same, the water being retained within the dash-pot 1 by the gradual closing of the upper end of the circulating-pipe as the piston rises and the valve 9 opening to admit the flow of water above the plunger as the valve is shifted for the descent of the piston.

In the construction shown in Fig. 3 the tapered form of the plungers 3 and 4 is equivalent to the perforations in the plungers shown in Fig. 2, it being evident that as either of the plungers enters its dash-pot the water will be permitted to pass from the dash-pot to the port and circulating-pipe as the tapered portion enters the dash-pot, and that this flow of water will be gradually retarded as the plunger advances until it is practically stopped as the water-grooves 8 enter the dash-pot. The operation of this construction is substantially the same as that of Fig. 2, except that the plunger does not gradually close the port G as it enters the dash-pot, but produces the cushioning effect wholly by the direct retardation of the flow of water from the dash-pot to the cylinder. In this construction, however, it will be seen that as the valve is shifted for the ascent of the piston the pressure of the water entering at port G is not exerted upon the full surface of the piston, but only upon that portion outside of the plunger. The movement of the piston, therefore, would be retarded from this cause until the plunger left the dash-pot; but the by-pass, by admitting water to the dash-pot outside the plunger, avoids this difficulty.

The operation of the constructions shown in Figs. 4 and 5 is substantially the same as that of Fig. 3. As will be understood from the drawings the connection of the by-pass to the center of the dash-pot and to the circulating-pipe outside the port G, as shown in Fig. 4, involves no change in the operation of the device.

The operation of the apron construction of Figs. 6 to 9 is the same as that of Fig. 2.

While the operation of my automatic stop is such as to render it of general application in all hydraulic-motor apparatus to prevent shock without interfering with the return of the piston at full speed, it is intended especially for use in hydraulic elevators, its special function therein being to avoid the jumping of the car caused by the slackening of the cable on a sudden stop. Moreover, it provides a simple and efficient safety device whereby the car will be stopped at the top and bottom without shock in case of too great speed being attained through breakage of the valve-controlling mechanism or otherwise.

In the manufacture of elevators it is desirable that so far as possible the parts should be manufactured and kept on hand ready to supply demand. It is evident, however, that if the entire motor be constructed without regard to the distance which the elevator-car is to travel the movement of the piston may and probably will vary from that required for the distance to be traveled by the car, so that the plungers 3 4 will not stop the car exactly at the upper and lower landings. I avoid this difficulty and permit the construction of substantially the entire motor independently of the length of travel of the piston by the following means: The cylinder A, as usual, is made in sections varying in length a foot or more, any number of these sections being connected together to form a motor-cylinder. The dash-pots, plungers, piston, and all the

other parts, with the exception of the flanged rod 6, (shown in Fig. 2,) may be completed. In constructing the elevator it will probably be found that the length of the motor-cylinder formed from the sections will vary a foot or more from the length desired. The flanged rod 6 may be made of such a length as to compensate for this difference and to increase or decrease the length of the piston, with its attached plungers, to such an extent that the plungers 3 and 4 will enter their respective dash-pots to gradually stop the movement of the piston and elevator-car as the latter arrives exactly at the upper or lower landings. The same result is attained by the construction shown in Fig. 3, which permits the entire motor to be manufactured independently of the special elevator in which it is to be used. In this construction the lower plunger is cast with or otherwise secured to the piston and the upper plunger is mounted upon the piston rod or rods so that it may be raised or lowered thereon, being constructed, preferably, of two parts, which may be clamped together upon the piston-rods by bolts, as shown, or in any other suitable manner. The plunger may be adjusted to the position required and supported therein by means of blocks 23, any required number of which may be inserted between the plunger 3 and its supporting-block attached to the piston, the length of the piston, with its plunger, being varied as required. These blocks 23 may serve also as counterbalance-weights, if desired. Figs. 4 and 6 also show adjustable plungers.

For automatically removing from the cylinder the air entering with the water I have provided the following means: A pipe 24 is tapped into the upper end of the dash-pot 1 and communicates with the supply-pipe D, being controlled by a cock 25. From an elbow on the pipe 24 extends a curved pipe 26, provided with a cock 27, this pipe discharging into a drain-cup 28, from which the water may be drawn away through a drain 29. The piston B is provided with a passage 30, cored or cast therein and extending upward through the piston and the body of plunger 3, communicating above with a pipe 31, provided with a pivoted valve 32, which opens upward, but is kept normally closed by means of its weight and by the pressure of the water. For opening this valve 32 as the piston reaches the end of its upward stroke said valve is provided with an arm 33, projecting slightly above the upper level of the plunger, which arm as the plunger reaches the end of its movement comes in contact with the upper end of the dash-pot and opens the valve, permitting the air to pass from below to the dash-pot and thence through the pipe 24 to the supply-pipe. Fig. 4 shows the same construction at the upper end of the cylinder. At the lower end of the cylinder the following means is provided: Pipe 34 communicates with the circular port G and with the lower end of the dash-pot 2, this pipe being controlled by a cock 35. From an elbow at the lower end of the pipe extends a discharge-pipe 36, controlled by a cock 37.

The operation of the device is as follows: As the piston descends the air in the lower part of the cylinder will be forced upward through the passage 30 in piston B and into the pipe 31, and as the piston ascends the air brought in by the water from the supply-pipe D will similarly pass through the passage to the pipe 31. As the piston reaches the end of its stroke the end of the pivoted arm 33 will strike against the head of the dash-pot 1 and open the valve 32, the air thus passing out into the upper end of the dash-pot. When the motor is first started, the cock 25 will be closed and the cock 27 opened, the piston as it rises thus forcing out through the pipes 24 and 26 the air previously collected in the cylinder, which passes with a small quantity of water into the drain-cup 28, from which it may be drawn off through the drain 29. The cock 27 will then be closed and the cock 25 opened slightly, sufficiently to allow the passage of air from the dash-pot 1 to the supply-pipe D, but to prevent the passage of a sufficient amount of water to interfere with the cushioning effect of the dash-pot. Thus, the air contained in the cylinder prior to the introduction of water having been drawn off through the pipe 26, the air brought in by the water during the operation of the motor passes from the dash-pot through the pipe 24 back to the supply-pipe D, the air from the lower end of the piston being carried upward into the dash-pot 1, as previously described. The operation of the construction shown in Fig. 4 is the same, except that the air from the lower end of the cylinder does not pass upward through the piston, but is removed through the pipe 34, leading from the end of the dash-pot to the circular port G and controlled by the cock 35, the air contained in the lower end of the cylinder when the water is first admitted being led away through drain-pipe 36, controlled by cock 37, the pipes 34 and 36 corresponding, respectively, to the pipes 24 and 26 at the upper end of the cylinder.

It is a great convenience in elevators to pack the piston at the upper end of the cylinder rather than at the lower end, and to permit this and avoid the necessity of removing the counterbalance-weights I support my counterbalance-weights W upon an extension of the piston-rod below the piston, which in the present case, as shown in Fig. 2, is flanged rod 6, which connects the piston B with the plunger 4.

It will be understood that while I have shown my invention as applied to a vertical hydraulic motor of the form common in elevators the automatic stop and means for removing the air are applicable to hydraulic motors whatever be the position of the motor-cylinder. My invention, moreover, is not to be limited to motors operated on the special

system shown, but may readily be adapted by one skilled in the art to other forms of hydraulic motors which are well known and need not be described or illustrated herein.

What I claim is—

1. The combination with a cylinder having a passage for the supply and exhaust of fluid, and extending beyond said passage, of a piston arranged to gradually close said passage as the piston approaches the limit of its movement, and prevent the escape of fluid from the space between said passage and the end of the cylinder, and another passage connecting the supply with said space and provided with a self-acting valve arranged to prevent the flow of fluid from said space, but to permit the flow of fluid from the supply to said space on the reversal of the piston, substantially as described.

2. The combination with a cylinder having a partition and an opening adjacent to the end, of a piston having a projection adapted to fit said opening and arranged to enter the same as the piston approaches the limit of its movement, a channel provided with a self-acting valve and connecting the parts of the cylinder on the opposite sides of the partition, said cylinder being provided with a supply and discharge opening beyond which said projection passes when the piston is at the limit of its movement, substantially as described.

3. The combination with a cylinder having a partition and an opening adjacent to the end, of a piston having a projection adapted to enter the opening, and channels connecting the parts of the cylinder on opposite sides of the partition, one of said channels being provided with a self-acting valve, said cylinder being provided with a supply and discharge opening beyond which said projection passes when the piston is at the limit of its movement, substantially as described.

4. The combination with a cylinder provided with a dash-pot at the end thereof, of a piston provided with a projection arranged to enter said dash-pot as the piston approaches the limit of its movement and operating to gradually close the discharge-port of the cylinder, a by-pass connecting said dash-pot with the water-supply, and a check-valve for controlling said by-pass, said cylinder being provided with a water supply and discharge opening beyond which said projection passes at the limit of its movement, substantially as described.

5. The combination with a cylinder having a partition with an opening adjacent to the end, of a piston having a plunger adapted to fit said opening and arranged to enter the same as the piston approaches the limit of its movement, whereby a dash-pot is provided, said plunger being constructed to gradually retard the flow of water from the dash-pot as it enters the latter, a series of water-grooves between the plunger and cylinder, and a passage independent of said opening connecting the dash-pot with the fluid-supply and provided with a check-valve permitting the admission of fluid to the dash-pot but preventing the escape of fluid from the latter, substantially as described.

6. In a hydraulic motor, the combination with a motor-cylinder provided with a dash-pot at the end, of a piston provided with a hollow plunger entering said dash-pot, the wall of the plunger being provided with one or more series of perforations, the total area of the perforations on different lines transversely to the plunger decreasing from the outer end of the plunger inward, substantially as described.

7. In a hydraulic motor, the combination with a motor-cylinder provided with a dash-pot at the end, of a piston provided with a hollow plunger entering said dash-pot and operating to close the discharge-port of the cylinder, the wall of the plunger being provided with one or more series of perforations the total area of the perforations on different lines transversely to the plunger decreasing from the outer end of the plunger inward, substantially as described.

8. In a hydraulic motor, the combination with a motor-cylinder provided with a dash-pot at the end, of a piston provided with a hollow plunger entering said dash-pot, the wall of the plunger being provided with one or more series of perforations, the total area of the perforations on different lines transversely to the plunger decreasing from the outer end of the plunger inward, a by-pass connecting said dash-pot with the water-supply, and a check-valve controlling said by-pass, substantially as described.

9. In a hydraulic motor, the combination with a motor-cylinder provided with a dash-pot at the end, of a piston provided with a plunger entering said dash-pot, a by-pass connecting the dash-pot with the water-supply, a check-valve controlling said by-pass, and cocks for cutting out said by-pass and valve, substantially as described.

10. In a hydraulic motor, the combination with a motor-cylinder provided with a dash-pot at the end, of a piston provided with a plunger entering said dash-pot during the normal movement of the piston, said plunger forming with said dash-pot a cushion-stop for the piston, said dash-pot being provided with an air-escape and said piston being provided with an air-passage, a normally-closed valve controlling said air-passage and opening toward the air-escape end of the cylinder, and means for automatically opening said valve to allow the escape of air from the air-passage to the air-escape end of the cylinder, substantially as described.

11. In a hydraulic motor, the combination with the motor-cylinder provided with an air-escape port at one end, of a piston provided with an air-passage, a normally-closed valve controlling said passage and opening toward the air-escape end of the cylinder, and means

for automatically opening said valve to allow the escape of air from the air-passage to the end of the cylinder, substantially as described.

12. In a hydraulic motor, the combination of a piston provided with an air-passage, a pipe connected with said passage, a valve normally closing said pipe, and an arm connected to said valve and extended beyond the face of the piston in position to engage a fixed part of the motor, whereby the valve is opened as the piston reaches the end of its stroke, substantially as described.

13. The combination of the cylinder A, air-escape pipe 24, cock 25, pipe 26 entering pipe 24, and cock 27 in said pipe 26, substantially as described.

14. The combination of the vertical cylinder A, air-escape pipe 24, cock 25, pipe 26 entering pipe 24, cock 27 in said pipe 26, and drain-cup 28, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

NORMAN C. BASSETT.

Witnesses:
JOHN W. GIBBONEY,
W. J. PLUMSTEAD.