(No Model.)

W. E. HALE.

HYDRAULIC ENGINE.

No. 356,999. Patented Feb. 1, 1887.

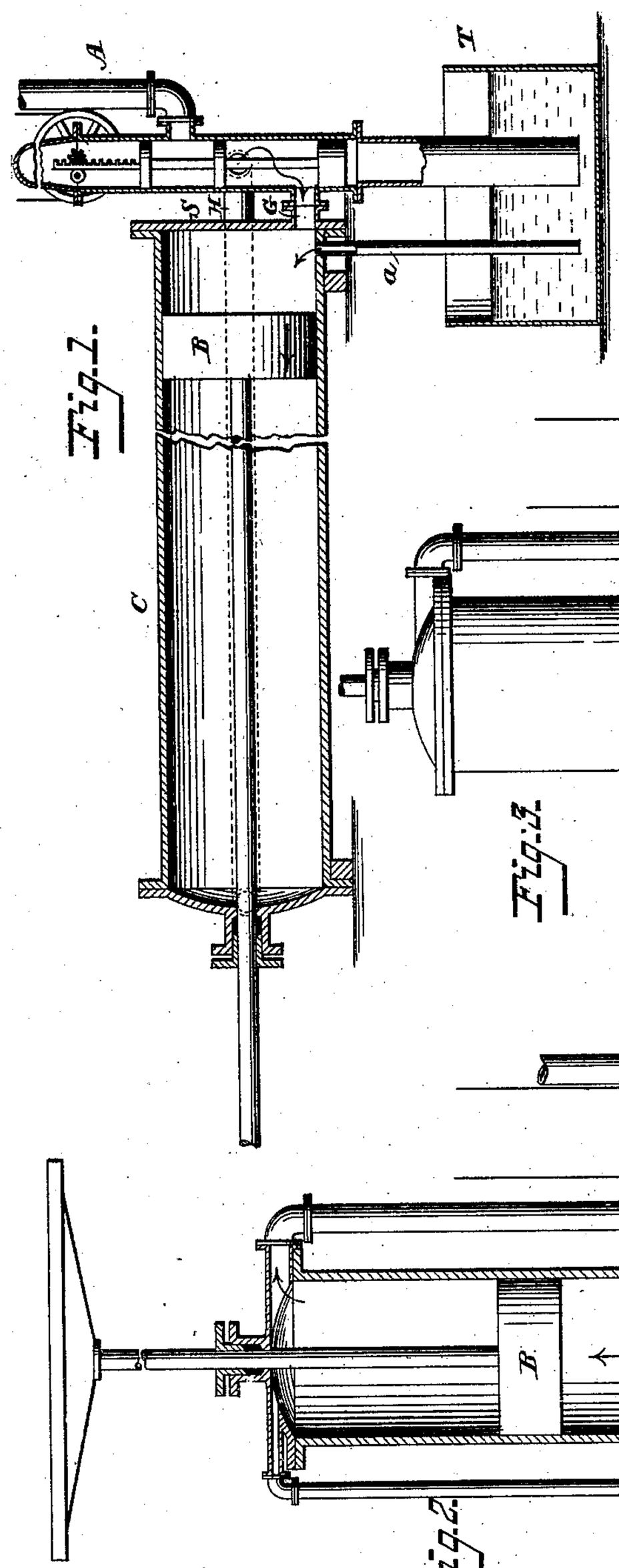

Fig. 1.

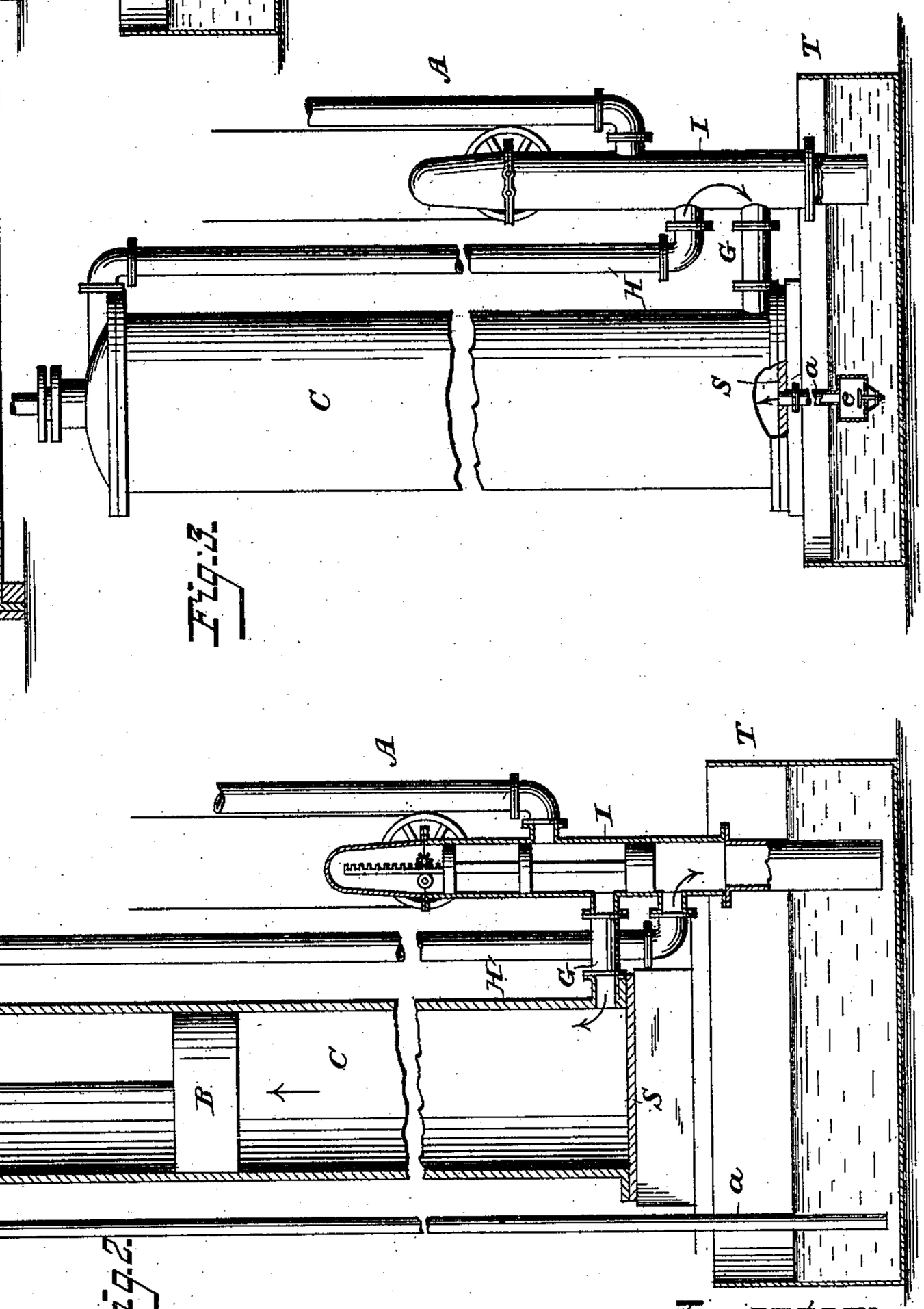

Fig. 3.

Fig. 2.

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UNITED STATES PATENT OFFICE.

WILLIAM E. HALE, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE HYDRAULIC ELEVATOR COMPANY, OF SAME PLACE.

HYDRAULIC ENGINE.

SPECIFICATION forming part of Letters Patent No. 356,999, dated February 1, 1887.

Application filed January 10, 1884. Serial No. 117,087. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. HALE, of Chicago, Cook county, Illinois, have invented certain Improvements in Hydraulic Engines, of which the following is the specification.

My invention relates to that class of water-engines usually employed for elevators, in which the piston is moved in one direction by the pressure of water from a supply-reservoir and in the other direction by the weight of the load while the water circulates from end to end of the cylinder; and my invention consists in means, fully described hereinafter, whereby to permit a ready circulation of the water when all connection with the supply is cut off.

In the drawings, Figure 1 is an elevation in part section, showing my invention as applied to a hydraulic engine having a horizontal cylinder. Fig. 2 is a sectional elevation of a vertical-cylinder engine embodying my invention. Fig. 3 is a sectional elevation of a vertical cylinder-engine receiving the motor-fluid at the opposite end from that shown in Fig. 2.

In hydraulic engines used for elevators it is common to circulate the water from one side of the piston to the other as the piston is moved either out or in, according to the structure, by the weight of the load, the circulating-channel, either in the cylinder or exterior circulation-pipes, being in communication with the motor-fluid under pressure. This communication in the described engines is essential, as the piston-rod on one side of the piston contracts the water-space at such side, so that the water in the larger space on the opposite side cannot be transferred, while the water from the piston-rod side will not fill the opposite space, and a partial vacuum would result upon any transfer. The communication with the source of supply affords opportunity for the escape of water from one side of the piston and supplies the deficiency if the circulation is in the opposite direction.

To avoid the necessity of maintaining the water in the cylinder under constant pressure from the source and yet permit a free circulation, I construct the valve device, of any suitable kind, so as to close the supply-pipe when the piston is moving under the load and the water is circulating; and I also provide a communication between the water-circulating passage and a separate open tank, so that the water required to supply the deficiency, or which is in excess, may pass freely between the tank and the cylinder.

When the cylinder is horizontal, as shown in Fig. 1, and the water from the supply-pipe A acts upon the outer or piston-rod side of the piston B to force it to the opposite or inner end, S, of the cylinder C, the communication is made with the tank T (which may be the usual discharge-tank) through a pipe, *a*, communicating with the end of the cylinder from which the water is discharged when the load is lifted. This pipe *a* dips below the water in the tank, and the water will have a free passage to the cylinder when there is any deficiency within the cylinder—as, for instance, when the valve D is in the position shown in Fig. 1 and the water is circulating from the forward to the rear end of the cylinder—the volume in front of the piston diminished by the displacement of the piston-rod being insufficient to supply the space at the rear. Under these conditions the water will be drawn and will rise freely from the tank into the cylinder.

In Fig. 2 the invention is illustrated in connection with a vertical-cylinder machine, where the weight of the load depresses the piston and the pressure of water from the supply-pipe A lifts it. In this case the pipe *a* extends to and communicates with the upper or discharge end of the cylinder, and when the water circulates, on the descent of the piston, through the pipes G H and valve-case I, permits the excess from below the cylinder to pass to the tank.

In Fig. 3 the vertical-cylinder engine is constructed to lift the load under pressure on the top of the piston, the load lifting the piston. In this case, also, the discharge end of the cylinder communicates with the tank through the pipe *a*, and the tank supplies the deficiency when the water from above passes below the piston as the load lifts the latter.

In each case there is a free communication between the water-tank and the cylinder, and the water to supply any deficiency within the cylinder or any surplus therefrom passes automatically from or to the cylinder without the

control of any cocks or valve appliances, without any manipulation by the attendant, and without the necessity of providing any remedy against the undue escape of water from the supply source.

It is difficult to pack the piston and piston-rod of a vertical-cylinder engine so that air will not pass into the upper end of the cylinder and water flow downward past the piston when the engine is at rest if the lower end be open, as is the case when the pipe *a* communicates with said end.

To prevent the escape of the water and the admission of air under such circumstances, I provide the lower end of the pipe *a* with a check-valve, *e*, as shown in Fig. 3, which closes under the weight of the column above and prevents any downward discharge. While this valve closes the pipe when the engine is at rest, there is no obstruction of the pipe when the water is in circulation, and that in the tank rises to supply the deficiency in the cylinder, the valve being only a safety adjunct to prevent loss when the engine is at rest if leakage should occur, and having no effect so far as the circulation is concerned.

I claim—

1. The combination, with the cylinder and supply, circulating, and discharge pipes, and valve of a hydraulic engine, of a water tank and pipe to afford an independent communication between the discharge end of the cylinder and the tank, substantially as and for the purpose described.

2. The combination, with a hydraulic engine having supply, circulating, and discharge pipes, of a pipe independent of said pipes and extending from the discharge end of the cylinder and affording a free communication between the same and a tank, substantially as and for the purpose set forth.

3. The combination, in a hydraulic engine, of a cylinder, and supply, circulating, and discharge pipes, and valve, and a pipe independent of said supply, circulating, and discharging pipes and extending from the discharge end of the cylinder to an open tank, as and for the purpose set forth.

4. The combination, with the working cylinder, and supply, circulating, and discharge pipes, of a supply-tank communicating with the cylinder through a passage independent of said pipes, provided with a valve arranged to open automatically to admit water freely to the cylinder, substantially as described.

5. In a hydraulic elevator, a cylinder containing the working-piston, and provided with supply, discharge, and circulating pipes in communication with a water-tank through a passage independent of said pipes, provided with a valve arranged to close under pressure from within the cylinder, substantially as described.

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

WILLIAM E. HALE.

Witnesses:

CHARLES E. FOSTER,

F. L. FREEMAN.