(No Model.)

2 Sheets—Sheet 1.

N. P. OTIS.

HYDRAULIC ELEVATOR.

No. 354,070. Patented Dec. 7, 1886.

Fig. 1.

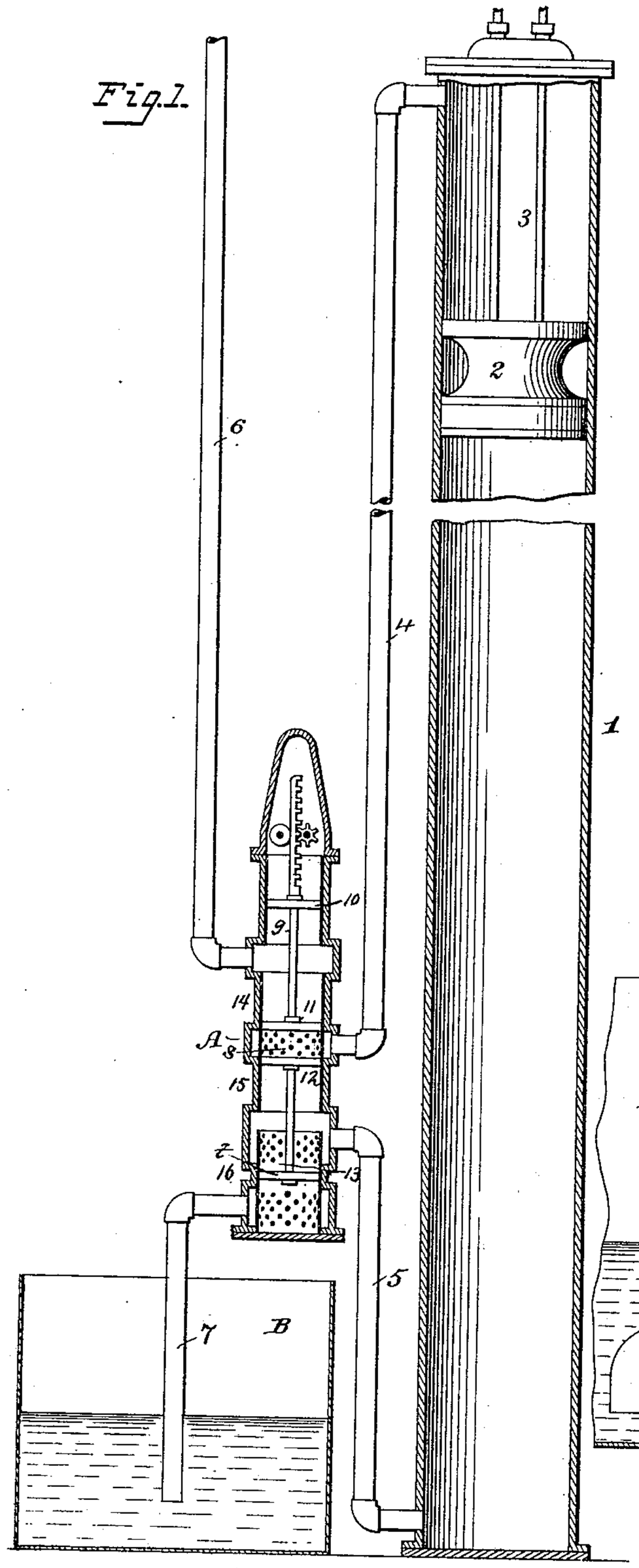
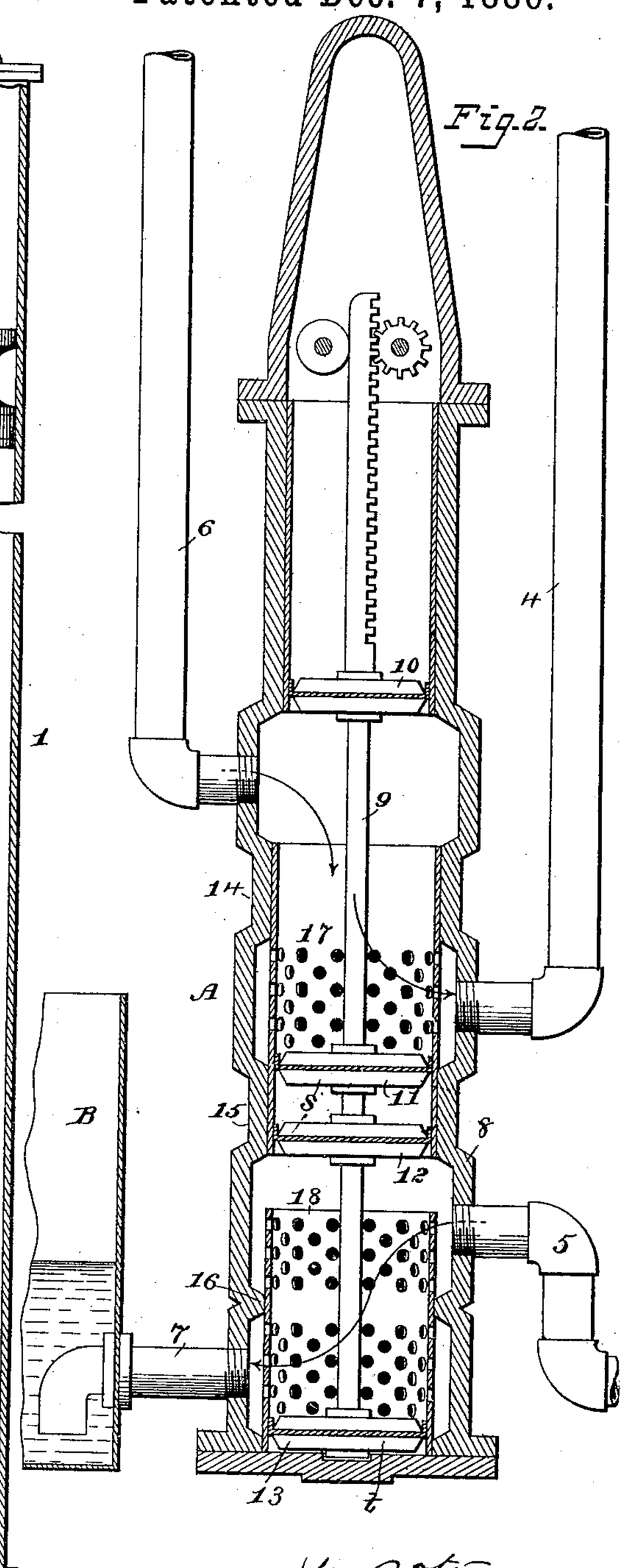


Fig. 2.



Attest:
Court, A. Cooper,
A. E. Fanomann.

Inventor:
N. P. Otis
By Foster & Freeman
Attys

(No Model.)

2 Sheets—Sheet 2.

N. P. OTIS.

HYDRAULIC ELEVATOR.

No. 354,070. Patented Dec. 7, 1886.

Fig. 4.

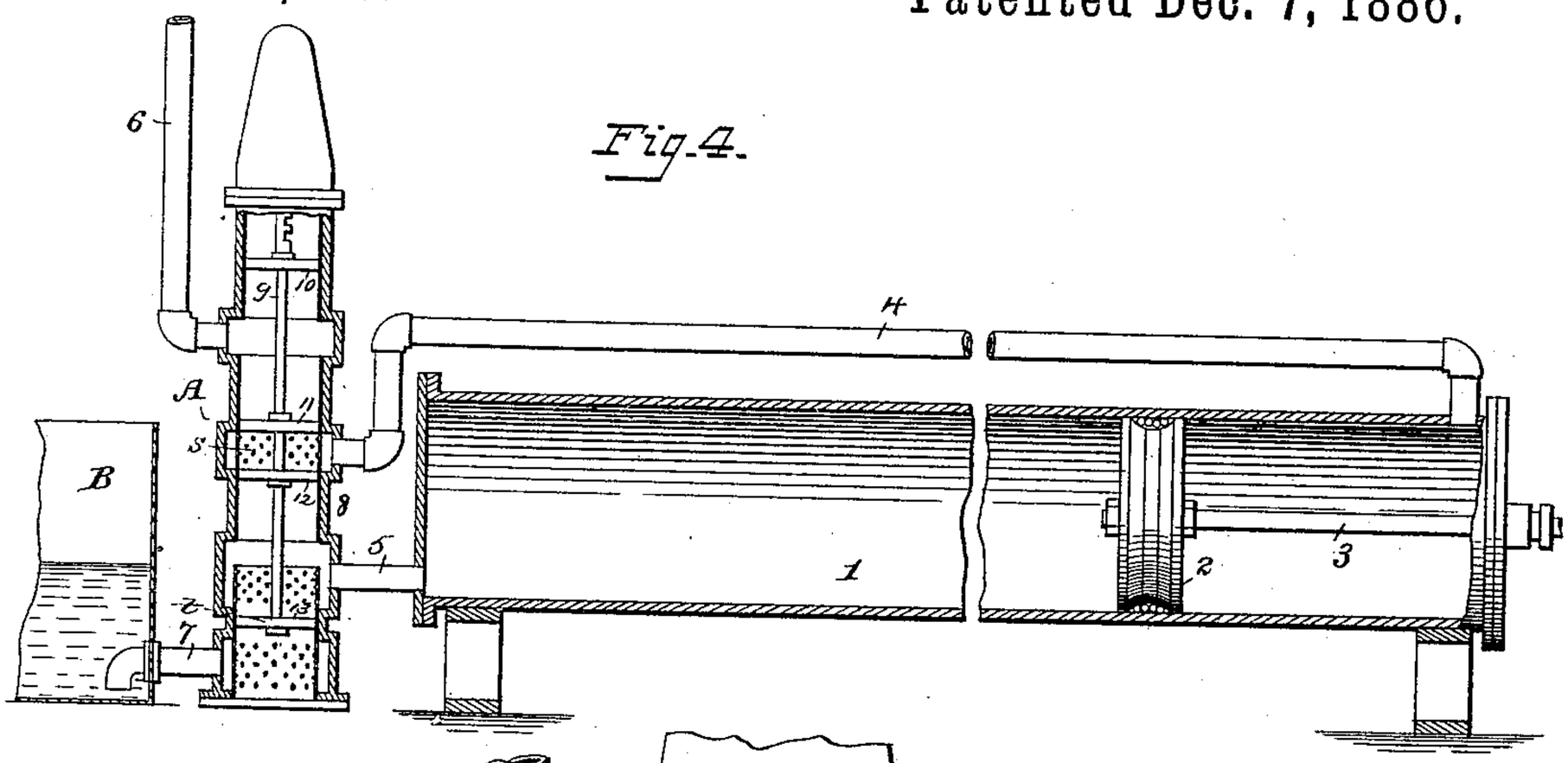
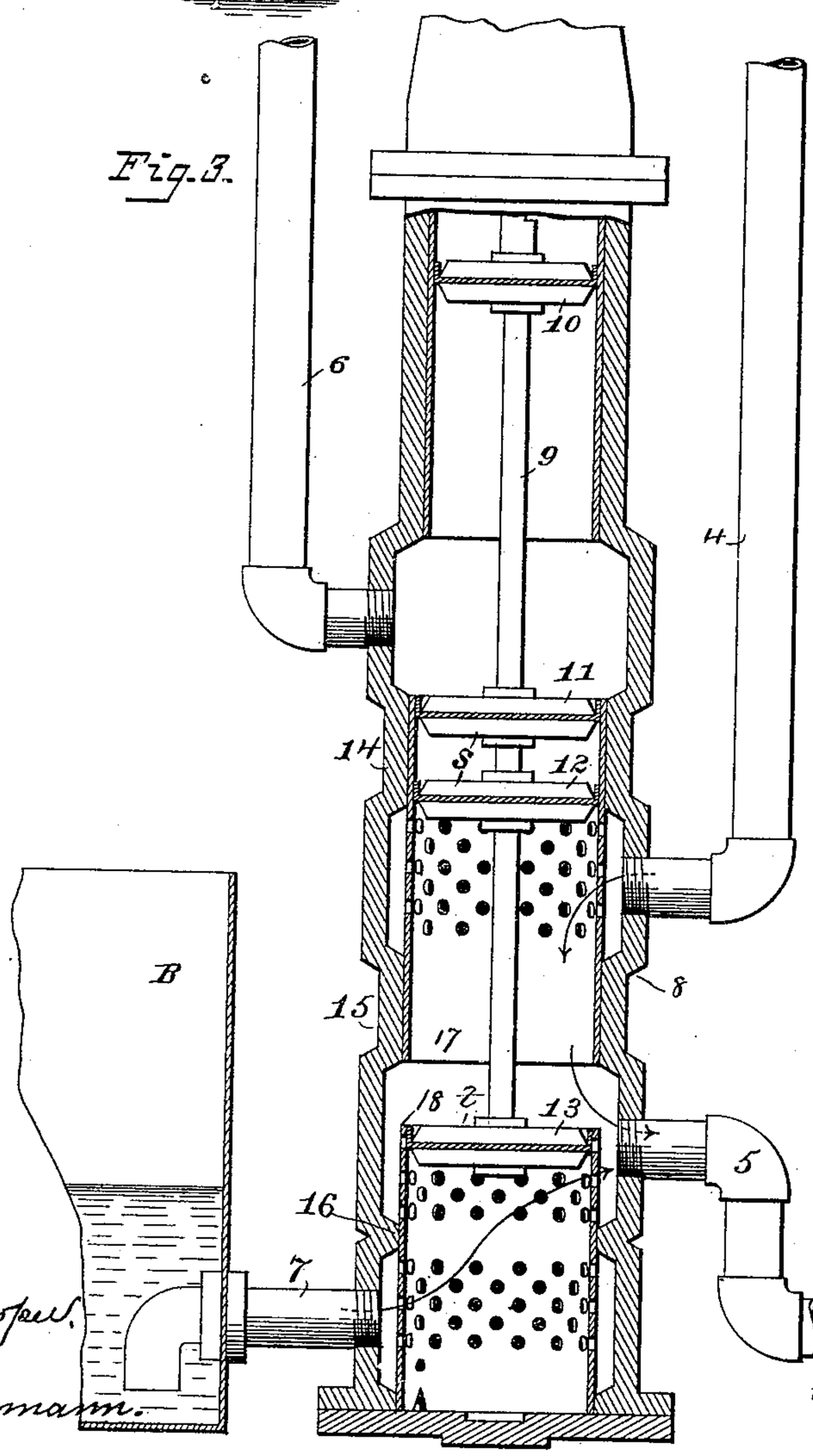


Fig. 3.



Attest:
Court. A. Cooper.
A. G. Fonoman.

N. P. Otis,
Inventor:
By Porter & Deeman
Attys

UNITED STATES PATENT OFFICE.

NORTON P. OTIS, OF YONKERS, NEW YORK.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 354,070, dated December 7, 1886.

Application filed June 23, 1886. Serial No. 206,017. (No model.)

To all whom it may concern:

Be it known that I, NORTON P. OTIS, a citizen of the United States, and a resident of Yonkers, Westchester county, New York, have invented certain new and useful Improvements in Hydraulic Elevators, of which the following is a specification.

In that class of hydraulic elevating-engines in which the water circulates through outside pipes from one end of the cylinder to the other it is common to maintain that end of the cylinder into which the piston rod or rods pass in continuous communication with the source of supply, so that when the water circulates from the end of the cylinder containing the piston-rods to the opposite end sufficient water can pass from the supply-pipe to compensate for the space taken up by the piston-rods and supply the deficiency which would otherwise exist in the space upon the opposite side of the piston. In order to avoid the necessity of maintaining this continuous communication between the supply-pipe and the cylinder, I combine with the cylinder a valve device, constructed as fully set forth hereinafter, to wholly cut off the communication with the source of supply when the piston is at rest, and when the water is circulating from end to end of the cylinder, and also to put the circulating pipe or cylinder in communication with the discharge-tank whenever the valve device is arranged to permit the water to circulate.

In said drawings, Figure 1 is a sectional elevation showing the cylinder, piston, circulating-pipes, valve device, inlet and discharge pipes of a vertical-cylinder elevator-engine, the parts being shown in the positions occupied when the piston is at rest. Fig. 2 is an enlarged view in section of the valve device, showing the position of the parts when the water is flowing through the valve device under pressure to lift the load. Fig. 3 is the same as shown in Fig. 2, showing the position the parts will occupy when the water is flowing from one end of the cylinder to the other. Fig. 4 is a sectional elevation of the valve device combined with an engine having a horizontal cylinder.

1 is the cylinder; 2, the piston; 3, the piston-rods; 4 5, the circulating-pipes; 6, the supply-pipe; 7, the discharge-pipe of the elevator-engine; and A is the valve device, and B the tank into which the water is discharged from the cylinder.

In the casing 8 of the valve device move the piston-valves on a rod or stem, 9, carrying the disks or pistons 10, 11, 12, and 13, the disks 11 12 constituting one wide piston-valve, *s*, and the disk 13 constituting a narrow piston-valve, *t*, the upper disk, 10, fitting a contracted portion of the casing and serving to close the latter and counterbalance the valves, and the casing being contracted at the points 14 15 16, enlarged at the intermediate points and closed at the lower end. The valves are adapted to the contracted portions 14, 15, and 16 of the casing. The supply-pipe 6 communicates with the casing above the point 14. The circulating-pipe 4 communicates with the casing between the points 14 and 15, the circulating-pipe 5 between the points 15 and 16, and the discharge-pipe 7 between the point 16 and the end of the casing.

In order to secure proper bearings for the usual packings at the peripheries of the pistons, I prefer to use perforated linings or sleeves 17 and 18, the upper sleeve, 17, of sufficient length to inclose the valve *s* at all points of its travel, and the lower sleeve equal in length to the throw of the valve *t*.

The valves are moved within the casing by means of the usual hand-rope or other operating appliance extending to or connected with the cage of the elevator in a manner too well known to need particular description.

In order to arrest the movement of the main piston and of the cage, the parts are brought to the position shown in Fig. 1, with the valve *s* opposite or within the enlarged portion of the casing between the points 14 and 15, thereby closing the passage of water in either direction to or from the circulating-pipe 4, the valve *t* being within the contracted portion 16 of the casing and preventing water from passing to and from the circulating-pipe 5. The entire body of water in the cylinder 1 is thus confined in both ends of the working-cylinder, and the cylinder is cut off from communication at all points with either the supply or discharge pipe.

When it is required to depress the piston and lift the cage or platform, the parts are brought to the position shown in Fig. 2, with

the valve *s* opposite the contracted portion 15 of the case, and the valve *t* at the lower end of the case, so that water under pressure will pass above the valve *s* and through the valve-casing to the pipe 4, and thence into the cylinder 1 above the piston 2, while the water from below the piston will pass out through the pipe 5, the valve-casing above the valve *t*, and discharge-pipe 7, into the tank B. When the movement of the piston is to be reversed, the parts are brought to the position shown in Fig. 3, with the valve *s* opposite the contracted portion 14 and the valve *t* above the contracted portion 16 of the casing, whereby all communication with the supply-pipe 6 will be cut off, and both the circulating-pipes 4 and 5 will be put in communication with each other through the casing, while the latter is also maintained in communication with the tank B through the pipe 7. Under these circumstances the weight of the cage will lift the piston 2 in the cylinder 1, and the water will pass from above the piston 2, through the pipe 4, valve-casing, and pipe 5, to the lower end of the cylinder, and as the presence of the piston-rods in the part of the cylinder above the piston diminishes the capacity of the latter, so that the water from above will not fully supply the space below the piston, the additional quantity necessary to compensate for this deficiency will flow freely from the tank B, through the pipe 7, and casing, and pipe 5.

When the position of the valve is reversed, as shown in Fig. 2, the contents of the cylinder below the pistons 2 will be discharged, while the water under pressure will flow into the upper end of the cylinder.

When a horizontal cylinder is used, the same valve arrangement may be employed, the pipes 4 and 5 being extended horizontally to the ends of the cylinder, as shown in Fig. 4.

Although I have referred to the valves as consisting of two pistons, 11 and 12, it will be evident that a single thick piston may be substituted for two separate pistons without any practical difference in the result.

I am aware that it has been proposed to construct a valve device with a casing, ports, piston, and valves arranged to close all the ports simultaneously by a single throw of the valves, and that it is not new to make a valve device consisting of a casing, piston, and valves arranged to open a connection with the discharge in circulating.

My improved device differs from the construction above described in the fact that when the valves are set to arrest the machine the upper port is absolutely closed and the lower circulating-port is cut off from connection with the tank by the valve, while when the valves are set to permit a circulation there is a connection between the lower circulating-port and the discharge-tank, permitting the water to flow upward from the discharge-tank and through the lower circulating-port.

Without limiting myself to the precise construction and arrangement of parts shown, I claim—

1. The valve-casing communicating with the supply-pipe, discharge-pipe extending below the water in the discharge-tank, and two circulating-pipes, combined with a valve-stem carrying two valves, one valve arranged to close the port of one circulating-pipe when the other valve closes communication between the discharge-pipe and the adjacent circulating-pipe, substantially as described.

2. The combination, with the cylinder, piston, and circulating-pipes, of a valve-casing communicating centrally with said circulating-pipes, inlet-pipe communicating with a supply-reservoir and with one end of the casing, discharge-pipe extending from opposite end of casing below water in a tank, and a stem carrying two valves, *s t*, and balance-disk 10, the valves arranged to close the port of one circulating-pipe when the communication between the other and the discharge-pipe is also closed, substantially as described.

3. The combination, with the cylinder, piston, valve-casing, and circulating-pipes connecting with the casing, of an inlet-pipe connecting with the casing, a discharge-pipe extending from the casing to and below the level of water in a tank, and valves, arranged substantially as described, to close the port of one inlet-pipe by one valve when the other valve closes the communication between the other circulating-pipe and its adjacent pipe, substantially as set forth.

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

NORTON P. OTIS.

Witnesses:
JAMES S. FITCH,
MARTIN BLAUVELT.