No. 656,465. Patented Aug. 21, 1900.

F. MARBURG, JR.

TURBINE PUMPING MECHANISM.

(Application filed Apr. 30, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig: 1.

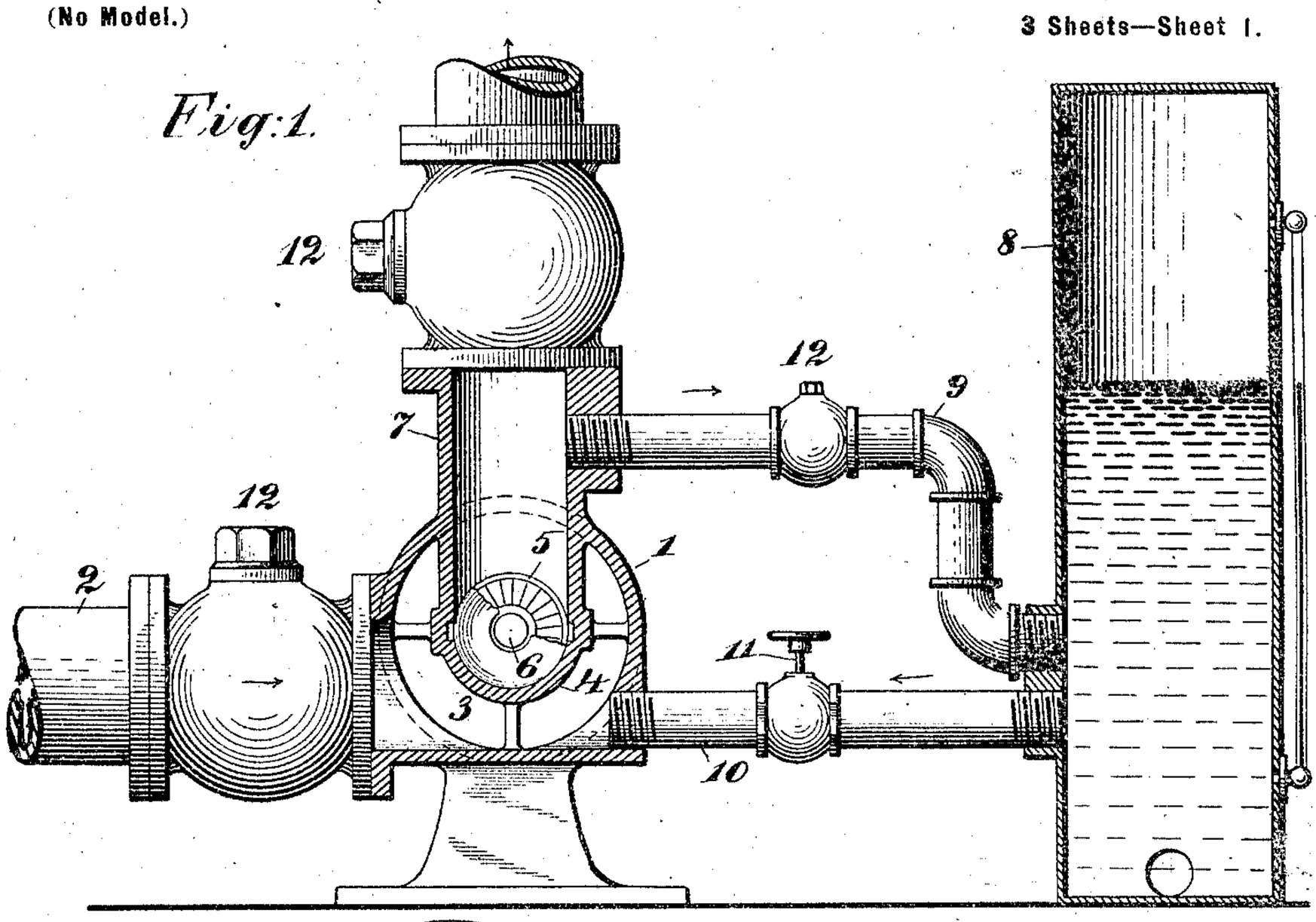

Fig: 2.

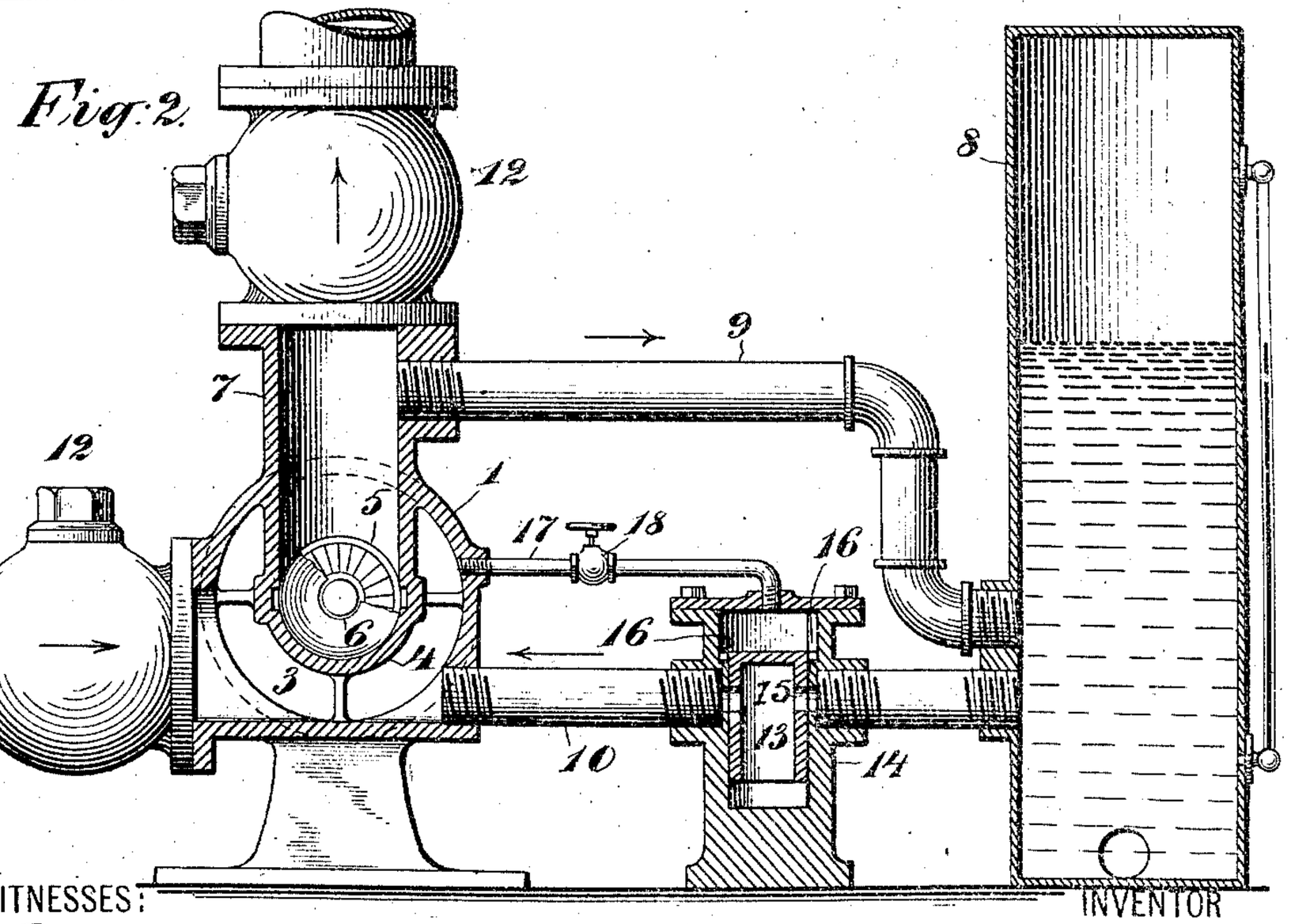

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Fig. 3.

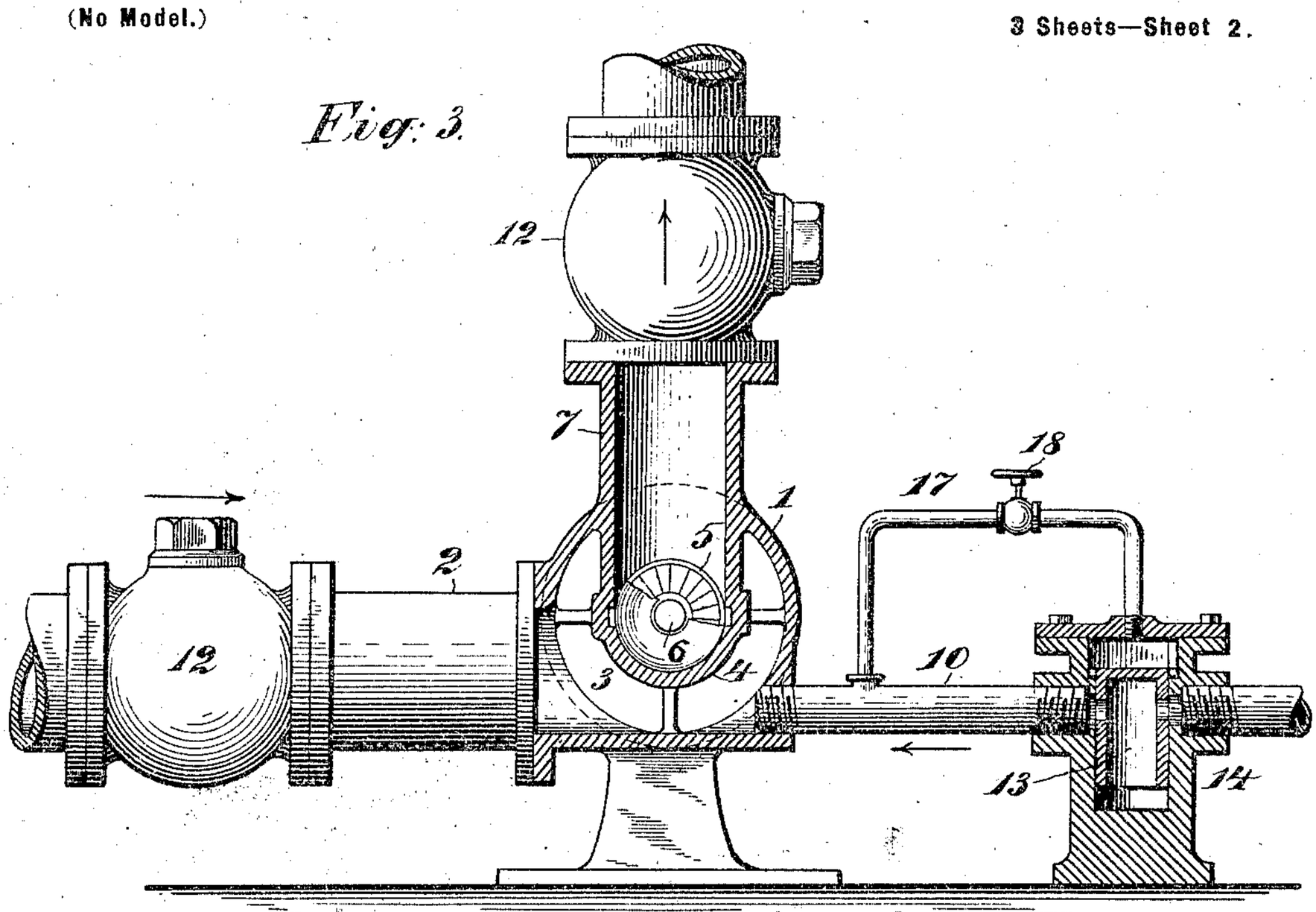

Fig. 4.

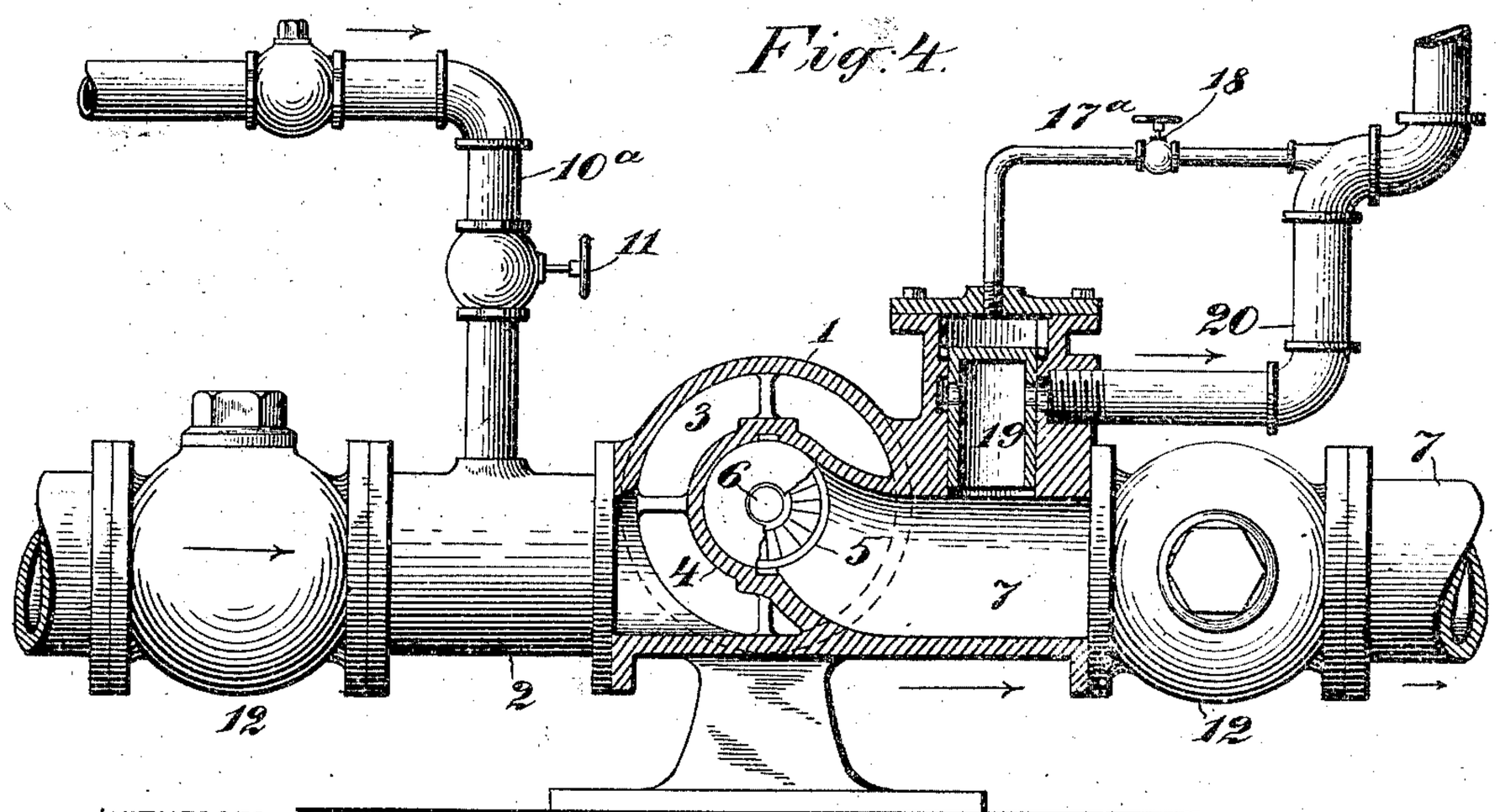

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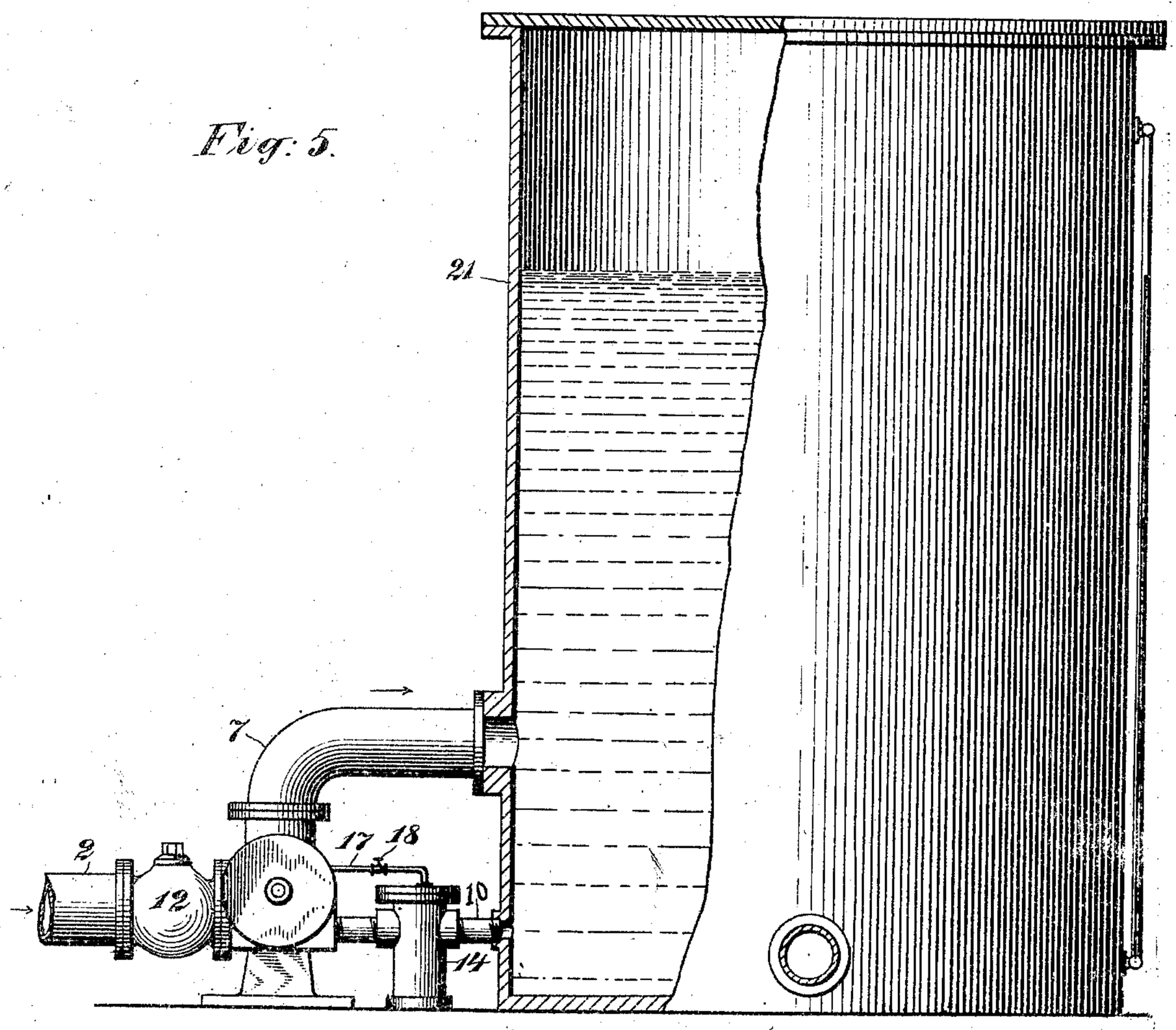
Fig. 5.



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TURBINE PUMPING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 656,465, dated August 21, 1900.

Application filed April 30, 1900. Serial No. 14,848. (No model.)

To all whom it may concern:

Be it known that I, FRANZ MARBURG, Jr., a citizen of the United States, residing in the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Turbine Pumping Mechanisms, of which the following is a specification.

This invention relates to the class of turbine mechanisms, such as force-pumps, for elevating a column of water. A typical mechanism of this character embodied in an axial-flow turbine is illustrated in the United States Patent No. 647,856, granted to me April 17, 1900, and reference may be had to this patent for a fuller understanding of the construction and arrangement of the turbines and their fixed guides, the means employed for avoiding end thrust on the turbine-shaft, and the requirement for relief at starting. It may be said here, however, that where a pump of this character is required to lift water or other fluid against a head or pressure, or, in other words, where the pressure is greater at the eduction side than at the induction side of the pump, it is necessary at starting to set up a current or flow through the apparatus before a head or pressure at the eduction side of the pump can be overcome, and in order to accomplish this in my before-mentioned patent is shown an automatically-operated relief-valve which opens the eduction side of the pump in a manner to avoid material pressure or resistance to the flow until a current with sufficient velocity shall have been established, after which the valve gradually closes.

In the present construction in lieu of relieving the pressure at the eduction side of the pump the object is to counterbalance or overcome this pressure by the admission initially of fluid under pressure at the induction side of the pump.

Several embodiments of the invention are illustrated in the accompanying drawings, wherein—

Figure 1 is a sectional elevation of one form of the pump, showing a pressure-tank and manual control. Fig. 2 is a similar view, but showing automatic control. Fig. 3 is a similar view showing a construction with automatic control where the counter-pressure on the induction side is obtained from a fluid under a head or pressure from any source. Fig. 4 is a similar view showing counter-pressure under manual control similar to Fig. 3 and in addition a relief-valve on the eduction side of the pump. Fig. 5 shows a construction where the counter-pressure is supplied from a tank which is itself supplied by the pump.

For the reasons already stated it has not been deemed necessary to show the specific construction of the interior of the pump.

My present invention is not specifically limited to any particular construction of the turbine mechanism and that fully illustrated in my before-mentioned patent will serve.

In the construction herein shown 1 is an outer casing into which the liquid flows or is drawn through the induction-inlet 2. From the annular chamber 3 in the casing the liquid flows into the ends of an inner cylinder 4, fixed in the casing 1 and containing the turbines 5 on their shaft 6. Preferably there will be two sets of these turbines, each set having fixed guides, all as clearly shown in my said former patent. The liquid taken in at the ends of the cylinder 4 will be discharged at a central eduction-outlet 7.

So far as described above the pump has no features of novelty over that in the said patent.

Referring now to Fig. 1, 8 is a closed pressure-tank, and 9 is a branch pipe connecting the eduction side of the pump with said tank. A pipe 10 connects the tank 8 with the induction side of the pump, and in it is a manually-operatable valve 11. Obviously whatever pressure there is on the eduction side of the pump will be found also in the tank 8. The operator sets the pump in operation by starting the turbine-shaft in motion and then opening to a greater or less extent the valve 11. The flow of liquid under pressure from the tank 8 through the pipe 10 counterbalances, more or less, the back pressure on the eduction side of the pump and permits the establishment of a current axially through the turbine sufficient to overcome the pressure at the discharge, and when this current shall have been established the valve 11 will be gradually closed. I have shown check-valves 12 in the several pipes; but these are

well-known features and form no part of my invention. A check-valve may be placed in any one of the pipes of the apparatus or pump where it is needed.

Fig. 2 shows the same construction as that illustrated in Fig. 1, except that the valve 11 is replaced by an automatically-operating valve 13, which is normally open and closes automatically when a current shall have been established through the pump. This valve is in the form of a hollow piston mounted to move up and down in a casing 14 and provided with oppositely-arranged contracted ports 15, through which the liquid from the tank 8 flows to the induction side of the pump. The valve 13 has lugs 16, these lugs being supported, when the valve is open, on a shoulder in the casing. The casing above the valve is connected with the induction side of the pump by a pipe 17, having in it a valve 18, whereby a regulable resistance to closing of the valve is provided and the latter is caused to close gradually. When a current is established through the pump, the pressure in the chamber 3 will be reduced, and owing to the contracted character of the ports 15 in the valve 13 the pressure under the latter will be greater than that above it, so that it will rise and close the ports 15, thus cutting off the flow of liquid from the pressure-tank to the induction side of the pump.

Fig. 3 illustrates a construction which is the same as that seen in Fig. 2, except that in the construction of Fig. 3 the pressure-tank 8 and the supplying branch pipe 9 are omitted and the pipe 10 is to be supplied from any source where there is a head—for example, from a street-main if the pressure therein is suited to the purpose. The automatic valve device illustrated in this view is the same as that shown in Fig. 2.

The construction shown in Fig. 4 is the same as that seen in Fig. 3, except that the pipe 10^a from the main or other source of liquid under pressure and which corresponds to the pipe 10 of Figs. 1, 2, and 3 is provided with a manually-operatable valve 11, like that of Fig. 1, and there is a relief-valve 19 at the eduction side of the pump to assist in relieving the pressure. As a variant from the construction illustrated in my former patent the pipe 17^a from the top of the valve-casing leads to an elevated part of a waste-outlet pipe 20 and not to the induction side of the pump. The object of this connection is to insure the maintenance of liquid above the valve in the casing. The operation of such a relief-valve is fully explained in my former patent and need not be repeated here.

Where the pump is supplying a tank under pressure—as those used to operate elevators, for example—the construction shown in Fig. 5 may be employed. In this figure, 21 is the tank, which is connected directly with the eduction-pipe 7 of the pump. The pipe 10 connects this tank with the induction side of the pump, so that the pressure within the pump is balanced, as the automatic valve controlling the pipe 10 will be normally open. This valve will gradually close, however, when a current shall have been established through the pump. Obviously this form of the apparatus might have a manually-operatable valve 11 in lieu of the automatic valve, if desired.

The pump illustrated herein and that shown in my former patent are axial-flow turbines; but the same requirements exist in radial-flow turbines as well—that is to say, a current must be established through the turbine before pressure can be overcome at the eduction side of the apparatus. My improvements are applicable to both of these classes of turbine mechanisms and also to any force-pump driven by an electric motor or gas-engine where it is necessary for the motor to get up speed before the load is thrown on.

It will be understood that by "back pressure at the eduction side of the pump" is meant a considerable or material back pressure. The pump would at starting overcome a slight pressure due to friction in the passages and the like.

Having thus described my invention, I claim—

1. A pump having controllable means for admitting a fluid under pressure or head to its induction side to wholly or partially counterbalance the normal excess of back pressure at the eduction side thereof.

2. A pump having automatically-controllable means for admitting a fluid under pressure or head to its induction side to wholly or partially counterbalance the normal excess of back pressure at the eduction side thereof.

3. A turbine pumping mechanism having controllable means for admitting a fluid under pressure or head to its induction side to wholly or partially counterbalance the normal excess of back pressure at the eduction side thereof.

4. A turbine pumping mechanism having automatically-controllable means for admitting a fluid under pressure or head to its induction side to wholly or partially counterbalance the normal excess of back pressure at the eduction side thereof.

5. An axial-flow turbine pumping mechanism having controllable means for admitting a fluid under pressure or head to its induction side to wholly or partially counterbalance the normal excess of back pressure at the eduction side thereof.

6. A turbine pumping mechanism having an inlet-pipe for admitting fluid under head or pressure to its induction side and distinct from the normal induction-inlet, and a controlling-valve in said pipe adapted for shutting off the influx when a current shall have been established through the apparatus.

7. A turbine pumping mechanism having an inlet-pipe, distinct from the normal induction-inlet, for admitting a fluid under

pressure to its induction side, and a normally-open automatic controlling-valve in said pipe adapted to close when a current shall have been established through the apparatus.

8. The combination with the pump, of a pressure-tank connected with both the induction and eduction sides of the pump, and a controlling-valve between the said tank and the induction side of the pump, whereby the flow from the tank may be cut off at the proper time, substantially as set forth.

9. The combination with the pump, of a pressure-tank connected with both the induction and eduction sides of the pump, and an automatic controlling-valve between the said tank and the induction side of the pump, whereby the flow from the tank may be cut off at the proper time, substantially as set forth.

10. A turbine pumping mechanism having controllable means for admitting a fluid under pressure or head to its induction side to wholly or partially counterbalance the normal excess of back pressure at the eduction side thereof, and having also an automatic relief-valve on its eduction side.

In witness whereof I have hereunto signed my name, this 25th day of April, 1900, in the presence of two subscribing witnesses.

FRANZ MARBURG, JR.

Witnesses:
PETER A. ROSS,
HENRY CONNETT.