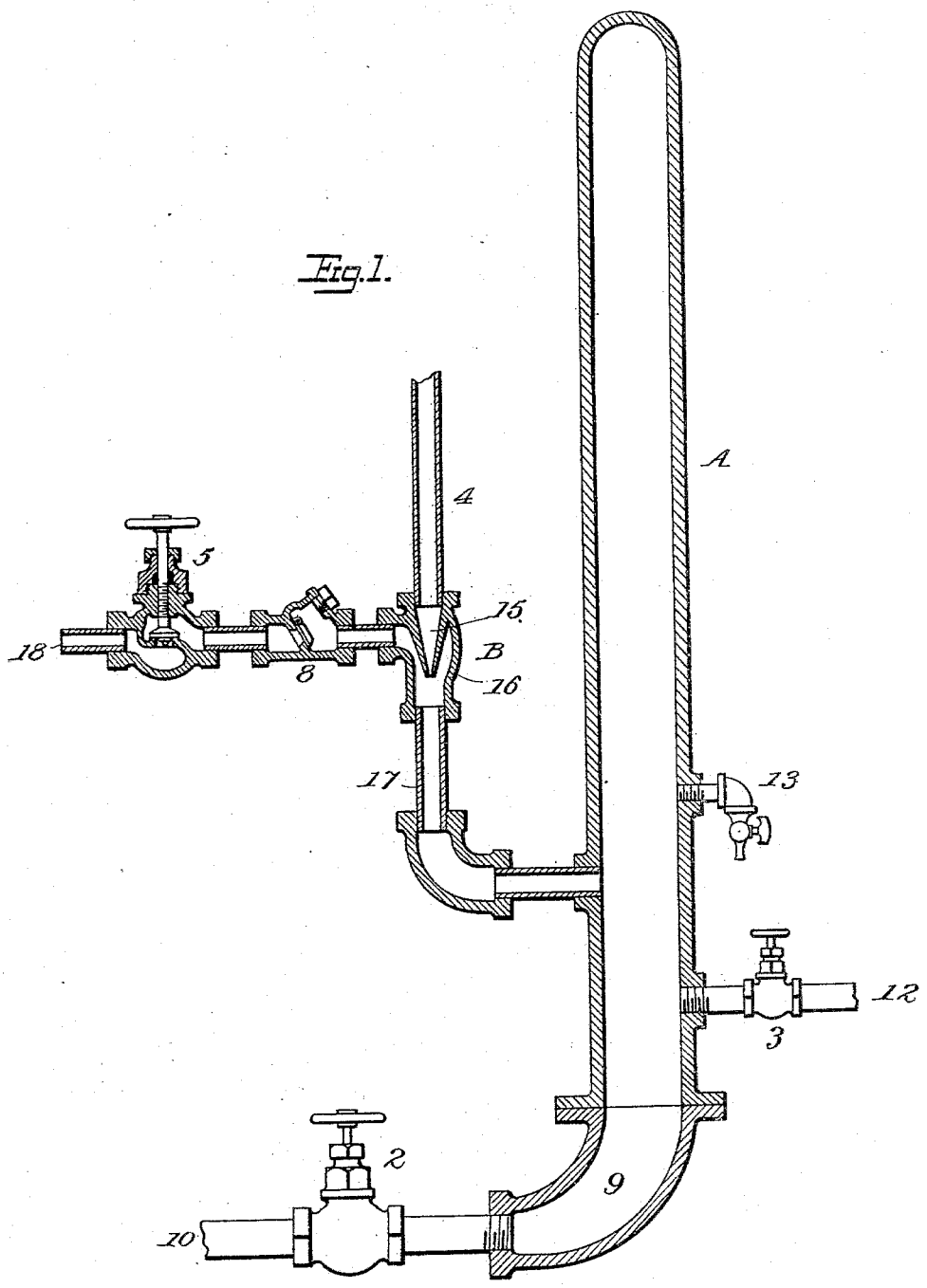
(No Model.) 3 Sheets—Sheet 1.

R. H. THORPE & T. E. BROWN, Jr.

APPARATUS FOR FILLING AIR VESSELS UNDER PRESSURE.

No. 569,774. **Patented Oct. 20, 1896**

Fig. 1.



Witnesses
J. G. Hinkel
Geo. H. Dobson

Inventors
Robert Henry Thorpe
Thomas E. Brown Jr.
by Foster Freeman
Attorneys

(No Model.) 3 Sheets—Sheet 2.

R. H. THORPE & T. E. BROWN, Jr.

APPARATUS FOR FILLING AIR VESSELS UNDER PRESSURE.

No. 569,774. Patented Oct. 20, 1896.

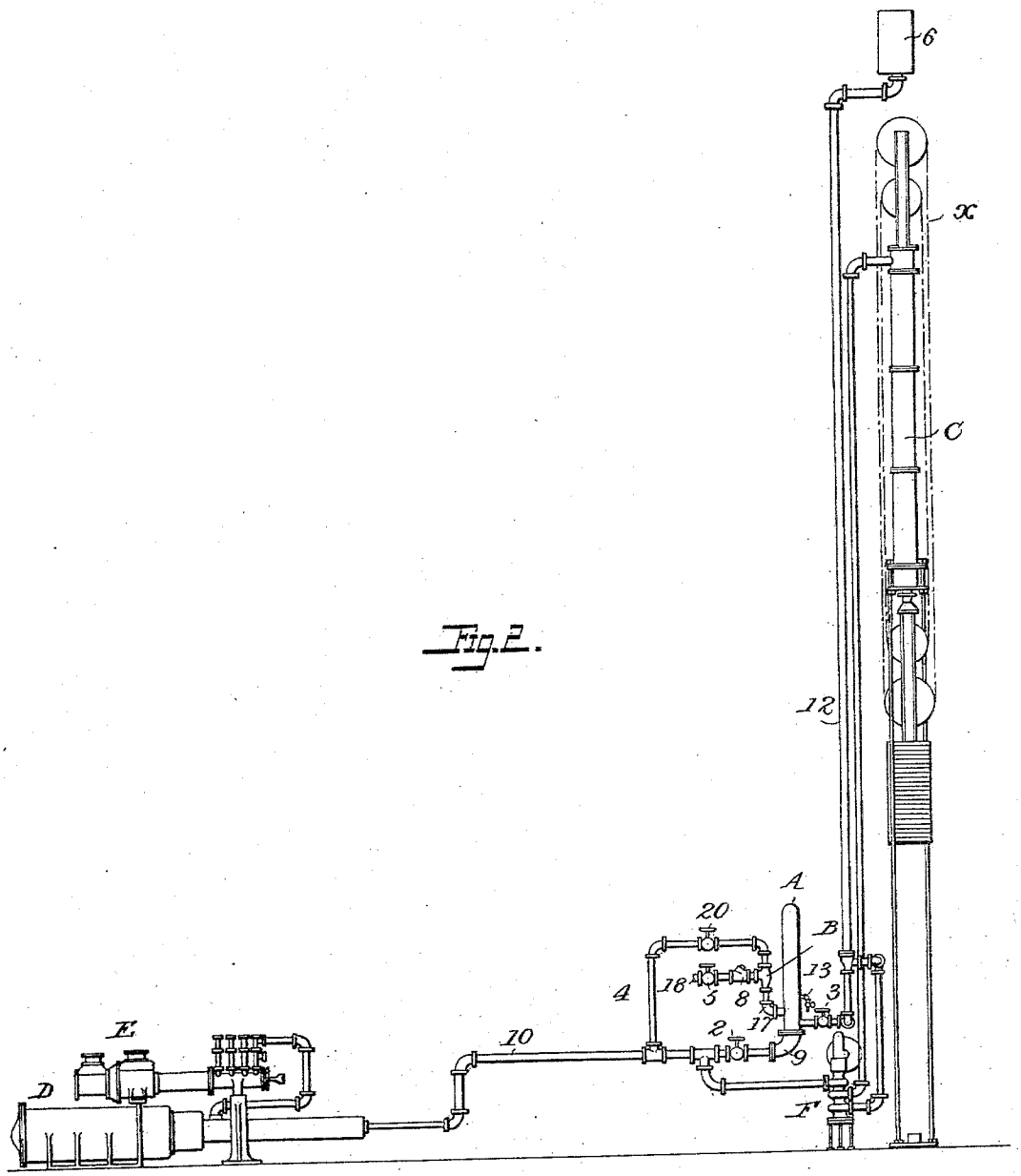


Fig. 2.

Witnesses
Jno. G. Hinkel
Leicester A. Dobson

Inventors
Robert Henry Thorpe
Thomas E. Brown Jr.
By Foster Freeman
Attorneys

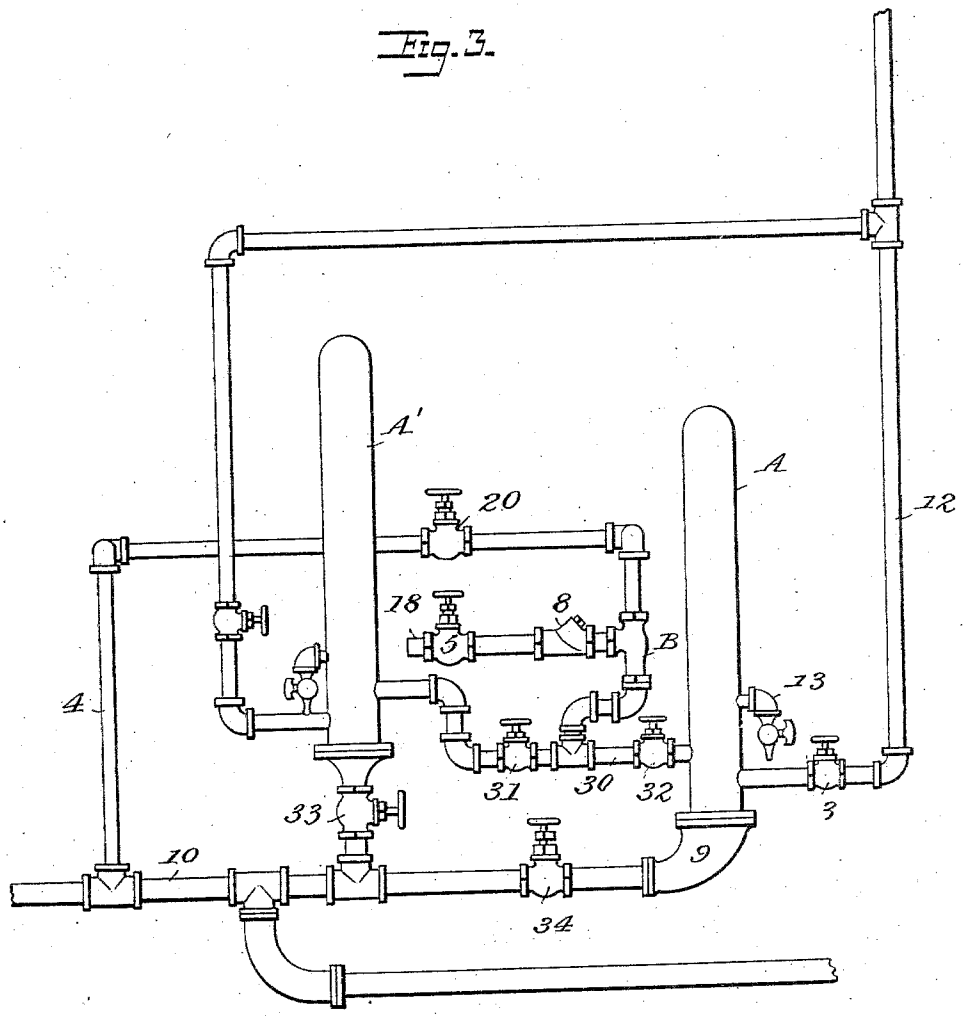
(No Model.) 3 Sheets—Sheet 3.

R. H. THORPE & T. E. BROWN, Jr.

APPARATUS FOR FILLING AIR VESSELS UNDER PRESSURE.

No. 569,774. Patented Oct. 20, 1896.

Fig. 3.



Witnesses
J. G. Hinkel
Arthur Dobson

Inventors
Robert Henry Thorpe
Thomas E. Brown Jr.
by Foster Freeman
Attorneys

UNITED STATES PATENT OFFICE.

ROBERT H. THORPE AND THOMAS E. BROWN, JR., OF NEW YORK, N. Y., ASSIGNORS TO THE NATIONAL COMPANY, OF CHICAGO, ILLINOIS.

APPARATUS FOR FILLING AIR VESSELS UNDER PRESSURE.

SPECIFICATION forming part of Letters Patent No. 569,774, dated October 20, 1896.

Application filed July 3, 1894. Serial No. 516,473. (No model.)

To all whom it may concern:

Be it known that we, ROBERT HENRY THORPE, a subject of the Queen of Great Britain, and THOMAS E. BROWN, Jr., a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Filling Air Vessels under Pressure, of which the following is a specification.

Our invention relates to that class of apparatus in which a motor fluid under a high pressure is used and in which an air-chamber is employed to reduce the shock of the pumping of the motor fluid or from other causes; and our invention consists in certain means for filling the air-chamber with air under pressure, as fully set forth hereinafter, and as illustrated in the accompanying drawings, in which—

Figure 1 is a sectional elevation illustrating the air vessel and means for filling the same. Fig. 2 is an elevation illustrating the improvement in connection with a hydraulic elevator, and Fig. 3 a view illustrating an arrangement whereby to avoid the shocks of the pumping-engine when the air vessel is being replenished.

The air vessel A may be constructed in any suitable manner, but, as shown, it is preferably a tube closed at one end without any joints and flanged at the opposite end for attachment to a bend 9, leading to a supply-pipe 10. The supply-pipe is supplied in any suitable manner with the motor fluid under pressure, and in the special class of apparatus for which our improvement is more particularly intended the pressure is much greater than is usual in ordinary hydraulic apparatus, being in some cases from six to eight hundred pounds pressure to the square inch, and it therefore follows that when the air-chamber has to be supplied with air there is a pressure therein which, although reduced beyond that of the normal pressure in the supply-pipe 10, is still very great and may exceed two hundred pounds. The water or motor-fluid discharge pipe 12 extends from near the lower end of the air vessel to a discharge-tank, which may be situated at any suitable point, and is frequently in an elevated position, so that there is considerable back pressure, and the pipes 10 12 are provided with cocks or valves 2 3. A petcock 13 serves to determine whether the air-chamber has a sufficient amount of air or not.

In order to introduce the air into the chamber in the vessel A under the pressure, which is always very great in said vessel, we make use of an injector, and we operate the injector preferably by the pressure of the motor fluid which is supplied to the pipe 10. To this end a pipe 4 communicates with the pipe 10 and extends to the nozzle 15 of an injector B, the said nozzle extending into the enlarged casing 16 of the said injector opposite a delivery-pipe 17, which leads to the air vessel A at a point preferably near the base of the latter. With the casing 16 of the injector communicates an air-pipe 18, having a cock 5 and a check-valve 8. When the air-chamber is to be replenished with air, the valve 2 is closed, the valve 5 is opened, and a valve 20 in the pipe 4 is also opened, together with the valve 3 in the motor-fluid-discharge pipe 12. As soon as the valve 20 is opened the motor fluid under great pressure passes to the nozzle 15 and, traversing the casing 16 of the injector, draws in the air through the pipe 18 and forces the same through the pipe 17 into the receptacle A, the water in which passes into the receptacle A, being discharged through the discharge-pipe 12 to the discharge-tank.

The inlet through the injector can be so adjusted with reference to the outlet from the independent discharge that the pressure in the air-chamber differs from that in the source of supply by a sufficient amount to enable the injector to suck in the air. Thus if the pressure in the source of supply is seven hundred pounds and the pressure in the air-chamber when the discharge-pipe 12 is open is three hundred and fifty pounds the water will rush in with a pressure of seven hundred pounds, carrying the air with it into the air-chamber until the latter is practically full of air, after which the valve which controls the discharge 12 is shut. The injector will then cease to draw in air, as the pressure in the air vessel will increase until it is equal to that derived from the source of supply. If the air-cham-

ber is full at a pressure of three hundred and fifty pounds and the water is continued to be introduced until the pressure of the inlet-water is overcome, the air in the chamber will be compressed to half its volume, and will then be at seven hundred pounds pressure, and the vessel will be charged for service.

In practical operation it takes but a short time to fill the chamber, varying from five to fifteen minutes, according to the size.

While we have referred to the use of a check-valve 8, which prevents any possible back pressure through the air-pipe 18, this is used simply as a precautionary measure.

The air vessel as thus arranged may be charged with air for many different purposes in connection with different apparatus, as, for instance, in waterworks, elevator apparatus, &c., and steam might be used instead of water in the case illustrated, but we prefer to use water, as it is quicker in operation and free from some of the practical objections to the use of steam. A glass gage might be used instead of a petcock, so as to indicate the height of the water in the vessel.

In Fig. 2 we have illustrated the arrangement of the air vessel in connection with a hydraulic elevator, in which C is the elevator-cylinder, provided with the usual piston, piston-rod, and sheaves carrying the cable *x*, and with the control-valve device F. The discharge-tank 6 is arranged in an elevated position, and is supplied from the air vessel A through the pipe 12, as before described. The supply-pipe 10 communicates with the valve device and with an accumulator D, the same being a strong vessel, into which water is pumped by a compound pump E until the desired pressure is secured.

While we have referred to the nozzle of the injector as being supplied with a motor fluid from the supply-pipe 10, it will be evident that it may be supplied with a fluid under high pressure from an independent source.

It will be evident that in charging the air-chamber as above described, when the pumping service is employed and when the air vessel is cut off from the pressure-pipes in charging, the pulsations of the pump will during such time be naturally transferred to the piston of the elevator or other apparatus. To overcome this objectionable feature, we make use of two or more air vessels A A', as illustrated in Fig. 3, with a single injector B for feeding either of them through a pipe 30, communicating with both and provided with suitable cocks or valves 31 32. By closing one or the other valve 31 32 the injector may be put in communication with one or the other of the vessels, so that one may be charged while the other vessel is performing its normal function. In such case of course the vessels A A' communicate with the common pipe 10 and have suitable cocks 33 34 for cutting off the communication of one or the other therewith when required.

It will of course be apparent that there may be an injector to each vessel and that this arrangement is adapted for application with any service where it is desirable to take the shock of the pumping-engine off from the apparatus operated thereby.

Without limiting ourselves to the precise construction and arrangement of parts shown, we claim as our invention—

1. The combination with an air vessel for containing air under high pressure having a motor-fluid-inlet pipe provided with a cock and a motor-fluid-discharge pipe also provided with a cock and both communicating with the air vessel near the bottom, of an injector having a nozzle communicating with the source of supply for the motor fluid to the air-chamber and having an air-inlet, and a discharge-pipe leading from the injector to the air-chamber near the bottom thereof, all proportioned and arranged to force air directly into the closed air-chamber while the latter contains compressed air under high pressure substantially as described.

2. The combination in an elevator apparatus with the cylinder, piston, valve device, and motor-fluid-supply pipe communicating with said valve device, of an air-chamber for containing air under high pressure communicating with said motor-fluid-supply pipe and having a motor-fluid-discharge pipe and tank connected therewith, an injector having a nozzle communicating with the motor-fluid-supply pipe, an air-pipe, and a communication between the nozzle of the injector and the air-chamber, all proportioned and arranged to force the air directly into the closed air-chamber while the latter contains compressed air under high pressure substantially as described.

3. The combination in an elevator apparatus with the cylinder, piston, valve device, of an air-chamber having a closed top, a motor-fluid-supply pipe 10, communicating with air-chamber at its lower end, an injector, a pipe 4 connected to the pipe 10 and to the injector, an air-pipe 18 communicating with the injector and provided with a cock, a pipe connecting the injector with the air-chamber near the bottom thereof, a discharge-pipe 12 from the air-chamber provided with a cock, and a pipe connecting the pipe 10 with the valve device, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

R. H. THORPE.
THOS. E. BROWN, JR.

Witnesses:
JOSEPH CARSON,
HENRY L. BRANT.