

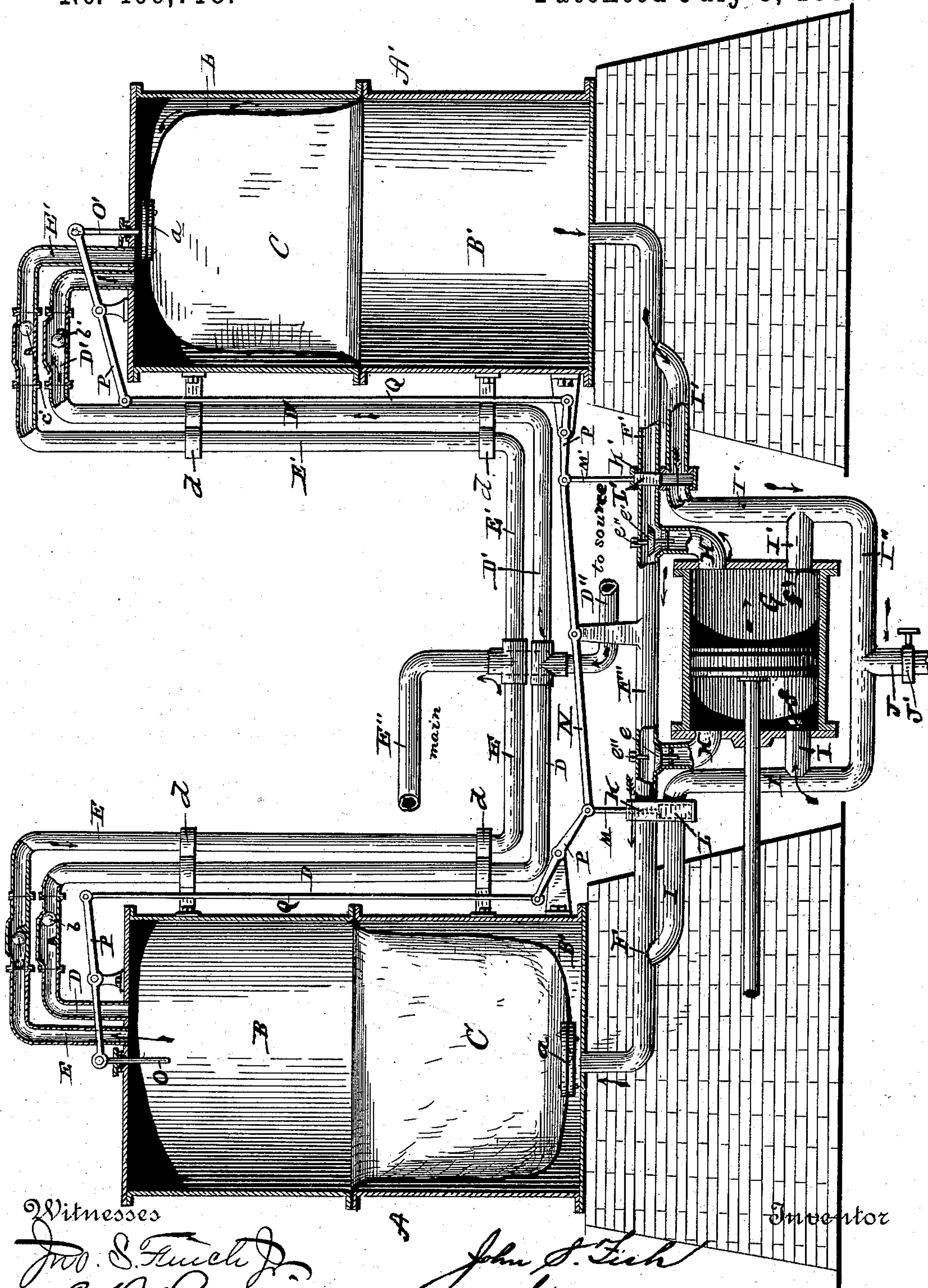
(No Model.)

J. S. FISH.

APPARATUS FOR FORCING GAS THROUGH MAINS.

No. 406,718.

Patented July 9, 1889.



Witnesses

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR FORCING GAS THROUGH MAINS.

SPECIFICATION forming part of Letters Patent No. 406,718, dated July 9, 1889.

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To all whom it may concern:

Be it known that I, JOHN S. FISH, a citizen of the United States, residing at Choestoe, in the county of Union and State of Georgia, have invented certain new and useful Improvements in Apparatus for Forcing Gas Through Mains, of which the following is a specification, reference being had therein to the accompanying drawing, in which is represented a vertical sectional view of my apparatus, some of the parts being in side elevation.

It is a well-known fact that when gas is transmitted for long distances through pipes the friction generated by the gas impinging on the interior of the pipes so retards or checks its passage and reduces its pressure that it has been found necessary to enlarge the pipes in proportion to the length of the line of pipe in order to keep up the pressure and obtain a rapid and regular flow of gas. This method and others equally expensive have been adopted for transmitting gas over long distances; but none yet tried, so far as I am aware, have proved entirely satisfactory, in that they fail to keep up a regular and steady pressure of gas. It is, therefore, the essential object of this invention to provide an apparatus of simple construction that will insure a rapid and regular flow of gas irrespective of the length of the pipe-line, as will be more fully hereinafter stated.

The invention consists, essentially, of two large vertical forcing-tanks, each of which is separated into two compartments—an air-compartment and a gas-compartment—by a flexible diaphragm, the upper or gas compartments of the tanks being connected by independent valved pipes with the main pipe and source-pipe, and the lower or air compartments of the tanks being connected by suitable valved air-pipes with an air-pump, and suitable automatic valves for reversing the flow of air through the air-pump, whereby the gas is alternately forced out of the gas-compartments of the tanks into the mains under an increased and steady pressure, one of the gas-compartments being filled with gas from the source-pipe, while the gas in the other compartment is being forced out into the main

pipe, and so on alternately, the operation being continuous and entirely automatic, as will presently appear.

In the accompanying drawing, A A' designate the two cylindrical forcing-tanks, which may be of any suitable size and shape, and may be mounted upon suitable bases or foundations. Each tank is divided into two compartments B B' by a loose flexible impermeable diaphragm C, made of any suitable material and secured at its edges to the tank in any convenient manner. The diaphragms are each provided with a central metallic plate *a*, and are sufficiently loose and baggy to extend from the middle of the tanks (their point of attachment) to their respective ends, as shown. I denominate the upper chambers B the "gas-compartments," as they receive nothing but gas, and the lower chambers the "air-compartments," as they receive nothing but compressed air.

Leading from the tops of the respective gas-compartments are two pipes or conduits D D', connected to and communicating with the source-pipe D'', these pipes D D' being provided with suitable automatic valves, in this instance ball-valves *b b'* being employed. Leading from the top of the respective gas-compartments of the tanks are also two other pipes E E', which connect and communicate with the main pipe E'', the pipes E E' being provided with suitable ball or other valves *c c'*. These pipes E E', and also the pipes D D', are stayed and supported by suitable brackets *d*, attached to the tanks.

Leading from the bottoms of the respective air-compartments are pipes F F', connected together by a central section of pipe F''.

G is an air-forcing cylinder or pump provided with a suitable reciprocating piston adapted to be reciprocated, through the medium of a piston-rod, by means of a suitable motor. (Not herein shown.) Leading from the respective ends or heads of the cylinder G, and connected and communicating with the section F'', are the short pipes or elbows H H', provided with gravitating valves *e e'*, regulated by suitable set-screws *e''*. Connecting the ends of the cylinder G, respectively, with the pipes F F' are the two air-

pipes I I', communicating with each other by an intermediate pipe I'', the said pipes I I' being provided with inwardly-opening valves $f f'$, where they enter the air-cylinder. Connected to the pipe I'' is the air-supplying pipe J, provided with a suitable valve or stop-cock J'.

Inserted or interposed in the pipes F I, and also in the pipes F' I', are the valve-boxes K K', in which work slide-valves L L', the latter being provided with suitable operating-rods M M', projecting out through the heads of the valve-boxes. The ends of these operating-rods M M' are connected by means of a long rocking lever N, pivoted upon a standard erected on the pipe F''. By means of this rocking lever it will be observed that when one valve is up the other will be down, as clearly shown.

Passing through suitable stuffing-boxes in the tops of the tanks A A' are central rods O O', pivotally connected, by means of the pivoted levers P and intermediate rods Q, to the respective ends of the rocking-lever N.

If desired, the source-pipe D'' and the main E'' may be connected directly together by a valved pipe, as shown in dotted lines, whereby the gas may be allowed to flow from the source-pipe into the main without passing through the apparatus, should it be desired or become necessary.

The parts being in the position indicated and the piston in the air-cylinder moving in the direction indicated by the arrow, the flow of gas and air will be as follows: As the piston moves forward, the air in front of it will pass out through the pipe H' (the pressure having closed the valve f') into the pipe F'', and through the valve-box K and pipe F into the air-compartment B' of the tank A, as indicated by the arrows, the valve L preventing the air from passing through the pipe I and the valve L' preventing it from entering the pipe F'. At the same time the air is being thus forced from in front of the piston into the air-compartment of the tank A the air is being exhausted from the air-compartment of the other tank and drawn into the air-cylinder behind the piston, the air passing through the pipes F', I', I'', and I, past the inwardly-opening valve f , the valve e being held closed by the pressure and suction thus created, as is evident. This movement of the air continues until the piston reaches the end of its forward stroke. When the piston moves in the reverse direction, the air that has been drawn into the cylinder behind the piston in the manner described is forced out through the pipe H, (the valve f being automatically closed,) past the valve e , and through the valve-box K and pipe F, into the air-compartment of the tank A, the air being in the meanwhile drawn out of the air-compartment of tank A' into the forward end of the cylinder, in front of the receding piston, through the pipes F' and I', and past the valve f' , the

valve e' being closed by the pressure and suction of the piston. As the air is thus forced in the air-compartment of the tank A and drawn out of the air-compartment of the tank A', the gas in the gas-compartment B of the tank A will be forced out through the pipe E, past the valve c , and into the main E'', the valve b in the inlet-pipe being closed by the pressure of gas in the gas-compartment, and as the air is being drawn out of the air-compartment of the tank A' the gas from the source-pipe D'' is drawn into the gas-compartment of this tank through the inlet-pipe D', past the valve b' , the valve c' in the outlet-pipe E' being closed by the pressure of gas from the main and the other outlet-pipe E. As the air is drawn out of one compartment and forced into the other, the flexible impermeate diaphragm in the former will move downward and the diaphragm in the latter will be forced upward, as is evident. When the air has been nearly exhausted from the tank A' and forced into the tank A, the diaphragm in the latter will (through the medium of its metallic plate a) come in contact with the rod O and force it upward. This movement of the rod O will, through the medium of the pivoted levers and connecting-rods, raise the valve L and depress the valve L' and rod O', thus reversing the operation of the entire apparatus. The instant the valves L L' are thus shifted the air will be drawn out of the air-compartment of the tank A, through the pipes F I, valve-box L, pipes I' I, and into the cylinder, and from the cylinder the air will be forced, through the pipes H H', F'', and F', into the air-compartment of the tank A', as is obvious.

The operation of the apparatus, it will thus be observed, is continuous and entirely automatic, the air-pump never having to be reversed, and the gas will be forced rapidly and steadily, at an increased pressure, through the main. By increasing the speed of the air-pump the speed and pressure of gas in the main will be proportionately increased, and vice versa. By thus alternately pumping the air from one air-chamber into another by means of a closed pump, cut off during its operation from the external atmosphere, the pressure of fifteen pounds to the square inch incident upon the connection of the pump with the external air will be obviated, and the friction in the main due to such pressure will be obviated. In other words, the atmosphere is employed in the pump, and the air-chambers to work the diaphragm, being simply moved back and forth from one air-chamber to the other, and forms a perfectly-balanced medium for operating the diaphragms, wholly unaffected from external atmospheric pressure.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

The combination of the two tanks, each di-

vided into two compartments by a movable
imperforate diaphragm, valved inlet and out-
let pipes leading into the gas-compartments
of the said tanks, an air-pump, valved pipes
5 connecting the air-pump with the air-com-
partment of the said tanks, and valves for auto-
matically reversing the flow of air through the
pump, substantially as herein described.

In testimony whereof I affix my signature
in presence of two witnesses.

JOHN S. FISH.

Witnesses:

JOHN J. FISH,
FRANK. WHITE.