(No Model.)

F. STITZEL.

GAS PUMP.

No. 283,036. Patented Aug. 14, 1883.

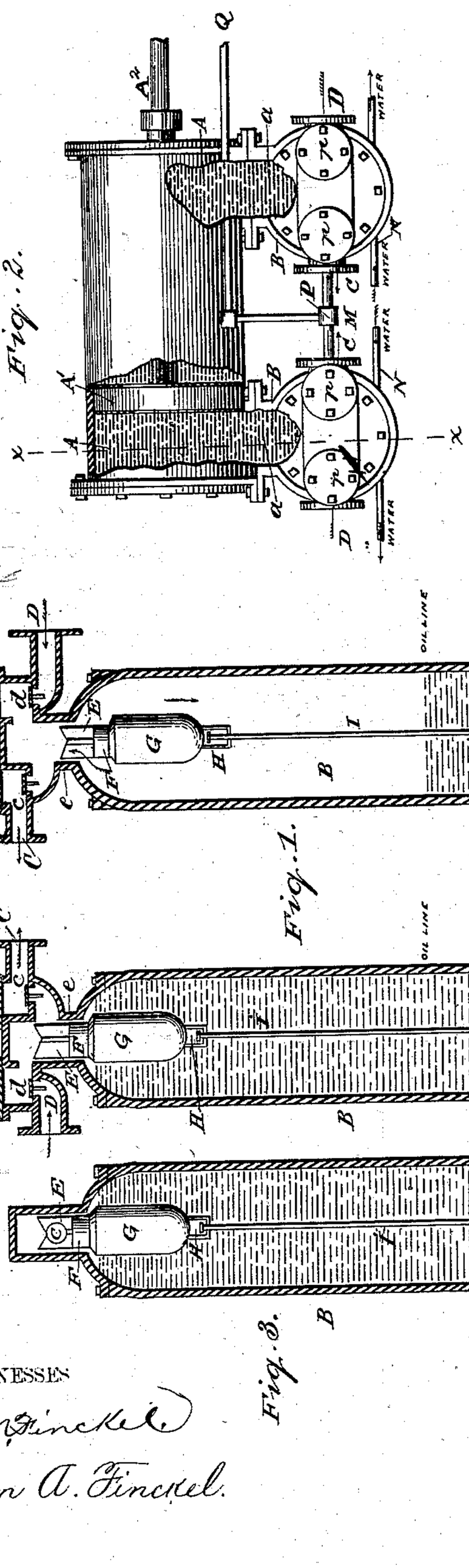

Fig. 2.

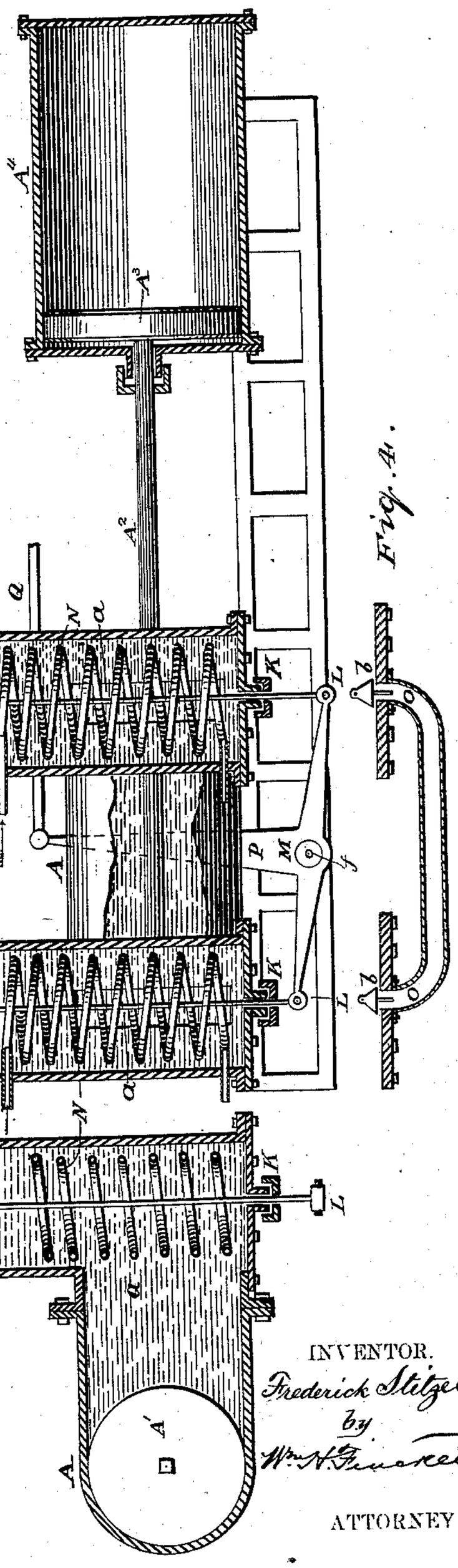

Fig. 4.

Fig. 1.

Fig. 3.

WITNESSES

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FREDERICK STITZEL, OF LOUISVILLE, KENTUCKY, ASSIGNOR OF ONE-HALF TO ADOLPH REUTLINGER, OF SAME PLACE.

GAS-PUMP.

SPECIFICATION forming part of Letters Patent No. 283,036, dated August 14, 1883.

Application filed February 3, 1883. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK STITZEL, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Gas-Pumps, of which the following is a full, clear, and exact description.

This invention is in the nature of improvements in gas-compressing pumps, and is specially designed for use in compressing ammonia gas for producing artificial cold.

The invention, as hereinafter specified and claimed, consists in the combination, with suitable pistons, cylinders, and valves, of reservoirs in which a mineral or other oil is employed between the compressing-piston and the gas in the reservoirs, which oil acts as pistons for alternately compressing the gas in the reservoirs, thus keeping the gas from direct contact with the piston.

The invention further consists in the details of construction or mechanism for effecting the object of this invention.

In the accompanying drawings, illustrating my invention in the several figures, of which like parts are similarly designated, Figure 1 is a vertical section; Fig. 2, a top plan view with outer parts broken away to expose the interior. Fig. 3 is a vertical section on the line *x x* of Fig. 2, and Fig. 4 is a sectional detail of a modification.

A is a cylinder containing a piston, A′, connected by the piston-rod A^2 with the piston A^3 of a steam-cylinder, A^4, of any suitable direct-acting steam-engine; or said piston-rod A^2 may connect with a crank or other power.

B B are upright similar cylinders bolted to the cylinder A and communicating therewith through ports *a a*. For convenience of distinction, and by reason of function hereinafter explained, I designate the cylinders B B "reservoirs," and they are herein so referred to. These reservoirs have outlet-pipes C and suction or inlet pipes D, and suitably seated in these outlets and inlets are check or flap valves *c d*, respectively, as in ordinary double-acting pumps. Adjacent to these inlets and outlets is a suitably-bored neck, *e*, in each reservoir.

E are wings projecting from valves F, which find their seats in the necks *e* under the guidance of the wings E. These valves are supported upon or are a part of floats G, which floats have stirrups H, engaged by headed rods I, sliding loosely therein, said rods extending down through stuffing boxes in the bottoms of the reservoirs and jointed to arms L L of a lever, M, rocked on a pivot or shaft, *f*, said pivot or shaft having its support in any suitable bed for the apparatus. The lever M has an upright arm, P, from which the rod Q leads to and connects said lever with the motive power, as the slide or piston valve or crank of an engine. (Not shown.) Within the reservoirs are coils of pipe N, having their openings outside the reservoirs. *p p* are removable caps in the heads of the reservoirs, and said heads may be in the nature of castings bolted to the reservoirs and comprising the pipes C and D and necks *e*.

The proportions of parts shown in the drawings are not such as will be invariably followed in practice. In fact, the reservoirs will preferably be about one-fifth shorter; but the drawings will serve to illustrate the principle of my invention.

Having thus described the construction of my apparatus, the function and operation of the parts and as a whole are as follows: The piston A′ is at the extreme left, and oil is introduced in the left-hand reservoir through the opening made by removing cap *p* until said reservoir is full. The piston is then moved to the extreme right, and the right-hand reservoir uncovered and filled. The pipes C are connected with the feed of the apparatus to be supplied with gas, and the pipe D with the exhaust of said apparatus. The piston A′ has completed its stroke to the left, and the left-hand reservoir is filled with oil, while the right-hand reservoir is also filled with oil, less its portion that has flown through the port *a* into the cylinder A and filled said cylinder between the right-hand face of its piston and its right-hand head. The float in the left-hand cylinder, being now raised by the oil, has closed the valve F in its seat in the neck *e* and shut off egress from the reservoir therethrough, and in so doing said float has, through its stirrup, lifted the rod I, rocked the lever M, and reversed the valve of the actuating steam-en-

gine. The piston A′ then begins its motion to the right; but in the meanwhile the reservoir to the right has filled with exhausted gas, which rests upon the surface of the oil in said reservoir, and hence as said piston continues toward the right it forces the oil from its cylinder up into the right-hand reservoir, moving the oil therein up against and compressing the gas, closing the inlet-valve *d*, the gas opening and escaping through the outlet-valve *c* to the place of use. So soon as the oil rises so far and in such volume as to move the float G in the right-hand cylinder, said float closes its valve F in the neck or port *e*, raises the rod I in said right-hand reservoir, and through said rod rocks lever M, the motion of which is converted, through upright P and rod Q, to reverse the engine, the piston having reached the end of its movement to the right. As soon as the piston begins its movement from each of the reservoirs the oil in that reservoir descends and follows the piston into its cylinder. Consequently the float in that reservoir, being no longer buoyed by the oil, will descend and open said reservoir to the admission of exhausted gas for compression. As heat is the result of compression of gas, and the same is communicated to the oil in the reservoirs, I keep up a circulation of a cooling agent—say water—through the coils N, and I employ such a quantity of oil as that its top level shall never fall below the upper portion of the coils.

It is obvious that this pump is equally applicable in compressing air.

The rocker-lever M will be constructed and arranged in accordance with the kind of steam pump or engine used to drive the gas-pump, and I may dispense with it and substitute therefor a pipe, *o*, connecting the reservoirs at their bottoms, the ends of the pipe being provided with valves *b*, with which the rods I I are connected. The piston in this instance will be geared up to any direct acting power, as the crank of a steam-engine. In the operation of the pump with this attachment, should oil leak past the piston, the float in the reservoir containing the excess will rise and carry with it the rod I and open its valve *b*, thus permitting the excess to escape through pipe *o* into the other reservoir, and suitable indicators may be applied to the reservoirs to indicate the movement of the oil; otherwise the action of the pump with this attachment is the same as described of that having the rocker.

It will be noticed that no oil can escape with the gas, for the moment the floats are buoyed up by the oil they close the exits.

The oil used (say mineral oil) will be impermeable, and not absorbent of gas and air, and hence its action in the reservoirs is substantially that of pistons. Instead of oil, I may use glycerine. By interposing this fluid-impermeable medium between the piston and gas to be compressed I obviate the disadvantages heretofore incurred in machines where the gas comes into direct contact with the metal piston, not the least of which is leakage of the gas. The pressure of the exhausted or returning gas is utilized in this pump by bearing upon the oil in the reservoir from which the piston is receding, and which pressure is transmitted by the oil upon the receding piston. When ammonia-gas is used the pressure is about fifteen pounds to the square inch. The exhausted gas is at a low temperature, and the compressed gas at a high, and as these temperatures are communicated to the piston by the direct contact of the gas therewith in ordinary pumps it follows that there is an injurious unequal contraction and expansion of the cylinder. This evil I overcome in my pump by keeping the gas from the piston.

By contracting the heads of my reservoirs, as shown, I am enabled to effect a very close compression of the gases.

What I claim is—

1. The combination, with a cylinder and a piston suitably reciprocated therein, of two reservoirs connected with said cylinder and containing oil, inlet and outlet valves to said reservoirs, float-valves automatically operated by the movement of the oil in said reservoirs, and a rocker-lever actuated by the movement of said float-valves to control the piston-reversing mechanism, substantially as and for the purpose described.

2. A cylinder provided with a piston, combined with reservoirs opening into said cylinder and containing oil, and float-valve mechanism in said reservoirs operated by the movement of the oil to actuate mechanism, substantially as specified, to cause the reversal of the piston, substantially as shown and described.

3. The combination, substantially as shown and described, of a piston, a cylinder therefor, reservoirs opening into opposite ends of said cylinder, float-valves in such reservoirs connected by rods with mechanism substantially as specified, the operation of which controls the admission of oil to the reservoirs, and inlet and outlet valves in said reservoirs.

4. The combination, substantially as shown and described, of a cylinder and a piston, the oil-reservoirs and the cooling-coils in said reservoirs, with valve mechanism operated by the movement of the oil to actuate, through intermediates, the piston, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand this 31st day of January, A. D. 1883.

FREDERICK STITZEL.

Witnesses:

ADOLPH REUTLINGER,

GUS. HALLENBERG.