(No Model.)

3 Sheets—Sheet 1.

H. C. SERGEANT.

Air Compressor.

No. 233,881. Patented Nov. 2, 1880.

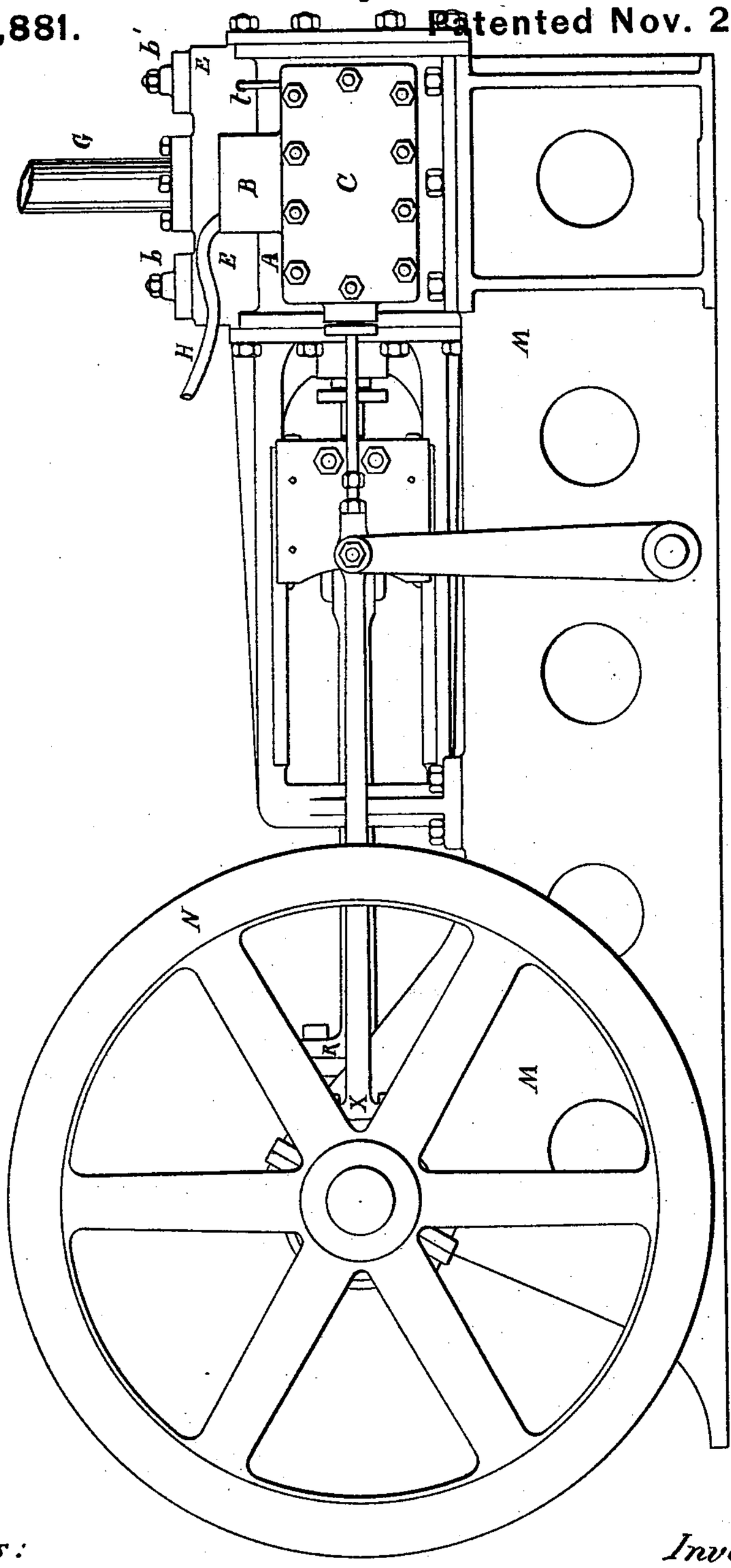

Fig. 1

Witnesses:
L. Weinberg
John Smith.

Inventor;
Henry C. Sergeant

(No Model.) 3 Sheets—Sheet 2.

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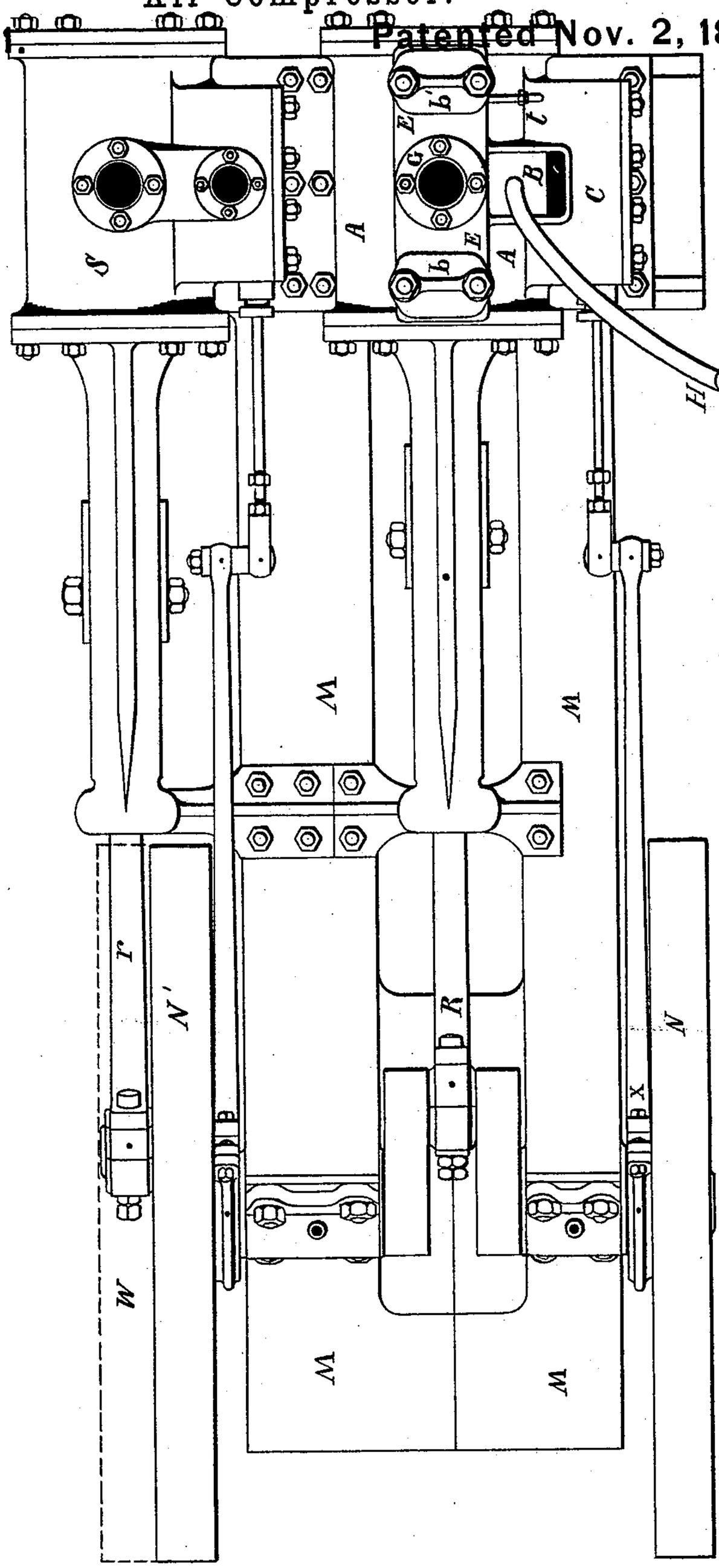

Fig. 2.

Witnesses:
F. Wienberg
John Smith.

Inventor:
Henry C. Sergeant

(No Model.) 3 Sheets—Sheet 3.

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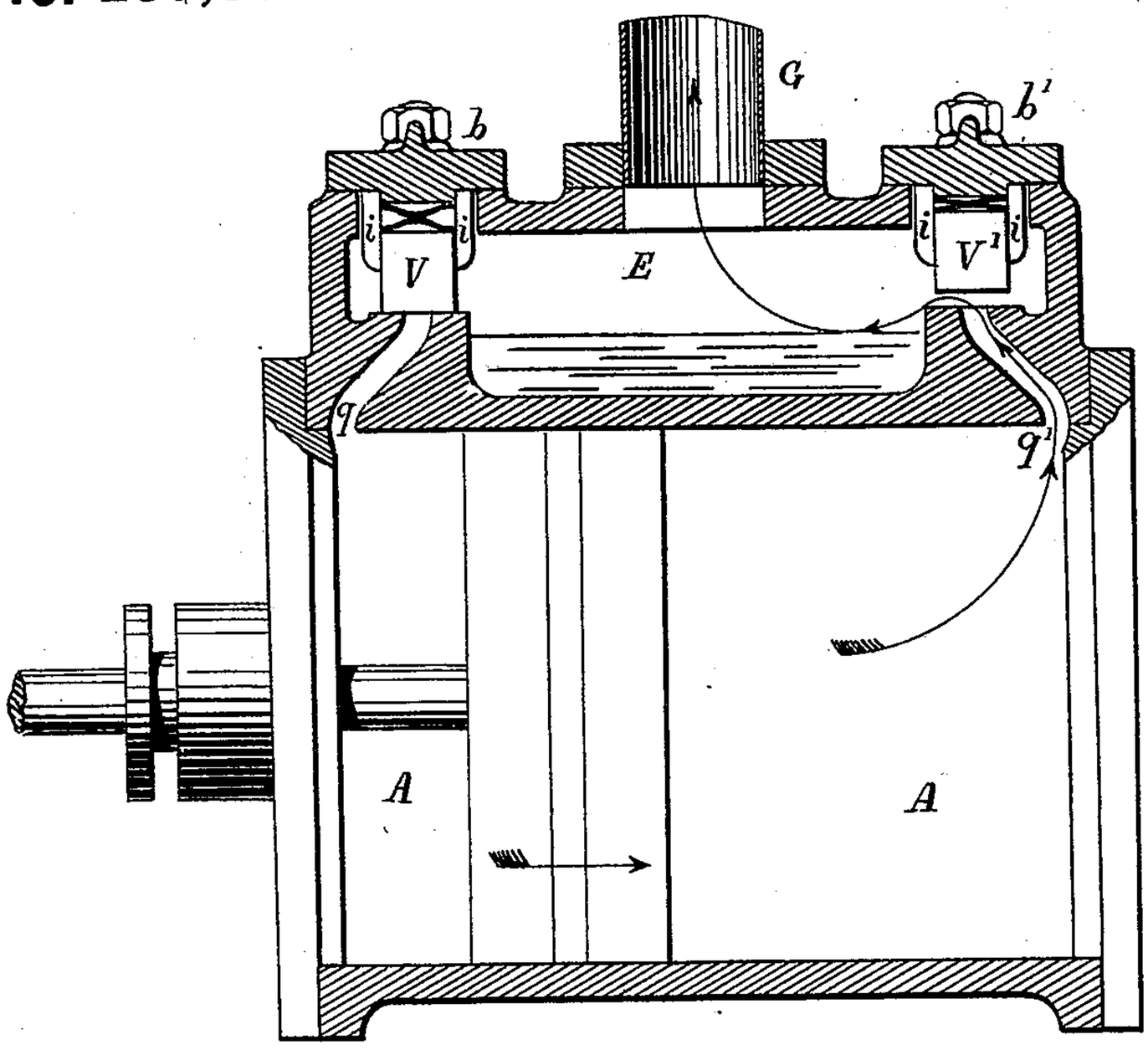

fig. 3.

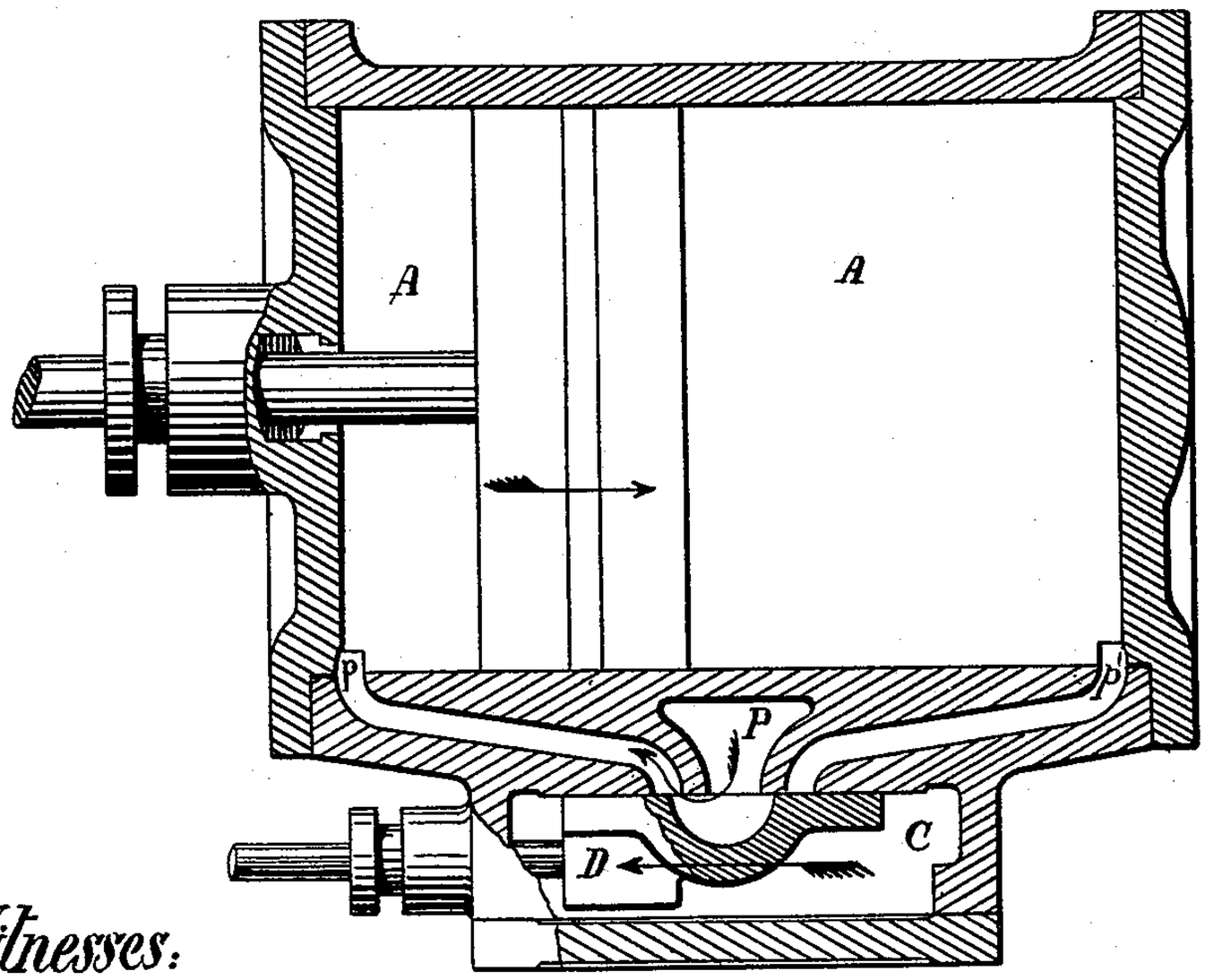

fig. 4.

Witnesses:
Jos. Wienberg
John. Smith

Inventor:
Henry C. Sergeant

UNITED STATES PATENT OFFICE.

HENRY C. SERGEANT, OF NEW YORK, N. Y.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 233,881, dated November 2, 1880.

Application filed April 30, 1880. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. SERGEANT, of the city, county, and State of New York, have invented a new and useful Improvement in Air-Compressors, of which the following is a complete description, reference being had to the accompanying drawings, forming part of the specification.

My invention relates to air-compressors intended for supplying air to mining and other machinery; and it consists in the combination and arrangement of the inlet and outlet air-valves, and of the other parts, as will be more fully described hereinafter.

The air-pump may be operated from an independent source of power by suitable belting or gearing, or it may have its own special motive power attached thereto. This latter disposition is shown in the drawings, Figures 1 and 2, Sheets 1 and 2, where A is the air-pump, and S a steam-cylinder, both secured on the frame M, and connected to the same crank-shaft by means of connecting-rods R and *r*, thus forming a complete engine.

When it is desired to operate the air-pump from another source of power the steam-cylinder S and its attachments may be removed, and instead of the fly-wheel N′ a suitable pulley or geared wheel, W, (shown in dotted lines,) may be placed on the shaft, by means of which the latter may be revolved and the air-pump operated.

In the disposition shown in the drawings the air and steam cylinder cranks are set at an angle of sixty degrees, the latter being behind the former, and suitable counterbalance-weights being provided in the fly-wheels N and N′. This arrangement, as may readily be seen, insures an efficient performance, as the maximum amount of power is applied to the steam-piston when the air-piston meets the greatest resistance.

I will now describe the special features of the air-pump.

To the side of the air-cylinder is appended a chest, C, Sheet 3, Fig. 4, similar to the steam-chest of an ordinary steam-engine. Ports *p* and *p′* connect this chest, respectively, to the two ends of the cylinder, and the port P leads into the atmosphere through the hopper B. (Shown in Figs. 1 and 2, Sheets 1 and 2.)

The ports *p*, *p′*, and P are covered by an ordinary D-shaped slide-valve, D, operated by means of an eccentric, X, on the crank-shaft.

The valve D is made of such proportions and its motion is so regulated that it will alternately place the ports *p* and *p′* in communication with the port P, thus alternately admitting air to the two ends of the air-cylinder.

It should be noticed that the device, although similar in shape to the distributing-valve of a steam-engine, only performs the function of admission, and does that through the port P, which, in a steam-engine, would be the exhaust-port.

It should also be noticed that, contrary to what takes place in a steam-engine, the chest C is at no time in communication with the ends of the cylinder, and is therefore merely a box for the valve D to work in.

In place of a slide-valve, D, I may use any other form of positive valve constructed and operated so as to produce the same results.

The delivery-valves V and V′ are shown in Fig. 3, Sheet 3.

On the top of the air-cylinder A is appended a chamber or chest, E, connected with the two ends of the cylinder through the ports *q* and *q′*, respectively. These ports are closed by means of puppet-valves V and V′, which are the delivery-valves of the air-cylinder. The motion of these valves is cushioned by springs and guided by means of prongs *i* and *i* on the valve-bonnets *b* and *b′*.

The air is forced by the piston through the valves V and V′ into the chest E, and thence it is carried through the pipe G to a suitable reservoir, or wherever required.

The chamber or delivery-chest E is connected to the inlet-valve chest C by means of a pipe, *t*, (shown in Figs. 1 and 2, Sheets 1 and 2,) so that there is always on the back of valve D as much pressure as the air-pump has developed in chest E, thus preventing the air from raising the valve D off its seat, and insuring its escape through the puppet-valves V and V′.

I will now describe the operation of the device.

Let us suppose that the piston is at the end of its stroke. The valve D has been set so that at such a position of the piston it shuts off all connection between the three ports *p*, *p'*, and P. When the piston starts, moving in the direction of the arrow, the valve moves in the opposite direction, and as it is near its mid-position it will move very fast, putting ports P and *p* in communication, thus admitting air from the port P to the cylinder. The valve D moves slower as the piston reaches the middle of its stroke. At that point the motion of the valve is reversed, and it travels slowly in the same direction as the piston, gradually going faster until the piston reaches the end of its stroke, when the valve D reaches its mid-position and again shuts off all connection between the three ports *p*, *p'*, and P. The valve D is set somewhat late, so that the piston may deliver the entire volume of air compressed before starting on its return-stroke.

No special description is necessary of the operation of the puppet delivery-valves V and V'. I only wish to call attention again to the fact that the delivery of air is done through them, and that the slide-valve D (or other equivalent positive valve) only admits the air, and that without any connection with the chest C.

Another feature of my invention consists in the admission of water with the air into the air-cylinder. The water is allowed to flow through a pipe or hose, H, into the hopper B and port P. The advantages derived therefrom are found, first, in preventing the heating of the machine; second, in that the water acts as a packing to fill up the clearances and enable the piston to discharge at each stroke the full volume of air admitted. How this is done I will show by reference to drawings 3 and 4, Sheet 3. We will suppose that the piston is moving in the direction of the arrow, the air and water being drawn through the ports P and *p* into the cylinder. When the piston returns and compresses the air it pushes the water back with it, the air rising at the surface and escaping through the valve V. The water will fill up the port *p* and the clearance at the end of the cylinder, and all the air must escape through the valve V, and after it what water may have been taken in the cylinder in excess of what is required to fill up said clearance and port *p*. Thus all the air taken in at one stroke is expelled at the return-stroke. To accomplish this it is necessary that the delivery-ports should be located above the inlet-ports, and that is why I place the inlet-valve on the side and the outlet-valves on the top of the cylinder. The water in the cylinder also acts as a lubricant to the moving parts.

What excess of water is delivered into the chest E is carried away with the air through the pipe G, although some of it will always stay in the bottom of said chamber E, and as the pipe *t* connects the two chests E and C, the chest C will always be filled with water under pressure, which will lubricate the valve D and hold it to its seat.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an air-compressor, the positively-moved valve D, constructed and arranged substantially as shown, whereby it is made to act as an induction-valve only, and the water-chamber C, in which a constant but varying pressure of water is maintained.

2. In an air-compressor, the combination of the positively-moved inlet-valve D and the puppet delivery-valves V V', operated by the escaping air, the former being arranged upon the side or bottom of the cylinder and the latter upon the top thereof, as a consequence of which the chamber C is kept constantly filled with water under pressure, and thus the valve D is kept to its seat, as set forth.

3. In an air-compressor, the combination of the water hopper or reservoir B, containing the air-induction passage, the passages P *p p'*, and the valve D, substantially as and for the purpose set forth.

4. In an air-compressor, the combination of the chambers C and E and pipe *t*, the arrangement being substantially such as described, whereby the chamber C is kept filled with water from chamber E, and under a pressure equal to that in the latter, as described.

HENRY C. SERGEANT.

Witnesses:
JOHN SMITH,
F. WIENBERG.