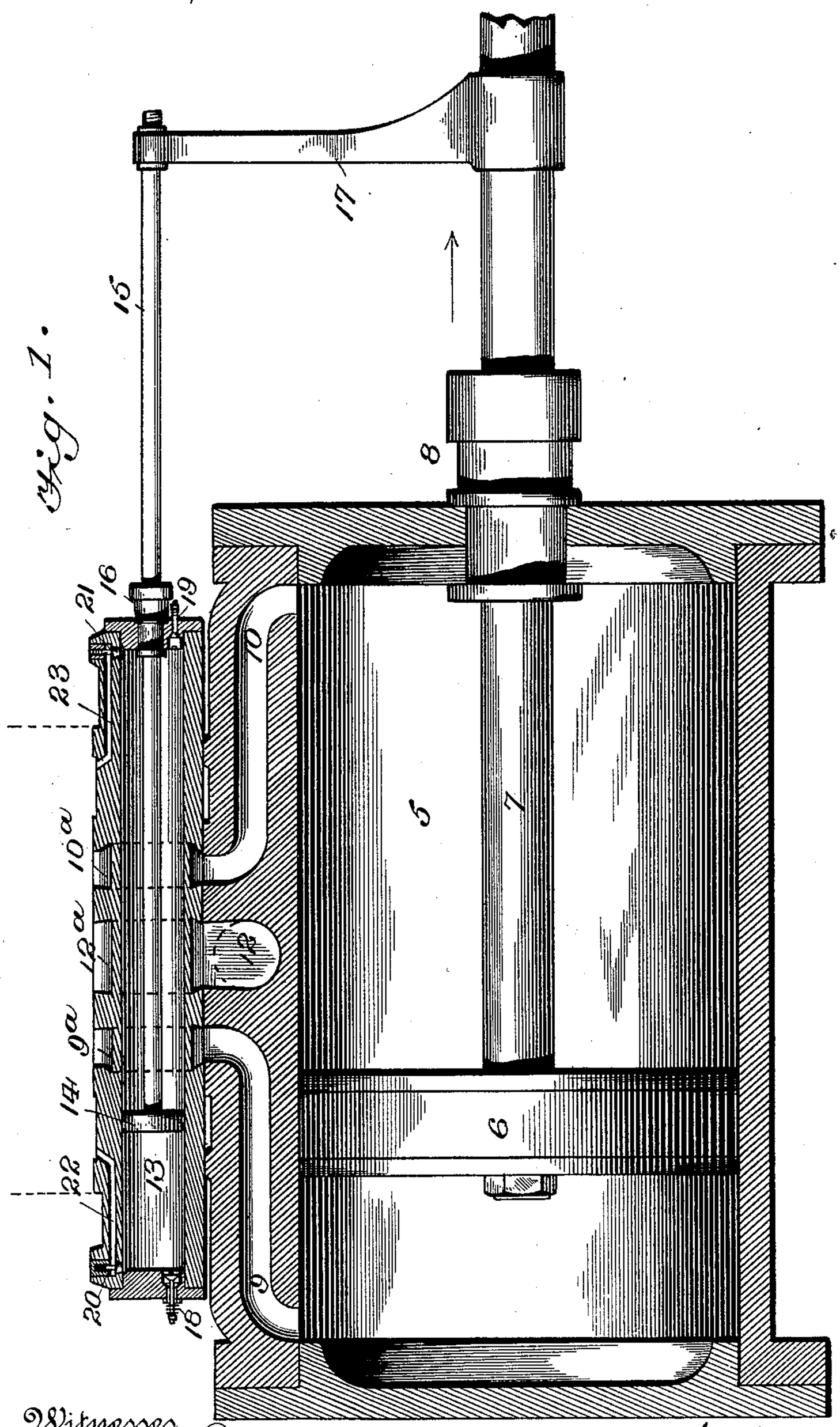
(No Model.) 2 Sheets—Sheet 1.

A. H. REEDER.

ANTIFREEZING ATTACHMENT FOR ENGINES.

No. 594,283. Patented Nov. 23, 1897.

Fig. 1.



Witnesses
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Inventor
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By James L. Norris
His Attorney

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

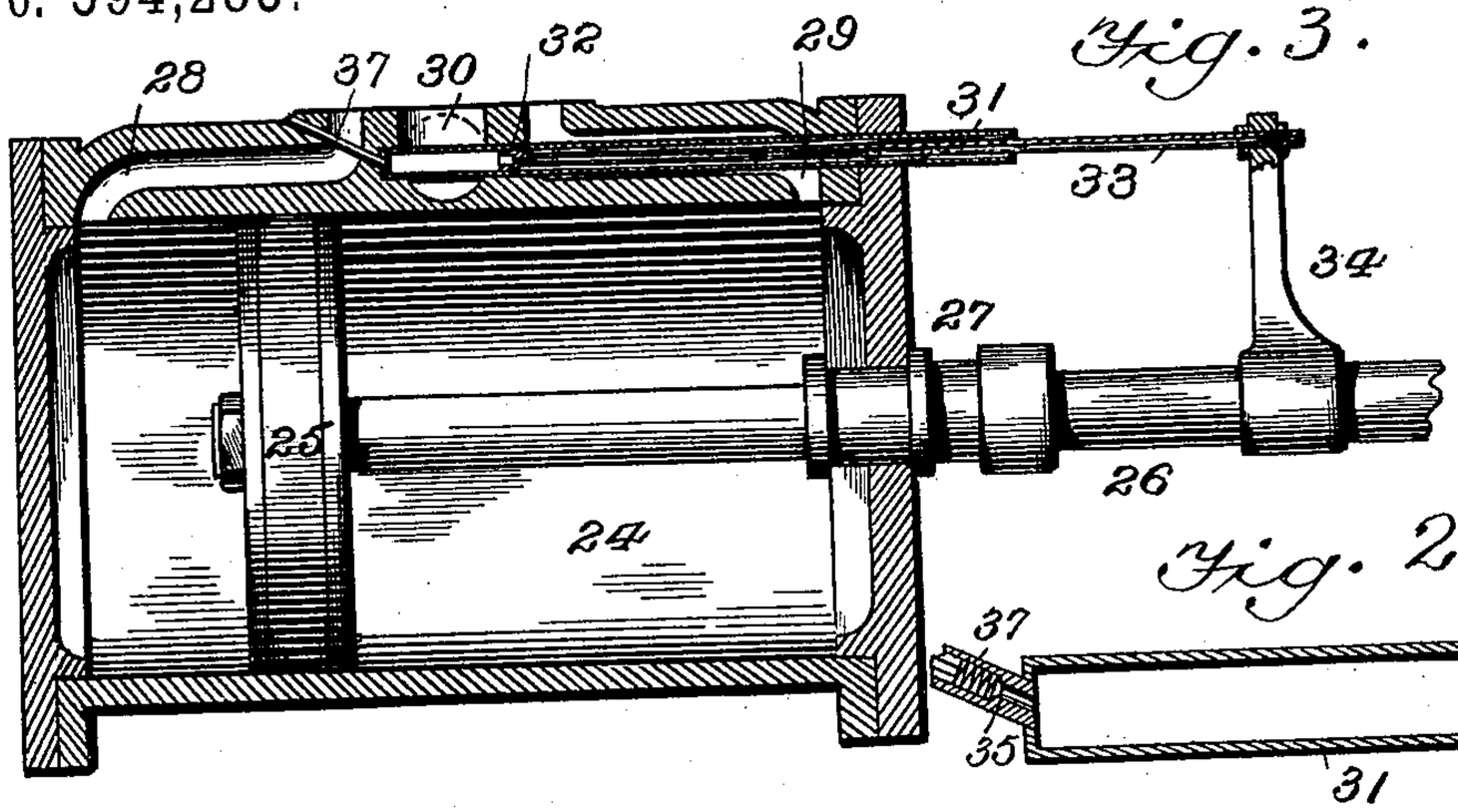

Fig. 2.

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UNITED STATES PATENT OFFICE.

ANDREW H. REEDER, OF UNIONTOWN, PENNSYLVANIA.

ANTIFREEZING ATTACHMENT FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 594,283, dated November 23, 1897.

Application filed October 29, 1896. Serial No. 610,446. (No model.)

To all whom it may concern:

Be it known that I, ANDREW H. REEDER, a citizen of the United States, residing at Uniontown, in the county of Fayette and State of Pennsylvania, have invented new and useful Improvements in Antifreezing Attachments for Engines, of which the following is a specification.

In engines operated by compressed air, and particularly that class designed for working pumps or other apparatus in mines, the air is usually compressed at some distance from the engines or at the surface of the earth and is conveyed by pipes to the engines which are to be operated. When air is compressed, considerable heat is disengaged which is termed "the latent heat of compression." The air immediately after it is compressed is at a high temperature, but this is materially reduced in transit to the engines which are to be operated. As the air exhausts from the engine after working the same, the sudden expansion causes the temperature of the air to fall below freezing-point, thus congealing the moisture in the exhaust-port of the engine, which sooner or later obstructs or prevents the operation of the same.

The object of the present invention is to provide novel, simple, efficient, and economical means for preventing freezing in the ports of an engine operated by compressed air. To accomplish this object, my invention involves the features of construction, the combination or arrangement of parts, and the principles of operation hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view taken vertically through an air-operated engine and showing my invention in operative connection therewith. Fig. 2 is a view similar to Fig. 1, showing a modification of my invention. Fig. 3 is a detail sectional view showing portions of the piston and cylinder of the air-compression pump illustrated in Fig. 2.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to Figs. 1 and 2 of the drawings, wherein the numeral 5 indicates the cylinder of an air-operated engine; 6, the piston; 7, the piston-rod; 8, the stuffing-box through which the piston-rod works; 9 and 10, the usual ports by which the compressed air is led to the opposite ends of the cylinder for the purpose of reciprocating the piston, and 12 the exhaust-port. The engine-cylinder is surmounted by a comparatively small air-compression cylinder 13 and around the circumference of which the ports 7, 10, and 12 of the cylinder 5 are continued, as indicated by the numerals 9^a, 10^a, and 12^a, in such manner that the engine-valve (not shown) may work in connection with suitable valve-faces formed upon the upper side of the air-compression cylinder 13 for the purpose of controlling the ports 9, 10, and 12, substantially the same as in an ordinary engine operated by compressed air.

I do not deem it necessary to fully illustrate the main valve of the engine, which, as before stated, will work upon the upper side of the air-compression cylinder 13, because such valve is well known and will operate upon the air-compression cylinder in substantially the same manner as it operates in ordinary engines as regards controlling the ports of the engine-cylinder. I have, however, indicated by dotted lines the air-chest in which the engine-valve is arranged to operate. The cross-sectional form of the air-compression cylinder 13 will be understood by reference to Fig. 2; but I wish it understood that the form or shape of this cylinder may be variously modified without altering the spirit of my invention. The cylinder 13 contains a piston 14, operated by a piston-rod 15, which works through a stuffing-box 16 on one of the cylinder-heads. The piston-rod 15 connects with an arm or horn 17, secured to the piston-rod 7 in such manner that when the piston 6 and piston-rod 7 of the engine are reciprocated the piston 14 and piston-rod 15 are correspondingly reciprocated. I do not, however, wish to limit myself to any particular means for operating the piston and piston-rod of the air-compression cylinder 13, as this can be effected by devices other than those specifically described, and shown in the drawings.

The air-compression cylinder 13 is provided at its opposite ends with air-inlet valves 18 and 19 and with outlet-valves 20 and 21,

which control communication between the interior of the cylinder 13 and ports 22 and 23, formed in the cylinder 13 and adapted to communicate with the air-chest of the main valve, which is in practice mounted on the air-compression cylinder, as hereinbefore stated. The operation of the piston and valves of the cylinder 13 compresses air, thereby generating heat according to the natural laws of the latent heat of compression. The radiation of the heat from the compression-cylinder 13 prevents ice from forming in the ports 9, 10, and 12 and 9^a, 10^a, and 12^a. The heated air which passes to the live air in the air-chest through the ports 22 and 23 effectually prevents the formation of ice in the air-chest or in the ports of the engine.

The arrangement of the small air-compression pump between the engine or pump cylinder 5 and its valve is advantageous and important in that the air-compression pump can be made of any suitable dimensions and thus secure the compression of sufficient air to prevent freezing in the ports of the engine, although the latter may be operated under extraordinary heavy pressure, which naturally increases the liability of freezing in the cylinder-ports of the engine.

In the modification illustrated by Figs. 2 and 3 the air-compression pump is arranged partly in the ports of the engine or pump cylinder, and consequently the main valve of the engine may work upon the valve-faces of the cylinder in the ordinary manner. In Figs. 2 and 3 the numeral 24 indicates the cylinder, 25 the piston, 26 the piston-rod, 27 the stuffing-box through which the said piston-rod works, 28 and 29 the live-air ports, and 30 the exhaust-port of the engine. The air-compression pump in this modification of my invention comprises a cylinder 31, a piston 32, and a piston-rod 33, connected at its outer end with an arm or horn 34, secured to the piston-rod 26 of the engine or pump. The cylinder 31 is of very small diameter as compared to the engine-cylinder and it extends through the live-air port 29 and the exhaust-port 30. The inner end of the cylinder 31 is provided with a spring check-valve 35, arranged in a tube 37, while the piston-rod 33 is tubular and the piston 32 is provided with a check-valve 36, all in such manner that at each outward stroke the live-air pressure closes the check-valve 35 and the vacuum in the cylinder opens the check-valve 36. At the end of each outward stroke the cylinder is filled with a new supply of air, which is compressed by the inward stroke and is forced through the check-valve 35 and tube 37 into the air-chest. The heat generated is transmitted by radiation to the ports 28, 29, and 30 to prevent freezing of the same.

When heavy pressure is employed to operate the engine, a very low temperature is produced in the exhaust-port and considerable heat is required to prevent freezing. For this reason I prefer the construction and arrangement of parts illustrated in Fig. 1 in that the air-compression pump can be made of any desired size to meet the conditions required, in which respect the construction shown in Fig. 1 is advantageous over that illustrated in Figs. 2 and 3.

The operation of the air-compression pump by a connection with the piston-rod of the air-operated engine is very advantageous and desirable in that the construction and operation are very materially simplified.

It will be observed that in all forms of my invention the heated air is delivered into the air in the air-chest and that consequently freezing is prevented in all the ports of the engine.

In the preferred construction, Fig. 1, the radiation of heat from the air-compression-pump cylinder is utilized and is very important, and the same remarks apply to the construction shown in Figs. 2 and 3.

Although I have referred to my invention as applied more particularly to air-operated engines designed for use in mines, I wish it clearly understood that I do not limit myself to any particular use of the engine nor to any particular construction of the same.

Having thus described my invention, what I claim is—

1. The combination with an air-operated engine having its cylinder provided with live-air and exhaust ports, of an air-compression pump having its cylinder extending through the exhaust-port of the engine and provided with a compressed-air outlet opening into the air-chest of the engine, said air-compression-pump cylinder serving to prevent freezing of moisture in the exhaust-port by radiation of heat generated by compressing air in the air-compression pump, substantially as described.

2. The combination with an air-operated engine having a valve-chest and a cylinder provided with live-air and exhaust ports, of an air-compression pump having its cylinder arranged longitudinally between the cylinder and the valve-chest of the engine, said air-compression-pump cylinder serving to prevent freezing of moisture in the air and exhaust ports of the engine-cylinder by radiation of heat generated by compressing air in said air-compression pump, substantially as described.

3. The combination with an air-operated engine having its cylinder provided with live-air and exhaust ports, of an air-compression pump mounted on the cylinder and around which the live-air and exhaust ports of the engine extend, and means for operating the air-compression pump, substantially as described.

4. The combination with an air-operated engine having its cylinder provided with live-air and exhaust ports, of an air-compression-pump cylinder mounted on the engine-cylinder and around which the live-air and exhaust

ports of the engine-cylinder extend, a compressed-air outlet leading from the air-compression-pump cylinder to the air and valve chest of the engine, and a piston working in the air-compression-pump cylinder and having a piston-rod connected with the piston-rod of the air-operated engine, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ANDREW H. REEDER.

Witnesses:
WILLIAM TAYLOR,
F. M. BROWN.