

H. BUSHNELL.
Compressed Air Motors.

No. 137,889.

Patented April 15, 1873.

fig. 1

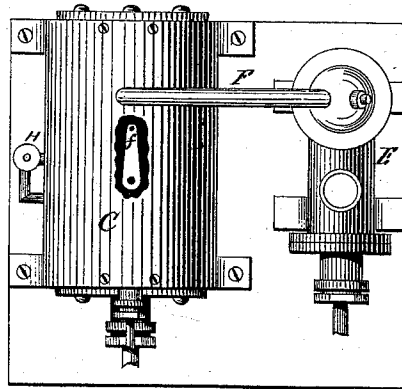


fig. 2

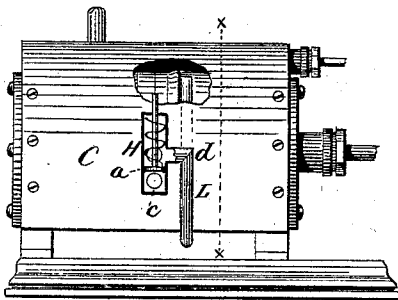
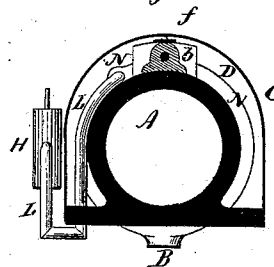


fig. 3



Witnesses

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IMPROVEMENT IN COMPRESSED-AIR MOTORS.

Specification forming part of Letters Patent No. **137,889**, dated April 15, 1873; application filed February 21, 1873.

To all whom it may concern:

Be it known that I, HENRY BUSHNELL, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Compressed-Air Motor; and I do hereby declare the following, when taken in connection with the accompanying drawing and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawing constitutes part of this specification, and represents, in—

Figure 1, a top or plan view; Fig. 2, a side view, a portion of the jacket in both figures broken away to show the interior; and in Fig. 3, a section on line *x x*.

This invention relates to an improvement in that class of engines which are driven by compressed air or other gaseous medium.

It is well known that air and other fluids compressed increase the temperature in proportion to the compression, but after standing or cooling the temperature is proportionately reduced. As the compressed air in the reservoir is usually about the same temperature as the surrounding air, it follows that when the compressed air is allowed to escape into the atmosphere it expands so rapidly as to reduce its temperature to such an extent as to cause the moisture in the escaping air to crystallize; and in engines which use this compressed air or fluid this crystallizing or freezing causes a great inconvenience and renders the use of high pressures impracticable.

To overcome this difficulty is the object of my invention; and it consists in injecting into the escape from the engine a jet of hot air sufficient to prevent the freezing before mentioned.

The best method of carrying out my invention known to me I illustrate in the accompanying drawing.

A is the cylinder, denoted in solid black, Fig. 3, constructed in substantially the usual manner for steam-cylinders; the exhaust or outlet represented at B, and *b* the valve-chamber. Around the cylinder I place a jacket, C, which forms a chamber, D, between the said jacket and cylinder, as seen in Fig. 3. Into this chamber, from a suitable air-pump, E, worked by the said engine or other power, a tube, F, leads and forces air into the chamber

D. In connection with the chamber a pressure-valve, H, is arranged, into which, through an opening, *c*, air from the chamber passes beneath the piston *a*, the said piston having a spring, or its equivalent, above graduated to the pressure required; and to this valve or cylinder H, and above the opening *c*, a second opening, *d*, is made into a tube, L, which leads up into the exhaust-passage N, so that air passing from the chamber D through the valve H flows directly through the tube L to the exhaust-opening B.

In operation the air-pump forces air into the chamber D; thence to valve H until the piston *a* rises sufficiently high to allow the air to escape. At this time the air has been sufficiently compressed to attain the requisite degree of heat, and in this heated state passes directly into the exhaust-passage from the cylinder A, there, mingling with the compressed air escaping from the cylinder A, raises the temperature of such escaping air sufficiently to prevent its freezing, and thus avoid the difficulty which usually attends the employment of air and similar fluids under pressure as a motive power.

As but a small quantity of heated air is necessary, the air-pump may be very small in comparison to the cylinder A. In case the pressure within the chamber D becomes greater than that within the cylinder, I provide a valve, *f*, which opens into the valve-chamber *b*, so that the air in the chamber D, under greater pressure than that in the cylinder, will open the valve *f* and pass into the valve-chamber.

It may be desirable at times that this heated air pass into the valve-chamber in order to warm the air or to prevent the sticking of the valves, and this will occur by means of this valve *f*, because, when the slide-valve is open to allow the air to pass into the cylinder A, the pressure upon the under side of the valve *f* is to a great extent removed. At that time the hot air from the chamber D will pass directly into the valve-chamber *b*; but this will only occur when the air is passing freely into the cylinder A, the valve *f* closing so soon as, or sooner than, the slide-valve closes.

While I believe this construction to be the best for the purpose named, it may be accomplished without the jacket or chamber around

the cylinder, the object of my invention being accomplished by the injection of hot air into the passage from the cylinder.

I claim as my invention—

1. In a motor employing a compressed gaseous medium, the injection of heated air or its equivalent into the exhaust-passage from the said motor, substantially as and for the purpose described.

2. In combination with the cylinder A and its exhaust-passage N B, the air-pump E and pressure-valve H, substantially as and for the purpose specified.

3. In combination with the cylinder A and

its exhaust-passage N B inclosed by a jacket, C, a valve, *f*, opening from the chamber formed by the said jacket into the valve-chamber *b*, substantially as and for the purpose specified.

4. In combination with the cylinder A and its exhaust-passage N B inclosed by a jacket, C, a passage, L, leading from the chamber formed by the said jacket to said exhaust-passage, substantially as and for the purpose specified.

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Witnesses:

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