W. D. GRIMSHAW.

AIR ENGINE.

No. 28,748. Patented June 19, 1860.

Fig 1.

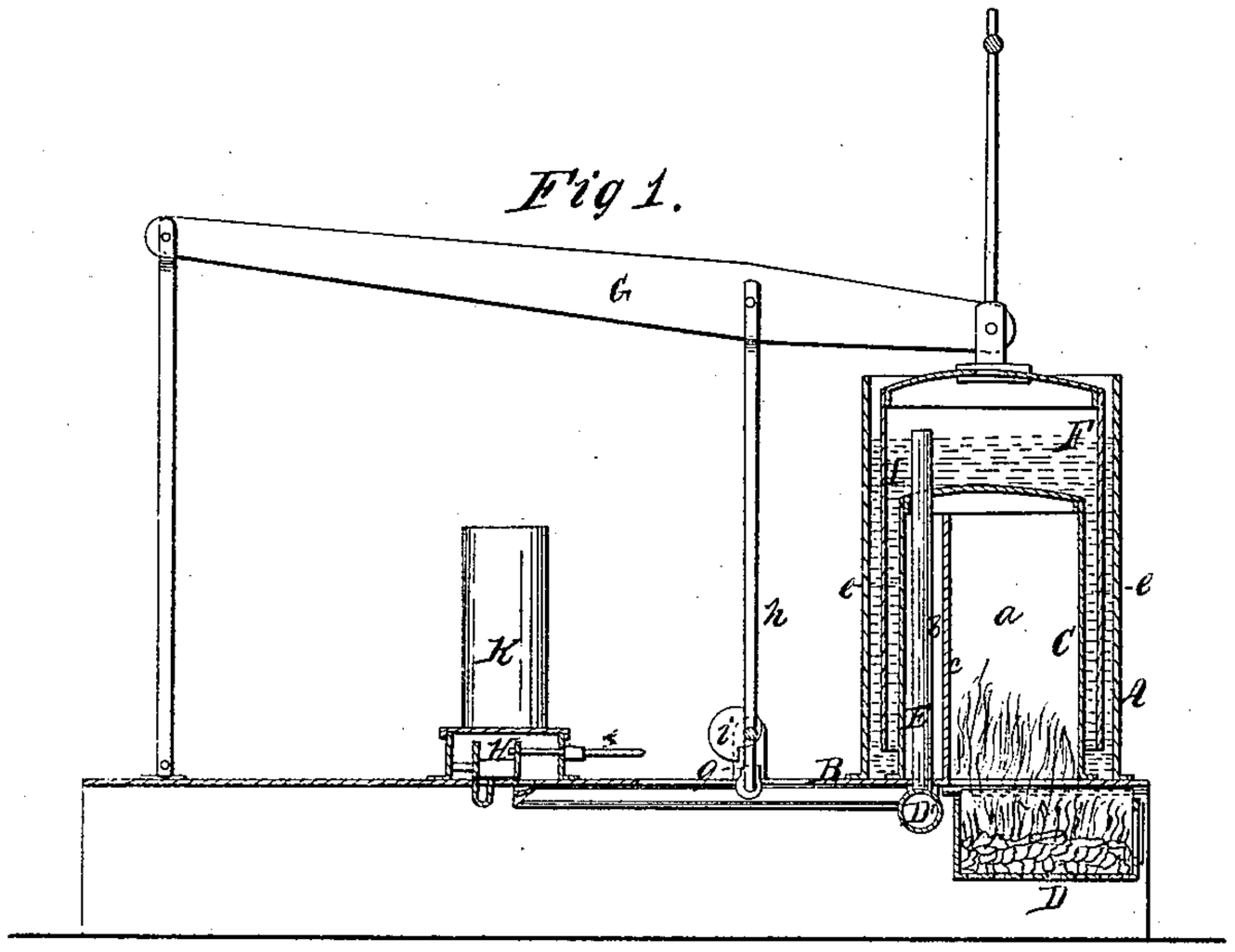
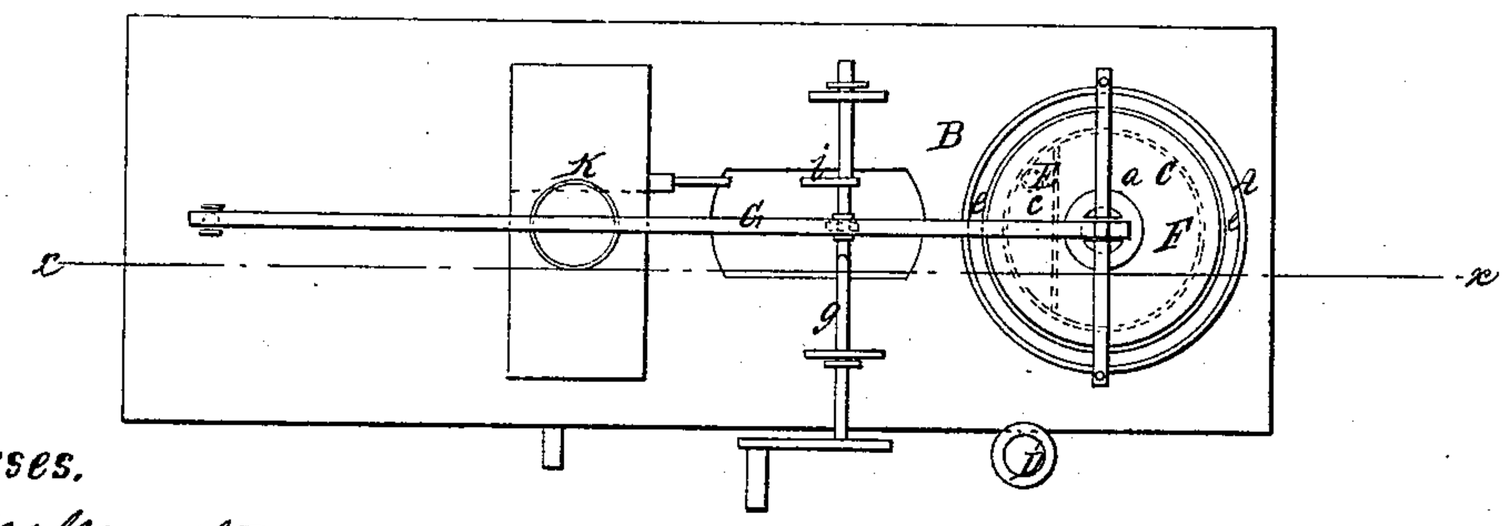


Fig 2.



Witnesses.

Charles Hughes

Inventor

William D Grimshaw

UNITED STATES PATENT OFFICE.

WM. D. GRIMSHAW, OF NEWARK, NEW JERSEY.

HOT-AIR ENGINE.

Specification of Letters Patent No. 28,748, dated June 19, 1860.

To all whom it may concern:

Be it known that I, WILLIAM D. GRIMSHAW, of Newark, in the county of Essex and State of New Jersey, have invented a new and Improved Air-Engine; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this specification, in which—

Figure 1 represents a longitudinal vertical section of my invention the line *x*, *x*, Fig. 2, indicating the plane of section. Fig. 2 is a plan or top view of the same.

Similar letters of reference indicate corresponding parts in both figures.

To enable those skilled in the art to make and use my invention I will proceed to describe its construction and operation with reference to the drawing.

A represents an open cylindrical vessel of sheet metal or of any other suitable material, and made round, square, oval, or of any desired shape. It is supported by the bed B, to which said cylinder may be secured by means of a flange projecting from its lower edge, and it is open on the top. In the interior of said cylinder and secured to its bottom or to the bed B, is the chamber C, which is closed on the top, and which communicates with a furnace D, as clearly shown in Fig. 1. The interior of this chamber is divided into two compartments *a*, *b*, by means of a partition *c*, which, however, does not extend clear up to the top of said chamber, so that the products of combustion arising from the furnace through the compartment *a*, find their way over the top of the partition *c*, and down through the compartment *b*, to the smoke pipe D′, which passes through the bottom of the compartment *b*. Another pipe E, which also passes through the bottom of this compartment, serves to conduct the steam or air to the piston, as will be hereinafter more fully explained.

The diameter or the cross section of the chamber C, which ought to be made of similar shape to the cylinder A, is considerably smaller than the diameter or the cross section of said cylinder, leaving an open space *e*, for the piston F. This piston consists of a cylindrical shell which is closed on the top and which is placed over the chamber C, and it is made of such a size that its sides do not come in contact either with the outside of the chamber C, or with the inside of the cylinder A. This piston connects with the working beam G, from which the motion is transmitted to a crankshaft *g*, by means of a rod *h*, in the usual manner.

The packing between the piston and cylinder is made by means of a quantity of metal I, placed into the space *e*, and melted by the influence of the fire in the furnace, D. The metal selected for this packing ought to be such that it melts at a pretty low temperature, but it must not under any circumstance, or at least not with ordinary temperatures, form into gas; and I have used with advantage a composition of bismuth and lead, which will melt at a temperature of about 300°.

The air or steam which is admitted through the pipe E, passes up on the top of the mass of fluid metal and by coming in contact with the heated surface of the same it expands and carries the piston up. A common slide valve H, operated by a cam *i*, on the crankshaft serves to produce the change in the ports, and when air is used, a pump K, or any other suitable device is provided for the purpose of forcing the air into the pipe E, at the desired intervals.

When this engine is to be used in practice, I arrange three or more of my cylinders side by side, and after the metal packing contained in each cylinder has been melted by the influence of the fires in the respective furnaces, the steam or air is admitted. Where steam is used it will regain its original temperature by passing up through the pipe E, and by coming in contact with the surface of the heated metal I, and the piston will be forced up. At the proper time the valve is changed, thereby opening the exhaust port, and the piston descends by its own gravity, assisted by the pressure of the atmosphere. In this engine steam may be used which has been conducted to the cylinder over a long distance, and it will recover its full force as soon as it comes in contact with the heated metal packing. When air is used the operation is the same; the air, by coming in contact with the heated metal surface, becomes suddenly heated and by its expansion the piston is carried up. The several pistons which work together as above stated, are so arranged that one is up when the other is down and another half-

way up, so that the positive force of the ascending pistons assists in depressing those which descend.

The operation of this engine is very simple, and it can be constructed at a trifling expense. No boring out of cylinders is required, and the pistons as well as the cylinders can be made of sheet metal and very light, thus saving much expense when the engines have to be transported from place to place. A gentle fire is sufficient to keep the metal in a melted state, and the expenditure of fuel is very small.

These engines can be worked with or without a condenser, as may be desired.

I am aware that a piston working in mercury has been employed and this I do not claim. Mercury could not practically be employed in my engine because the application of the heat would rapidly convert it into vapor.

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

1. The employment of the solid metallic packing I, in the manner substanially as herein shown and described so that when a sufficient degree of heat is applied to the engine the packing will melt and remain in a fused state until the heat is withdrawn as set forth.

2. The heating of the air or steam by bringing it in contact with the fused metallic packing I, substantially as and for the purpose herein shown and described.

3. The covering of the fire chamber C, with the metallic packing I, which fuses on being heated.

4. The combination of the pipe E with the cylinder C, piston F, and packing I, in the manner and for the purpose herein shown and described.

5. The introduction of the air or steam between the surface of the fusible packing I, and the interior of the piston F, substantially as and for the purpose herein shown and described.

WILLIAM D. GRIMSHAW.

Witnesses:

M. M. LIVINGSTON,

CHARLES HUGHES.