H. MESSER.
HOT AIR ENGINE.

No. 39,321. Patented July 21, 1863.

Fig: 1

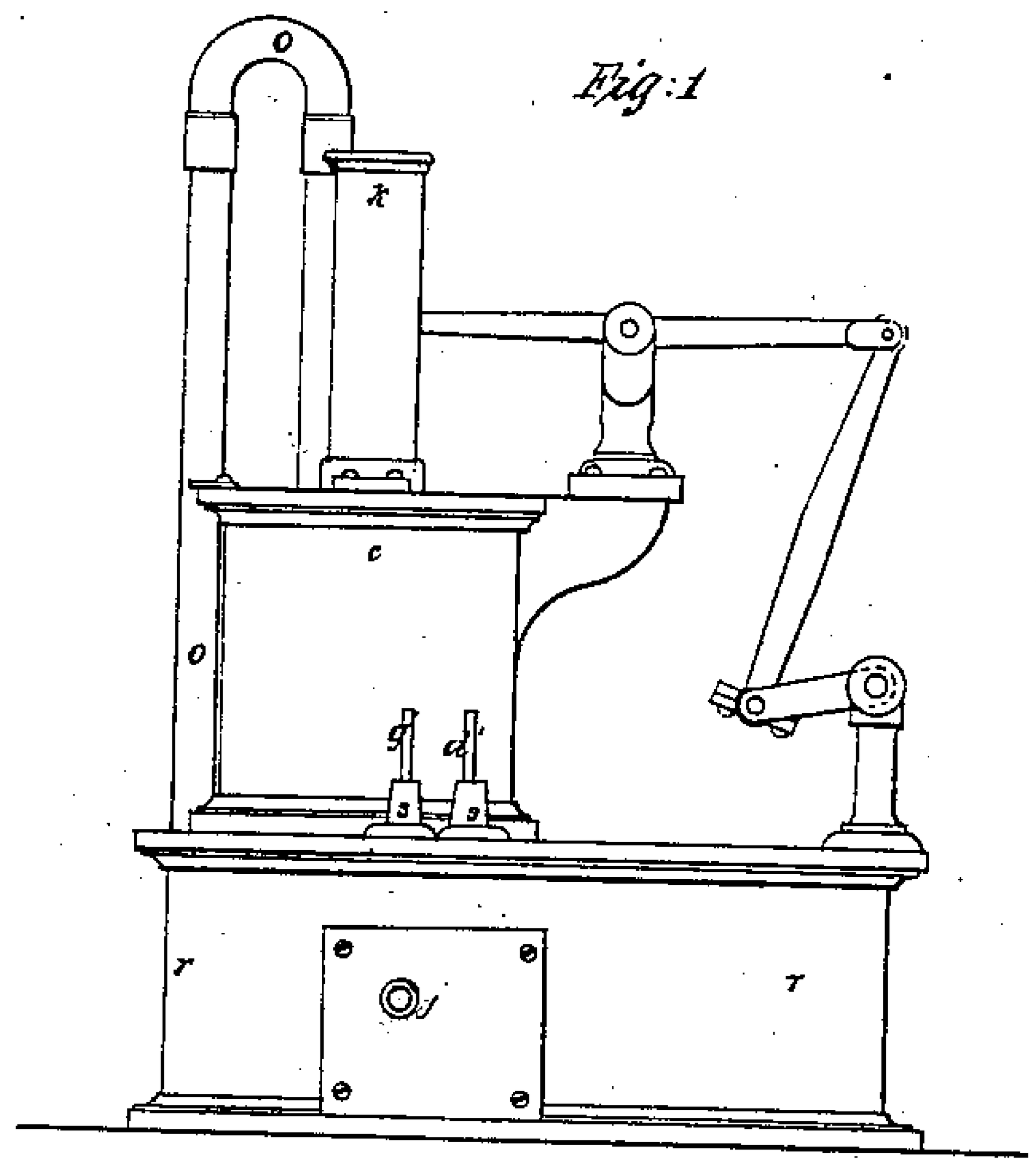


Fig: 4

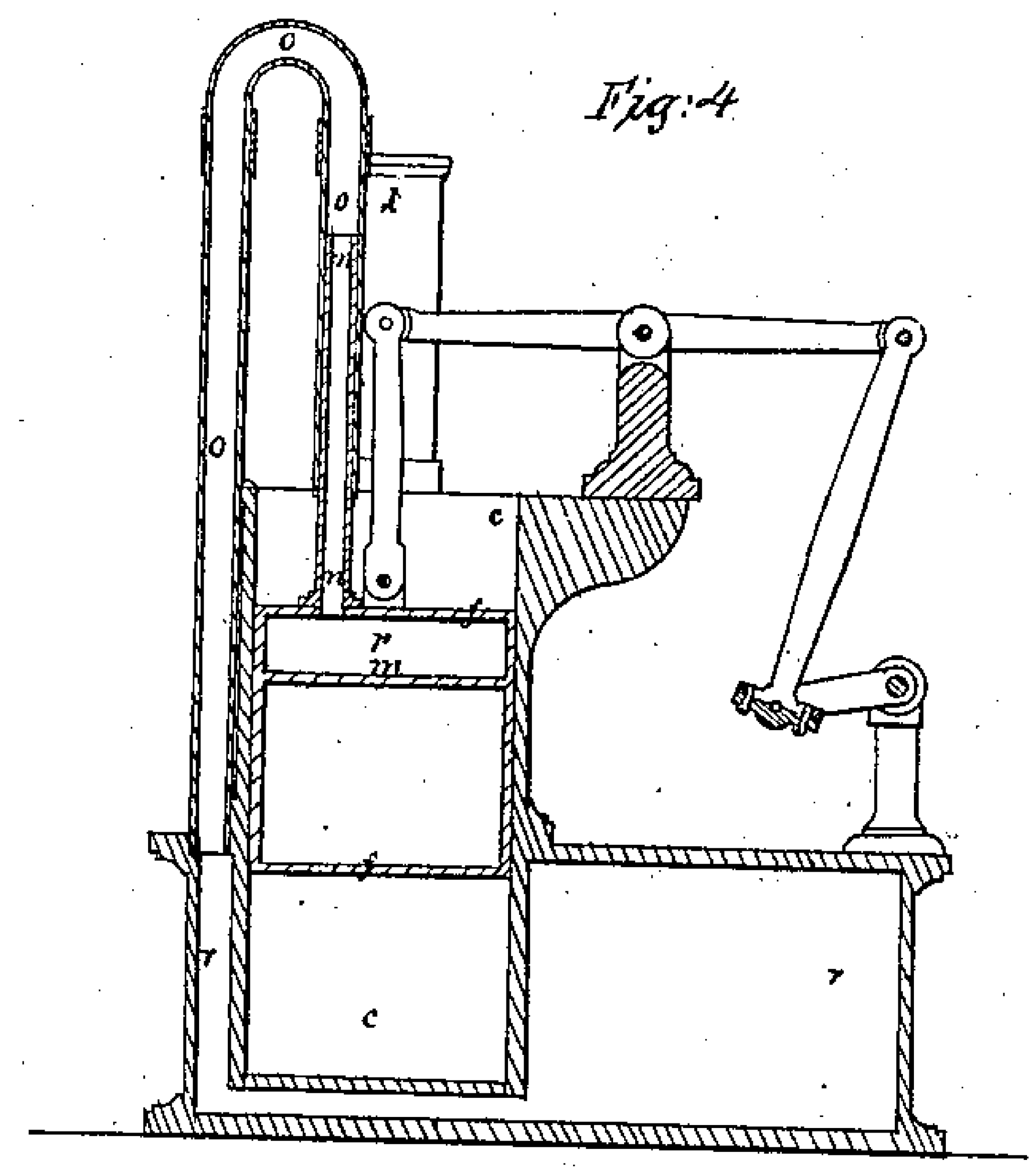


Fig: 2

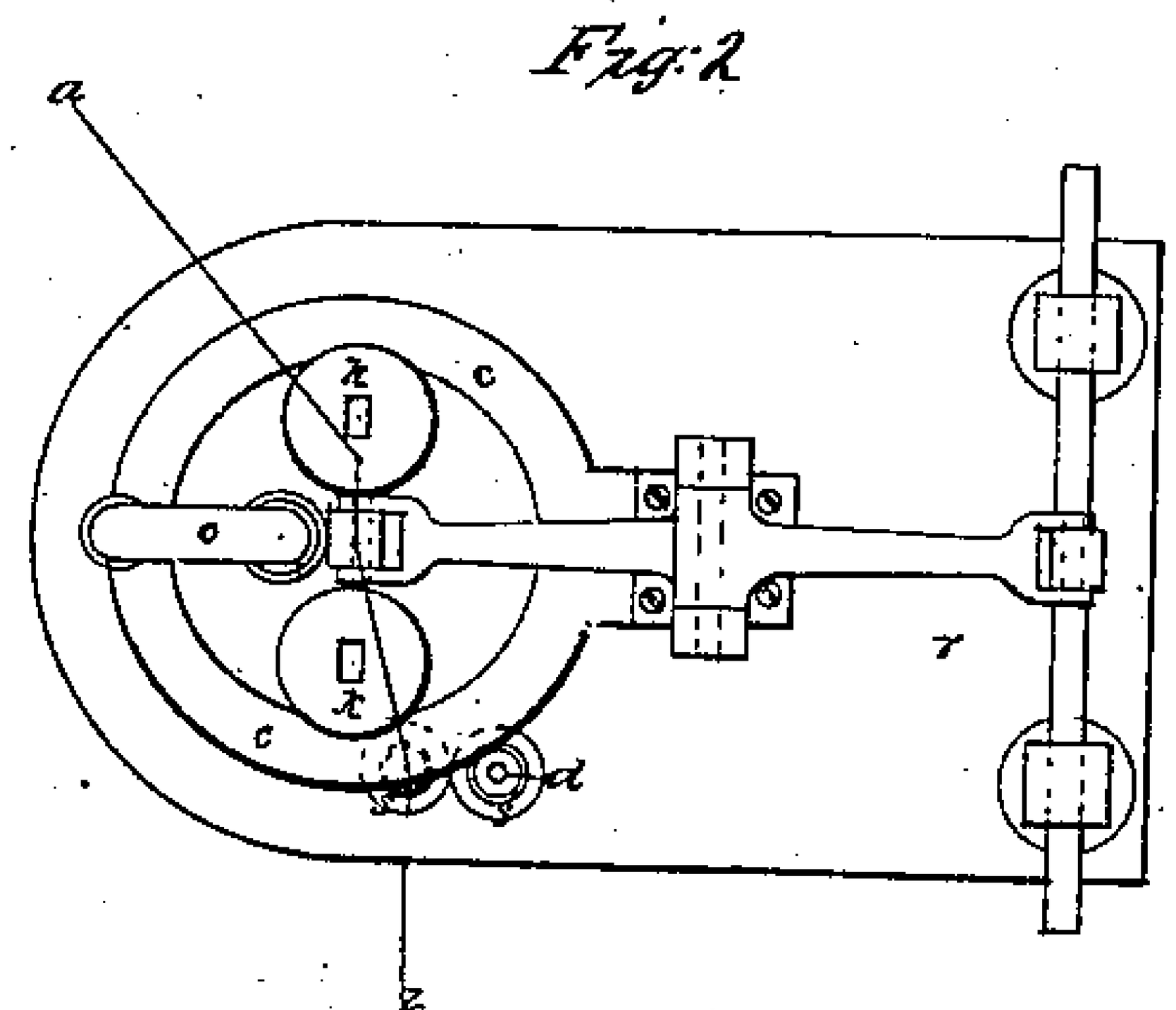


Fig: 3

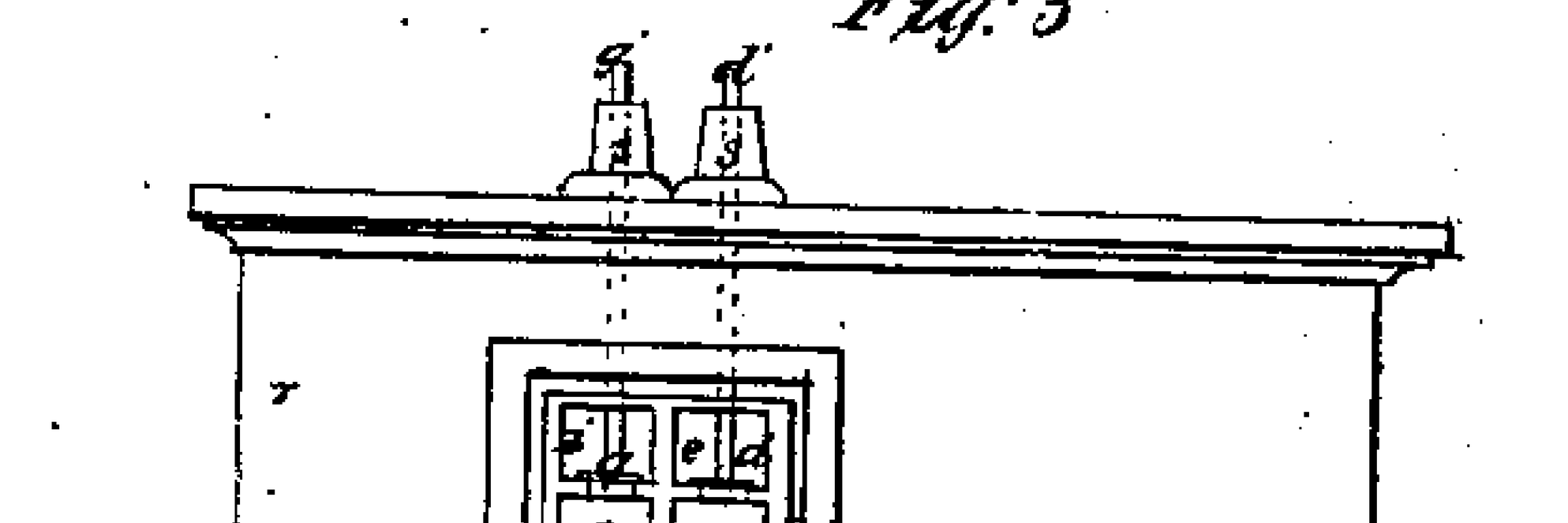


Fig: 5

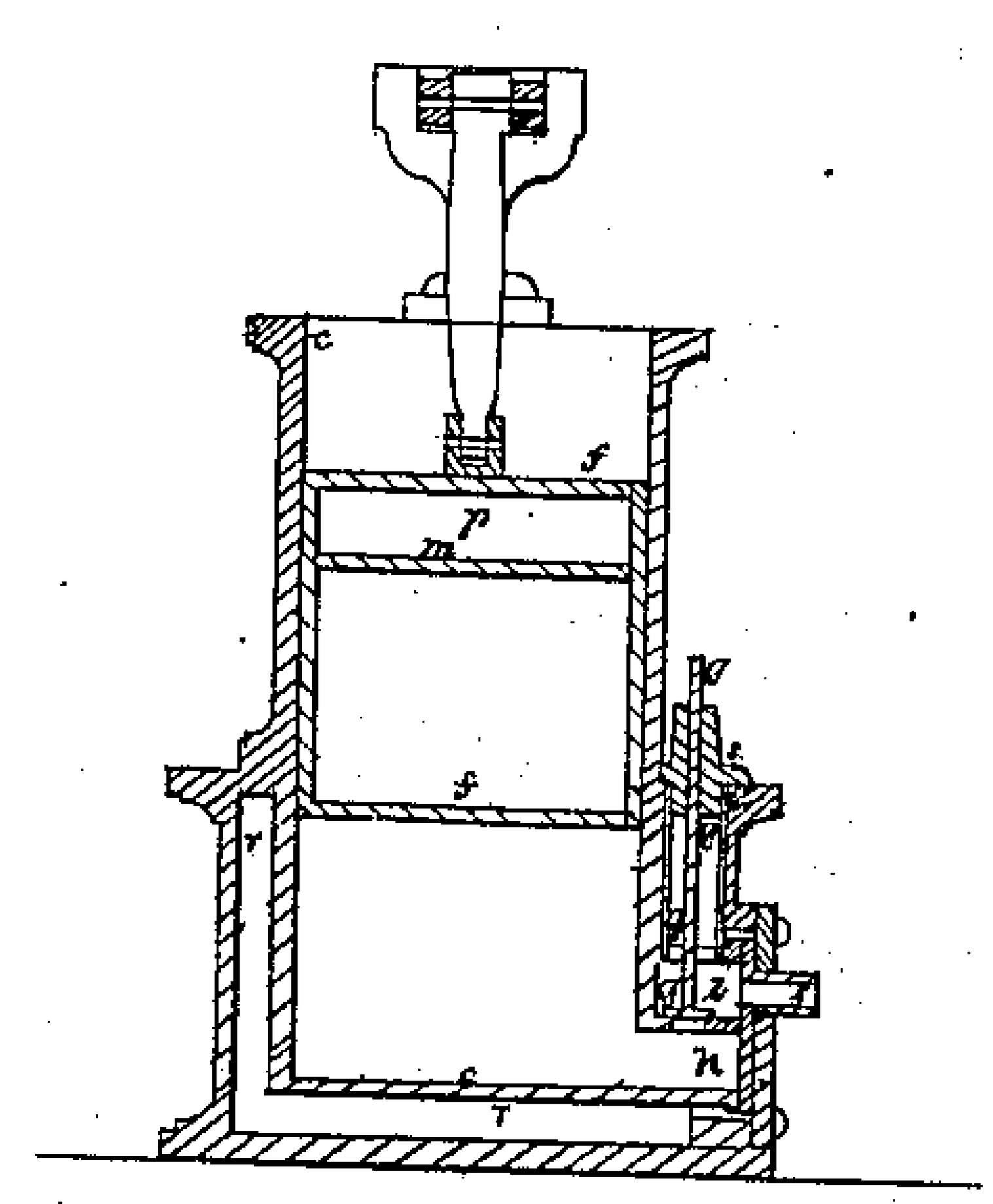


Fig: 6

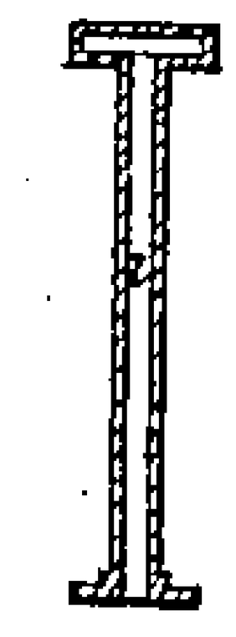
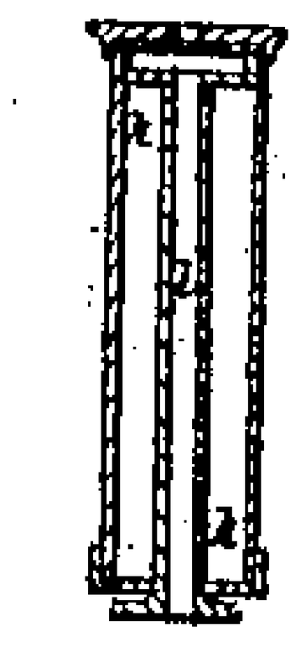


Fig: 7



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Inventor:
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UNITED STATES PATENT OFFICE.

HENRY MESSER, OF ROXBURY, ASSIGNOR TO HIMSELF AND CECILE G. DUNSCOMB, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN HOT-AIR ENGINES.

Specification forming part of Letters Patent No. **39,321**, dated July 21, 1863.

To all whom it may concern:

Be it known that I, HENRY MESSER, of Roxbury, in the county of Norfolk, in the State of Massachusetts, have invented certain new and useful Improvements in Hot-Air or Caloric Engines; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

This invention consists, first, in a peculiar arrangement and combination of parts by which the top or packed portion of the piston is kept cool by the constant presence of fresh compressed air, and by which the heat which tends to radiate from the top of the piston is utilized; and, second, in the provision herein shown and described, whereby the induction and eduction valves are easily placed in position and removed therefrom with their stems attached, and without the necessity of breaking the connection between the valves and their stems or rods.

In the drawings, Figure 1 is a side elevation of an engine embodying my invention. Fig. 2 is a plan of the same. Fig. 3 is a side view of the foundation and furnace containing portion with the valve-chest cover removed. Fig. 4 is a vertical center section. Fig. 5 is a vertical cross-section taken in the irregular line *a b*. Fig. 6 is a section of one of the supply-pump-pistons, and Fig. 7 is a section of one of the supply-pumps with the piston therein.

The hot-air cylinder is marked *c*, and extends downward into the chamber or reservoir *r*, which receives compressed air from the pumps *k*, in which reservoir it is heated by means of a furnace therein, and from which it passes into the chamber *d* above the induction-valve *d*, and thence, when valve *d* is lifted into the cylinder *c*, under the piston *f*, when valve *d* is closed and the eduction-valve *g* is opened, then the expanded air and volatile products of combustion pass from the cylinder through the passage *h*, past the valve *g*, and into the passage *i*, out of the exhaust-pipe *j*. The upper part of the cylinder *c* supports a bearing for a lever or working beam connected at one end by a link or connecting-rod with the crank and at the other with the piston *f*, also two double-acting force-pumps, K, the piston-rods *l* of which are hollow, and are fixed to the piston *f* so as to reciprocate with it. The piston *f* is hollow, and divided by the partition *m* into two compartments, the upper one, *p*, of which communicates with the hollow piston-rods *l* of the pumps, and with a pipe, *n*, which slides air-tight, or is packed in a siphon-formed pipe, *o*, which debouches into the reservoir *r*. The air is received into the pumps through either head, there being a valve on each, opening inward, which shuts to prevent egress of the air past the valves from which it is received.

The pistons of the air force-pumps are hollow, as well as are the piston-rods, and each piston is provided with two valves, which open inward to admit the air compressed on either side of the pump-pistons in the bodies of the pumps by the reciprocations of the pistons into the upper compartment, *p*, of the piston *f* through the hollow piston-rods *l*. The valve-chambers are connected with the outer part of the casing forming the reservoir *r* by tubes, one of which is marked *q*, and is shown in section in Fig. 5. These tubes prevent leakage of the hot expanded air from the reservoir *r* into the valve-chamber *i* and *e*, and enable the packings of the valve-rods *g'* and *d'* to be removed from that part of the valve-chamber which said rods pass through (which is directly subjected to the heat of the fire) to the exterior of the machine, which is comparatively cool, and where the packings can be easily got at to be kept in order. This, however, has before been accomplished by the use of small tubes, which but little exceeded the diameter of the valve-rods; and my improvement in this consists in making said tubes of such internal diameter as to equal or exceed the greatest diameter of the valves, thereby rendering it easy to remove the valves through the tubes when their caps at *s*, in which the packing-boxes are located, are removed. This renders it easy to keep the valves in good repair, which is a desideratum, inasmuch as the heat and grit from the fire rapidly deteriorates their faces and renders turning or grinding necessary. With the small tubes before in use it was necessary to couple the valves with their rods when the valves were put in their places, and the oxidation of the coupling-joint soon rendered it impossible to

disconnect the parts, so that when the valves required repairs the valves and their rods had to be broken apart, thus destroying or injuring one or the other, or both. The cost of this in time, material, and workmanship I save by making the described relation of size between the valves and the tubes *q*.

I do not show the means of working the valves, because they form no part of my invention, being such as are well known in other hot-air engines.

I propose to pack the main piston *f* with a cup-packing of leather at its upper edge, which, as it is not new, I do not show.

The construction of the force-pump piston is not novel, it having been shown by me in my patent No. 37,299; nor do I claim one or two stationary pumps located on and above the cylinder. I prefer to provide two force-pumps, one on either side of the cylinder *c*, because their pistons, being removed from the heat, can closely fill the pump-barrels and thus guide the piston *f* in its reciprocations.

The engine may be single, as shown in the drawings, or another may be coupled to a crank on the same shaft at about right angles with the one shown.

It will be seen that at each reciprocation of the piston *f* air is drawn into the pump-barrels, which air is at the next reciprocation discharged through the pipes *l* into the space *p* in *f*, and from thence through *n* and *o* into *r*. Thus the temperature of the upper part of *f* is kept cool enough to prevent the destruction of the packing of *f* by heat, *p* being constantly supplied with cool compressed air, which is renewed and changed at each reciprocation or half-stroke of the engine.

I do not claim as my invention a hot-air-cylinder piston which has a distinct chamber at or near its top, as this may be found in my Patent No. 37,299; nor do I claim a chamber in a hot-air-cylinder piston into which air is forced so as to escape through apertures in said piston all around it at or near its packing directly into the cylinder itself, for such an arrangement may be found in a United States patent designed to cool the frictional surface of the cylinder, and to prevent by a "counter current" the current of incoming air into the main cylinder from carrying with it ashes and grit from the fire between the piston-packing and the cylinder; but in this patent last referred to it will be seen that only a small portion of the air which is compressed by the action of the engine is passed into and through the piston of the main cylinder, and that what does thus enter and pass passes into the cylinder and not into the hot-air reservoir; whereas in my invention all of the air compressed by the pumps enters into and passes through this upper chamber of the piston, and is discharged from thence into the hot-air reservoir.

I claim—

1. The combination of a pump or pumps with a chamber in the piston of a hot-air engine, and with an outlet-pipe from said chamber directly into the hot-air reservoir, when so arranged as to pass all of the compressed cool air into and through said chamber, for the specified purpose.

2. Constructing the pipes which connect the valve-chambers with the exterior of the engine, and which incase the valve-stems and prevent leakage into the valve-chambers, of a diameter equal to or in excess of that of the valves, for the specified purpose.

Executed this 19th day of January, 1863.

HENRY MESSER.

In presence of—
J. B. CROSBY,
F. D. STEDMAN.