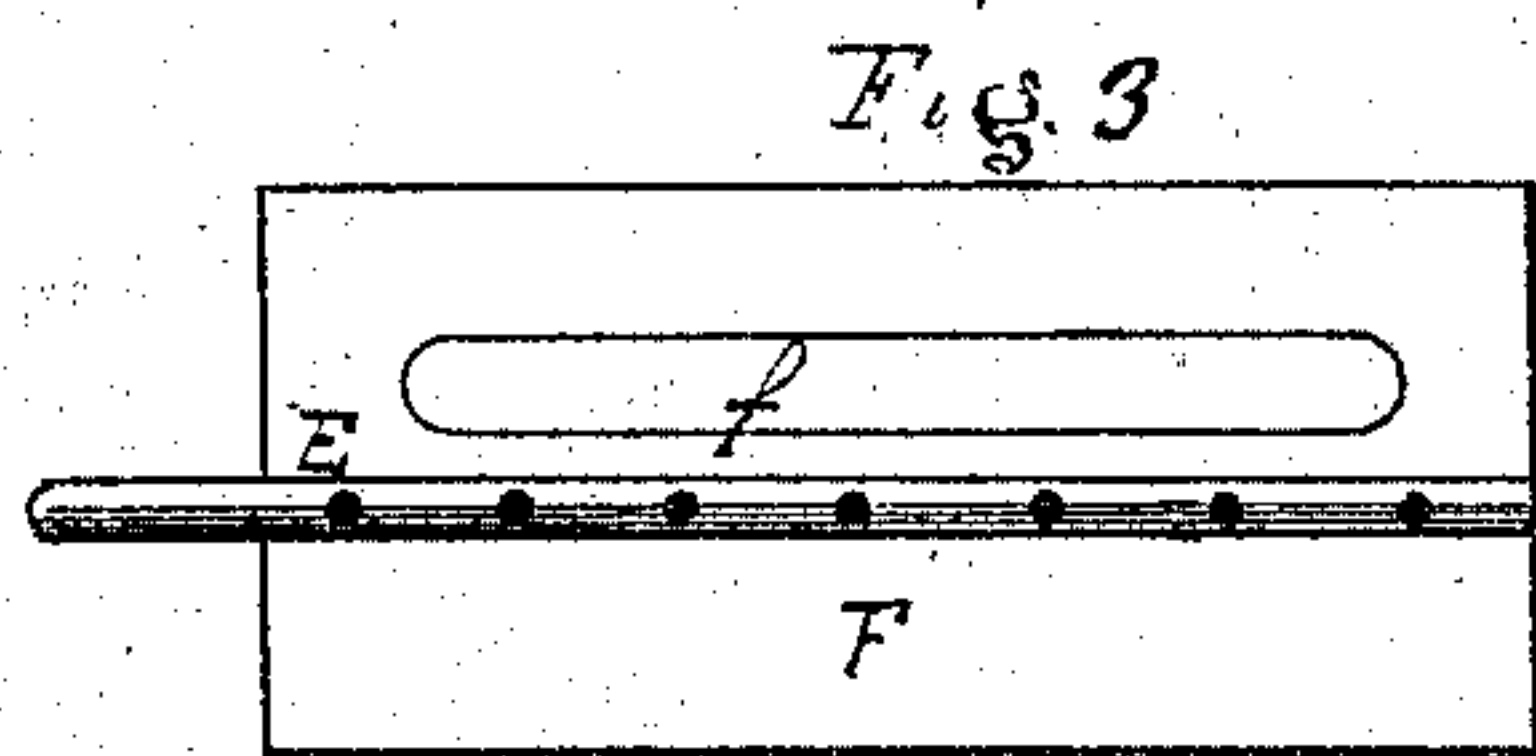
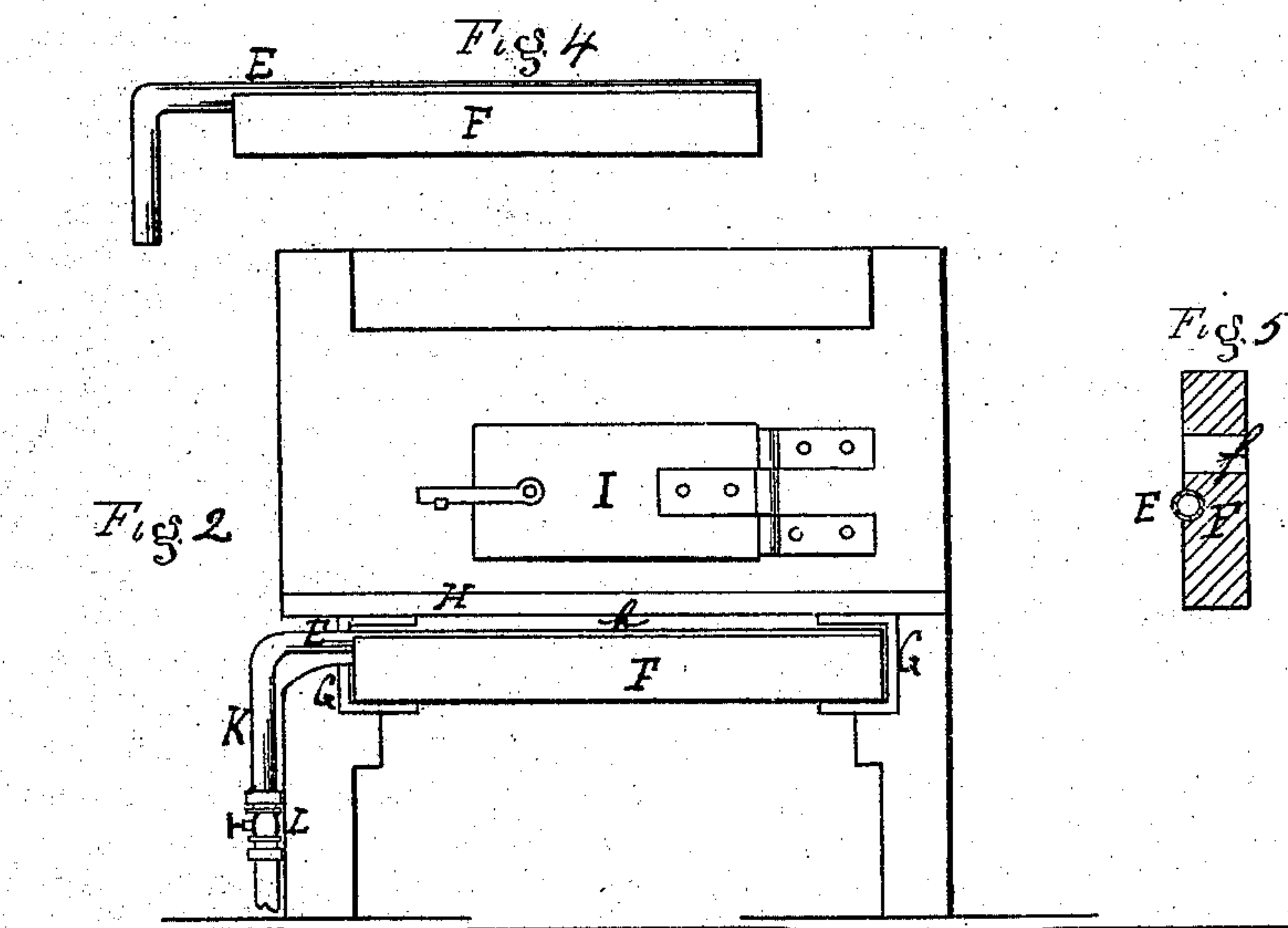
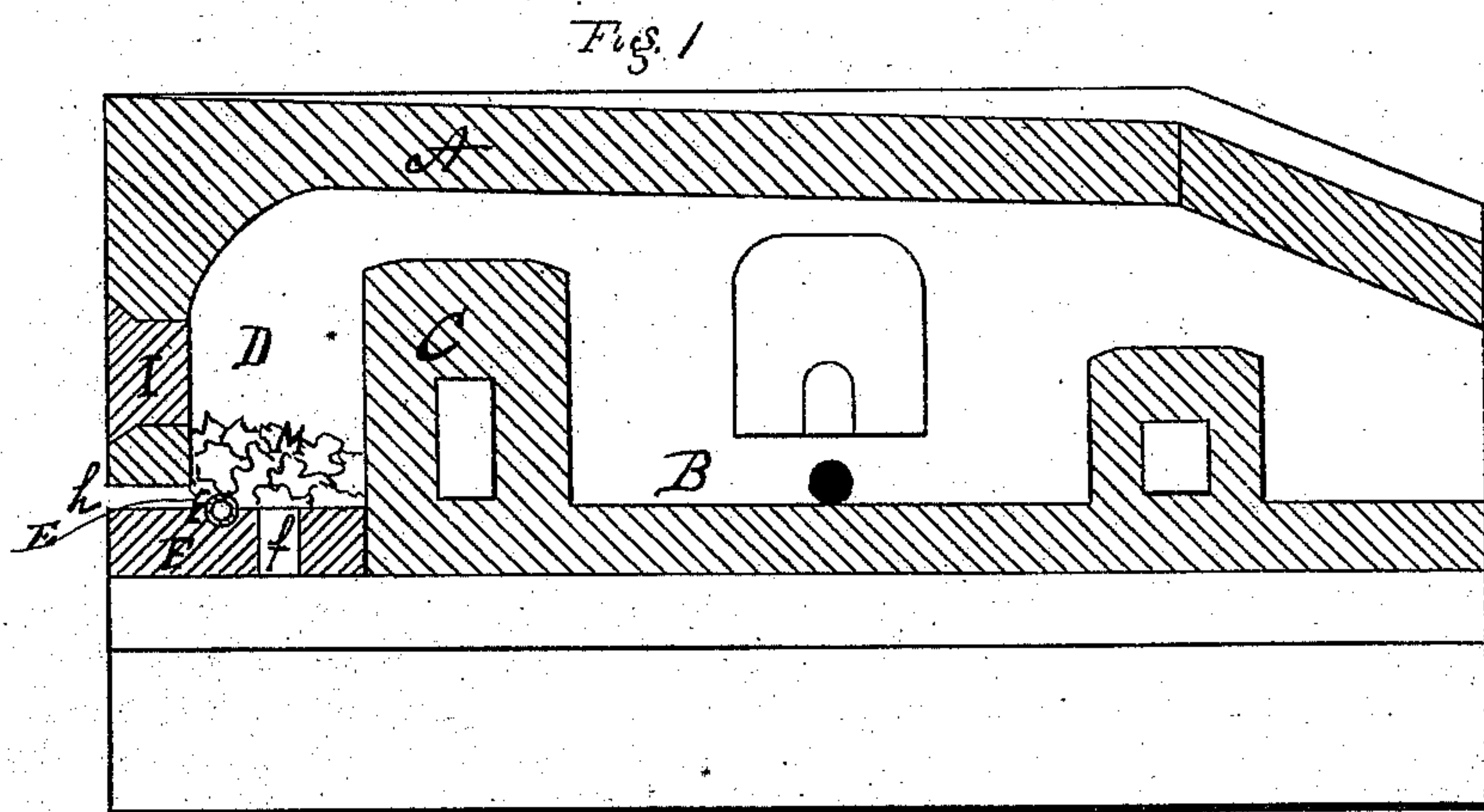


R. B. & H. R. GOUGH.
Metallurgic Gas-Furnaces.

No. 156,564.

Patented Nov. 3, 1874.



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UNITED STATES PATENT OFFICE.

RICHARD B. GOUGH, OF LEECHBURG, AND HENRY R. GOUGH, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN METALLURGIC GAS-FURNACES.

Specification forming part of Letters Patent No. 156,564, dated November 3, 1874; application filed August 4, 1874.

To all whom it may concern :

Be it known that we, RICHARD B. GOUGH, of Leechburg, Armstrong county; and HENRY R. GOUGH, of Pittsburg, in the county of Allegheny, and State of Pennsylvania, have invented a new and useful Improvement in Furnaces for Metallurgic Purposes; and we do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing forming part of this specification, in which—

Figure 1 is a longitudinal vertical section of our improved gas-furnace. Fig. 2 is an end view of the same. Figs. 3, 4, and 5 are detached views of the fire-plate and gas-distributing pipe.

Our invention relates to a method and apparatus for using either coal, petroleum, or natural gas in heating reverberatory and other furnaces; and it consists, first, in combining with the fire-chamber of reverberatory or similar furnaces a removable slotted fire-plate having a perforated gas-distributing pipe, the fire-plate and its distributing-pipe being capable of introduction through a slot in the end or side of the fire-chamber; and, secondly, in furnaces having perforated gas-distributing pipes resting on fire-bars or a slotted fire-plate, slotting the end wall of the furnace, so as to permit a free flow of air and admit of the introduction and withdrawal of the fire-plate.

Heretofore, in supplying gaseous fuel or burning gases in reverberatory or similar furnaces, several methods have been adopted, namely: one in which the gas is given off from a coking-chamber situated in the same plane as the hearth, and passed thence through a bed of live coal being burned in the furnace; but in said construction the impurities of the coal and gas are liable to be mingled with the flame passing over the bridge-wall; secondly, by means of gas distributed, by means of pipes, over the surface of the burning coal on the fire-chamber; and, thirdly, by means of injectors, by which petroleum gases and oils, together with steam and air, forming a mixed gas, have been burned within the fire-chamber. In the latter two methods much difficulty has arisen on account of the limited supply of oxygen and

the liability of much of the gas passing over the hearth unconsumed.

The object of our invention is to provide a movable fire-plate and distributing-pipe for the introduction of gas beneath the coke in the fire-chamber, to provide for free admission of air in such a manner as to protect the fire-plate and promote combustion, and to fulfill such other indications as are necessary in the economical use of petroleum, coal, or natural gas. (By natural gas we mean the gas obtained from wells, such wells being of frequent occurrence in the oil regions and similar localities.)

We will now proceed to describe the devices devised by us and their method of operation.

In the drawings referred to, A represents the wall of the furnace, B the hearth, and C the bridge-wall, all of which are of the usual construction; D, the fire-chamber, which we construct as follows: In adapting the reverberatory furnace of the ordinary construction the size of the fire-chamber, which is usually three feet six inches square, need not be altered; but where the fire-chamber is constructed with express reference to the use of my devices the length of the fire-chamber may be reduced to one foot. The width may be the same as usual. E represents a pipe or pipes of suitable diameter, perforated upon the upper surface by a number of holes for the exit of gas, said pipe preferably being cast or fitted into or secured upon the top of a fire-plate, F, of cast-iron or of other suitable material. F represents the fire-plate to which the pipe or pipes E is or are attached. The fire-plate is provided with a slot, f, for the admission of air, and rests in the channel-plate G, secured in the side walls of the furnace. H represents the bearing-bar, built into the side walls of the furnace, and supporting the brick-work at the firing end of the furnace. It rests upon the upper portion of the channel-plate G, so as to form an air-passage, h, along the end of the furnace, between the bearing-plate H and the fire-plate F. By this means the gas pipe or pipes E are protected by having air-passages to either side, so as not to be affected by the intense heat of the furnace. F represents channel-plates built into the side walls of the furnace, and are intended

to support the fire-plate F and to allow of its withdrawal and insertion. I is the firing-door on the end of the furnace, directly over the bearing-plate and the channel-plates G, through which the coke may be introduced into the fire-chamber, and which may be used to dress and keep the fire in order. K is a pipe leading from the gas-reservoir to the gas-supply pipe or pipes E, said pipe being provided at some point along its length with a check-valve, L, to regulate the amount of gas passing to the furnace. M is a body of coke or other suitable material placed upon the fire-plate F, through and by which the gas is broken up and distributed, and which prevents the escape of any unconsumed gas into the fire-chamber, and increases the burning-surface and purifies the gas.

In adapting furnaces of the ordinary construction, the fire-plate F may be dispensed with, the perforated pipe being laid directly upon the bars; but in such furnaces the slot or opening *h* must be formed in the end of the furnace, to allow of the free draft of air around and over the perforated gas-supply pipe E.

The operation of our devices is as follows: Through the firing-door I the requisite quantity of coke or similar material is placed upon the firing-plate over the gas-supply pipe, forming a reticulated bed, through which the gas, which has been permitted to enter by a proper adjustment of the valve L, is broken up and distributed, the gas being ignited upon the surface of the coke, the coke in turn becoming ignited by the flame of gas which issues from the pipe or pipes E; or, if a non-combustible material has been used, it becomes hot, and, soon acquiring a red heat, in turn imparts to the inflowing gas the requisite heat to prepare it for thorough combustion. The gas, in its passage through the coke or superimposed mass, being purified and distributed, will burn evenly, with an intense flame, upon the surface of the bed, so that no unconsumed gases pass over the fire-bridge, sufficient air being supplied by means of the slots or openings *f* and *h*, said

air in its passage tending to keep the gas-supply pipe at a low temperature. By these devices either coal, petroleum, or natural gases are readily burned without loss or waste, and all the indications for perfect combustion—namely, an equal supply and distribution of the gas, a thorough heating of the same, and a full supply of air—are obtained.

The advantages of this method are economy in coal and economy in the cost of manufacture of iron, and also better quality of iron; purity of the flame, which is free from sulphurous or other deleterious admixtures. A greater heat is obtained in less time, and the furnace may be raised to and kept at a working heat more readily than by any other method generally employed. Economy in cost of building and in the area of ground occupied by the furnace, which is also an important point, is secured. The fix employed for lining the furnace has been found to last longer than one subjected to the flame of coal fires or the fires generally employed.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In combination with the fire-chamber of a reverberatory or similar furnace, the removable slotted fire-plate F, having the gas-distributing pipe E, substantially as and for the purpose specified.

2. The slotted fire-plate F, provided with the gas-distributing pipe E, in combination with the fire-chamber of a reverberatory furnace, said fire-chamber being provided with a slot for the admission of air on, or about on, a line with the upper surface of the fire-plate.

In testimony whereof we, the said RICHARD B. GOUGH and HENRY R. GOUGH, have hereunto set our hands.

RICHARD B. GOUGH.
HENRY R. GOUGH.

Witnesses:

W. N. PAXTON,
F. W. RITTER, Jr.