(No Model.) 3 Sheets—Sheet 1.

J. J. & T. F. MELDRUM.

FURNACE.

No. 447,891. Patented Mar. 10, 1891.

FIG. 2.

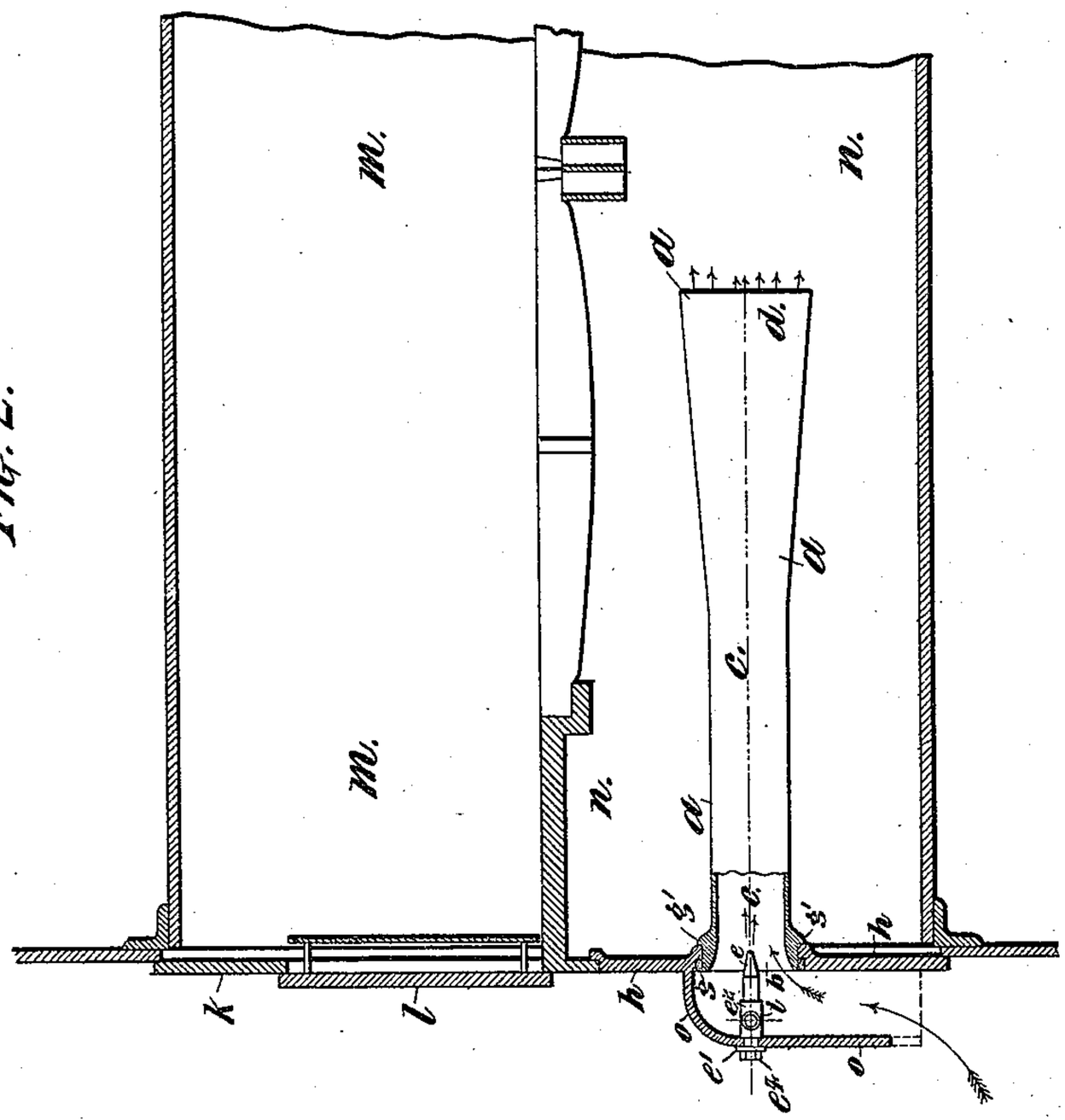

FIG. 1.

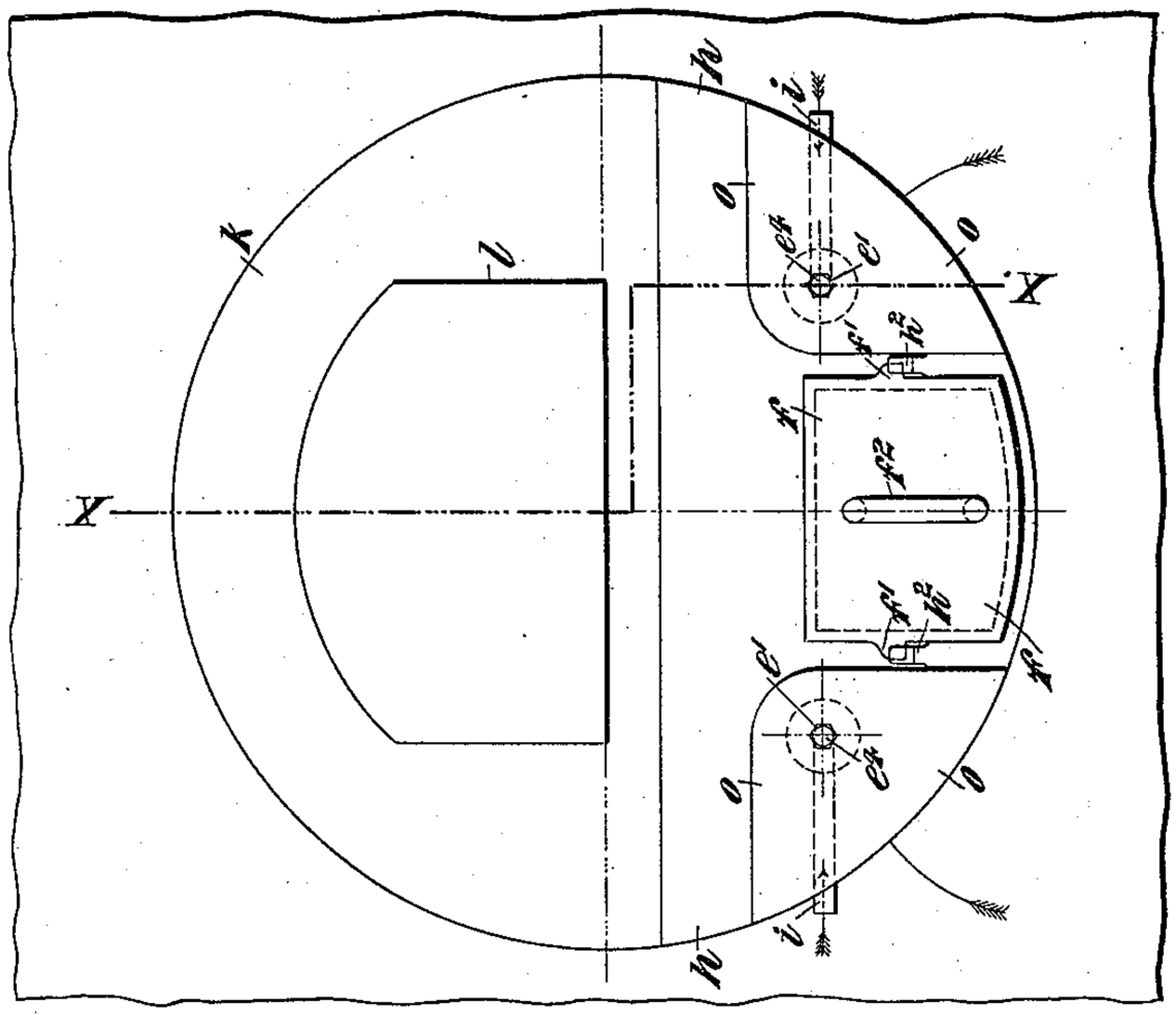

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FIG. 2A

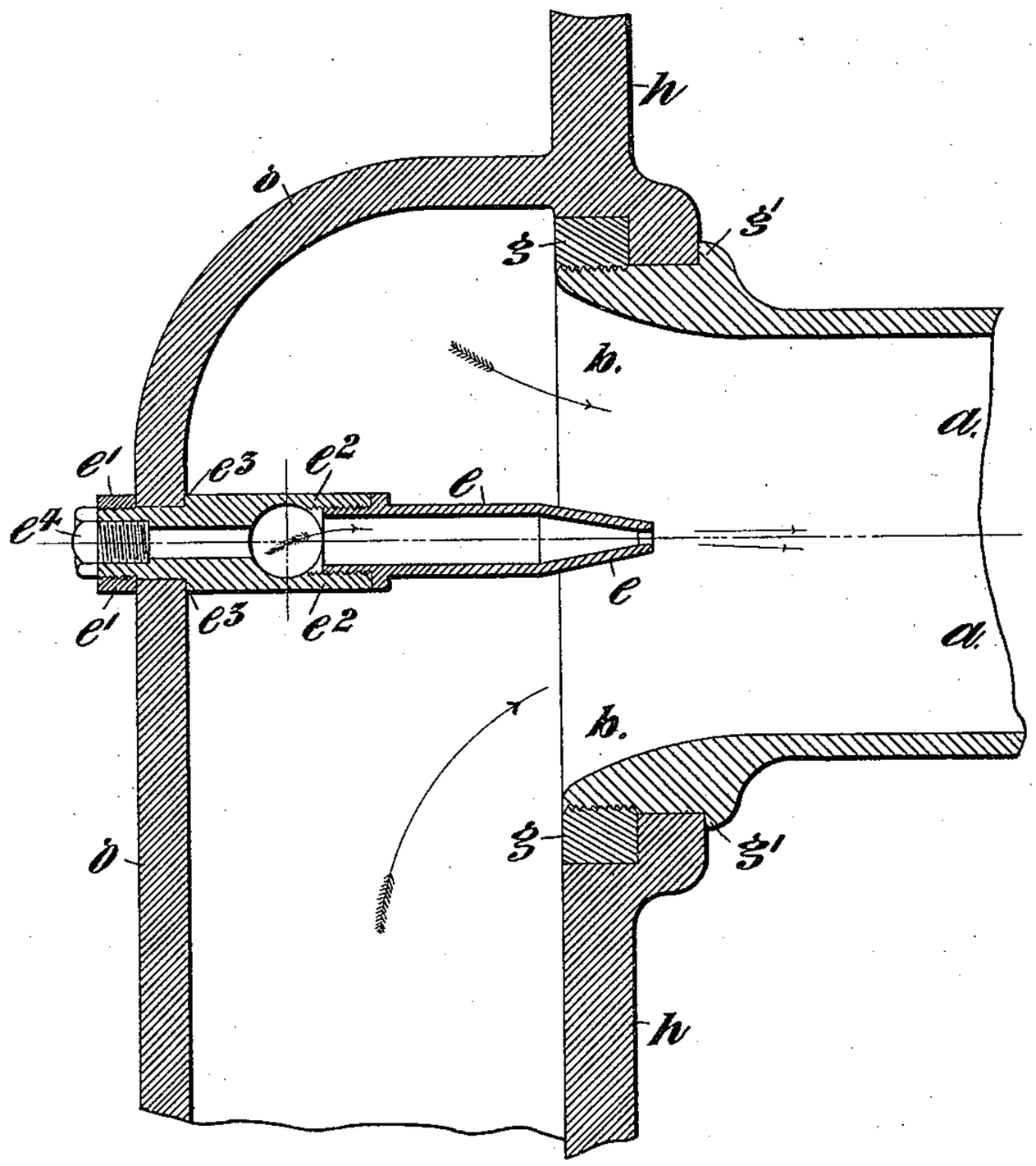

FIG. 4.

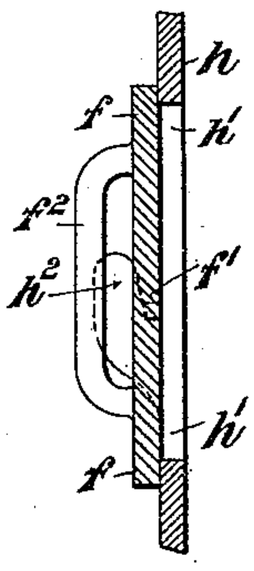

FIG. 3.

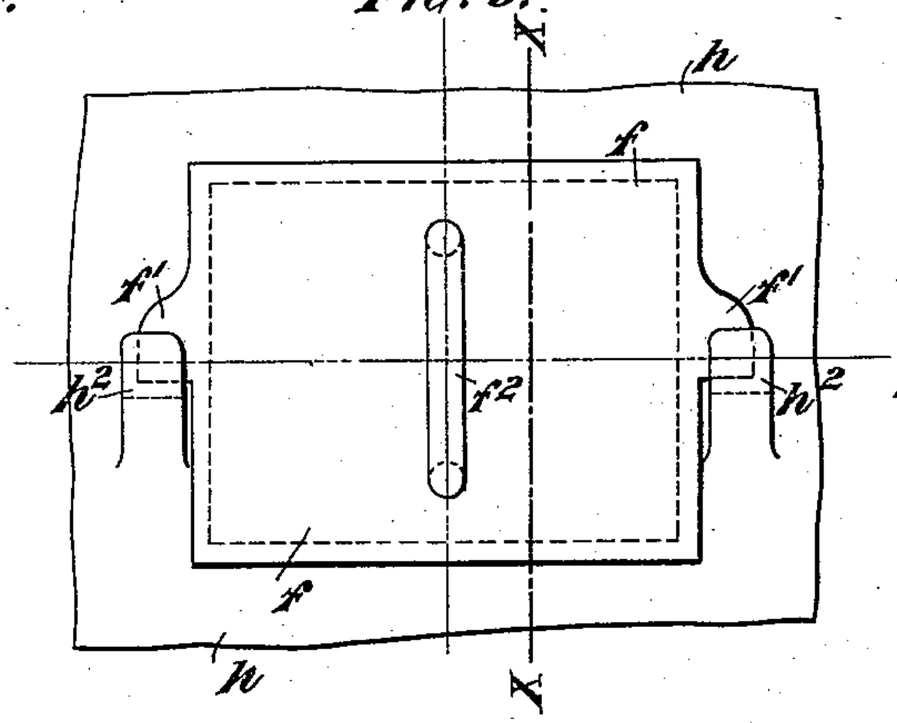

FIG. 5.

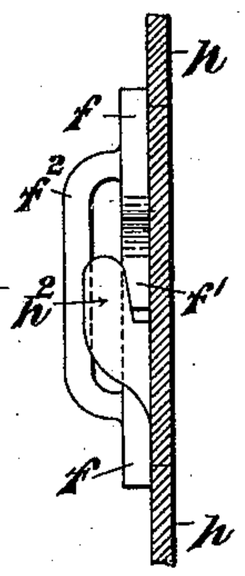

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FIG. 6.

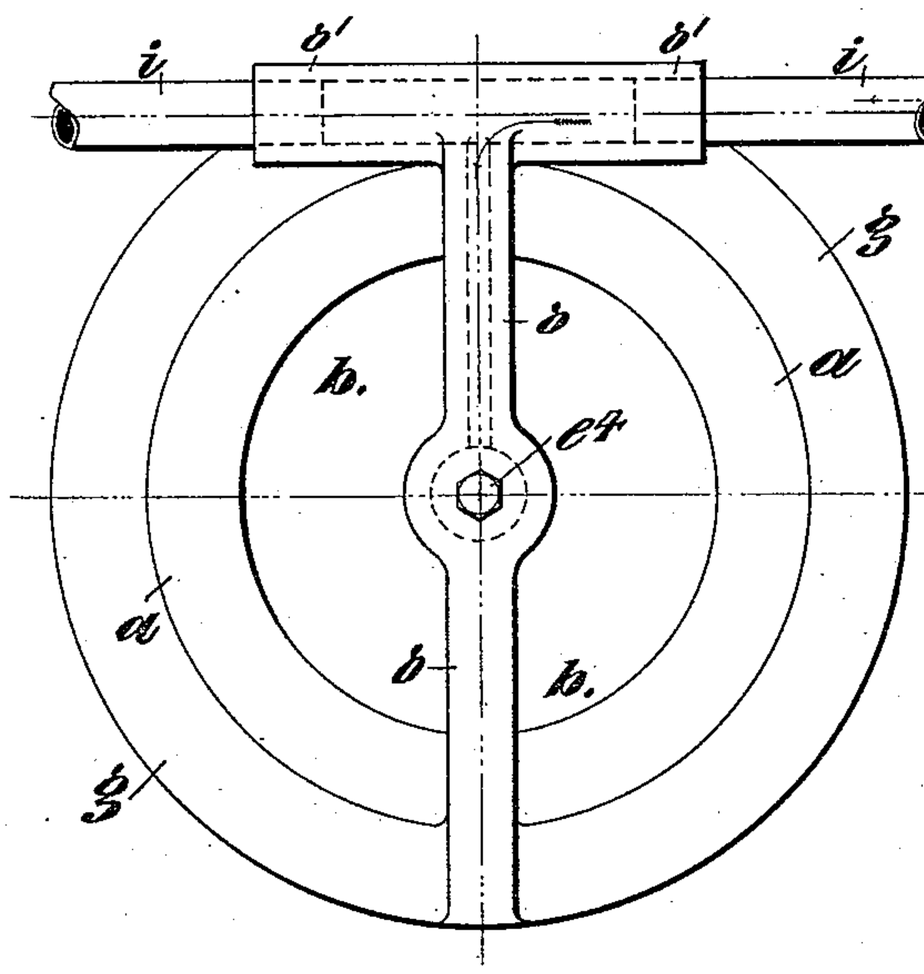


FIG. 7.

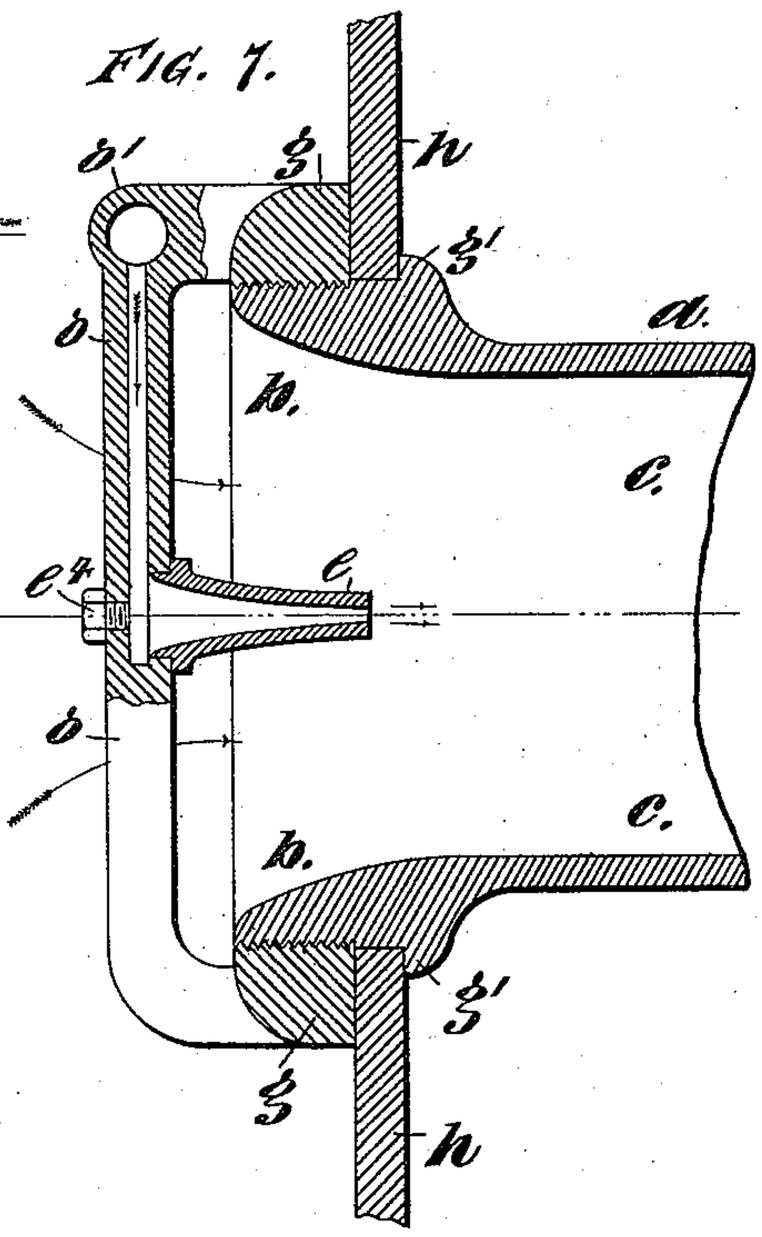


FIG. 9.

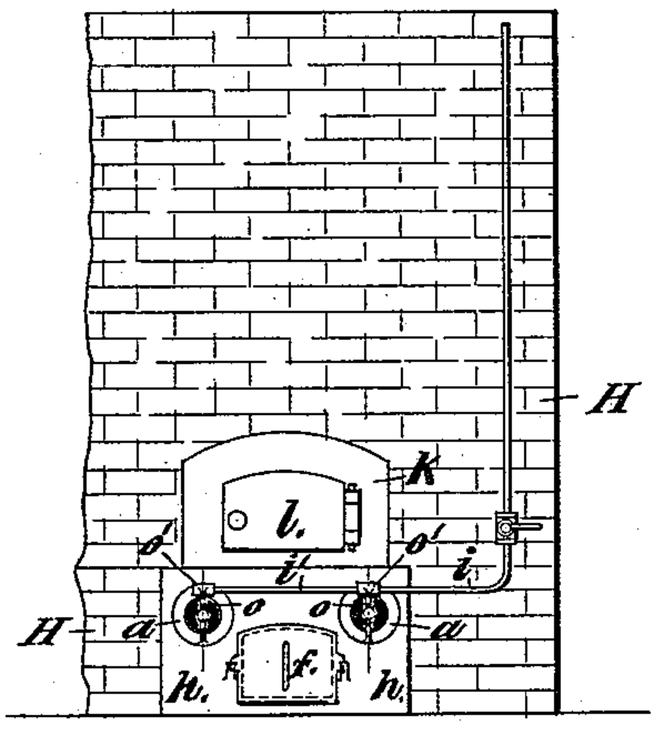
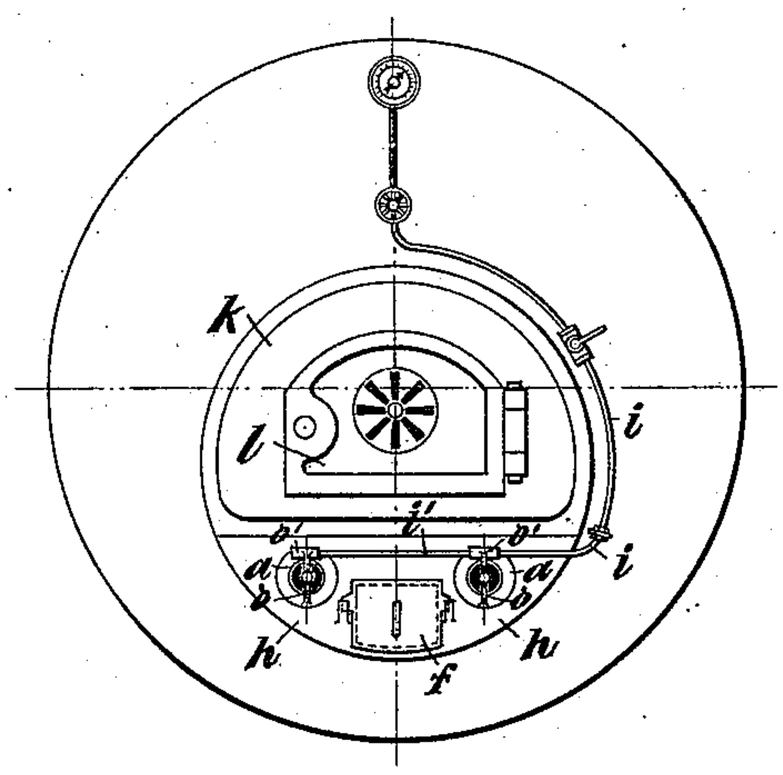


FIG. 8.



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UNITED STATES PATENT OFFICE.

JAMES JONES MELDRUM AND THOMAS FREDERICK MELDRUM, OF MANCHESTER, ENGLAND.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 447,891, dated March 10, 1891.

Application filed November 12, 1890. Serial No. 371,199. (No model.)

To all whom it may concern:

Be it known that we, JAMES JONES MELDRUM and THOMAS FREDERICK MELDRUM, both subjects of the Queen of Great Britain and Ireland, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Furnaces; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference to the combustion of fuel, such as coal, but more especially small and poor fuels, such as coke-dust, breeze, coal-dust, ash-pit refuse, and the like, and has for one of its objects to utilize the fuel to the best advantage and to effect complete combustion of it.

The invention is applicable to the furnaces of steam-generators generally, heating, puddling, chemical, and other like or analogous furnaces.

According to this invention the air used to support combustion of the fuel is introduced below the grate-bars of a furnace by steam-jet blowers. The blowers consist of a steam-nozzle, mixing-tube, coned inlet and diverging outlet tube, the body of the blowers being substantially wholly within the ash-pit or shell or case of the furnace.

In the drawings which serve to illustrate this invention, we show examples of furnaces provided with improvements according thereto and details of the parts employed.

In the drawings, Figure 1 shows a front elevation of a steam-generator furnace provided with improvements according to our invention. Fig. 2 is a sectional elevation thereof, taken at the line X X, Fig. 1; and Fig. 2^{A} is a detail showing the steam-nozzle. Fig. 3 is a front view of the ash-pit door. Fig. 4 is a sectional side elevation of same at the line X X, Fig. 3; and Fig. 5 is an elevation taken through the plate in connection with which the door is fitted, showing the door in outside side elevation. Fig. 6 is a front elevation, and Fig. 7 a longitudinal elevation in section, of the steam-jet blower, wherein the steam is conducted to the nozzle through a hollow bridge-bar. Fig. 8 is a front elevation of a Cornish boiler provided with two blowers of the type set forth with reference to Figs. 6 and 7; and Fig. 9 shows in front elevation a brick furnace provided with blowers of the type set forth with reference to Figs. 6 and 7.

In the various views the same letters and figures of reference are used to denote the same or equivalent parts wherever they occur.

With reference, generally, to the drawings, *a* designates the blower, which consists of a coned or rounded inlet *b*, combining cylinder or mixing tube *c*, diverging outlet *d*, and steam-nozzle *e*.

f is the door used to close the aperture by which access is had to the ash-pit of the furnace below the bars.

h is the plate, to which the door *f* is fitted and by which it is supported, and to which, also, the blowers *a* in Figs. 1, 2, 6, and 7 are fitted.

i is the steam-pipe, by which steam is conveyed to the blowers.

k is the furnace front plate.

l is the furnace-door.

m is the furnace, and *n* is the ash-pit.

Referring now more particularly to Figs. 1, 2, and 2^{A}, over and across the inlet *b* of the blowers *a* plates *o* are provided, to which the steam-nozzle *e* is secured. These plates in this example are formed on the ash-pit plate *h*, and are open at the lower part and at the outside, the upper and inner sides being closed, as shown. Through this open part of the plates the air, which is caused to flow into the blowers, enters. The end served by these plates is that they prevent all coal, ashes, cinders, dust, &c., which may fall from that being passed into or out of the furnace or ash-pit from entering the blowers, and thereby rendering their operation free from possible hinderances or impediments, which might follow or result if such matters should enter them. The inlet end of the blower *a* in Fig. 2 passes through the ash-pit plate *h* and is fixed to it by a ring-nut *g*, which screws onto said end, and a flange *g'*, provided on the blower, and which bears upon the inner side of the plate *h*. By turning and screwing up the blower-bodies into the nut *g*, it will be seen, they will be drawn up

rigidly to the plate *h* and firmly held in the horizontal position, as shown. The blowers lie practically wholly within the ash-pit *n*. The nozzle *e* in this case, as stated, is fixed to the bridge plate or bar *o* and is fastened thereto by a nut *e'*, which screws onto the shank e^2, into which the nozzle *e* screws, and which shank passes through the metal of the plate and is provided in the inner side of the plate by a shoulder e^3.

The shank e^2 constitutes a steam chest or chamber, into which the steam-pipe *i* is screwed and through which the steam enters the bore of the nozzle *e*. The bore of the nozzle is carried through the shank e^2, and at this the shank end is provided with a removable screwed plug e^4. This construction provides a means by which the nozzle may be cleaned, it being merely necessary to remove the plug e^4 and pass a suitable bar or rod or other cleaning device through it, when all obstructions can be at once removed.

The ash-pit door *f* (by which the aperture *h'* for gaining access to the ash-pit for withdrawing ashes from below the grate or other purpose, and which under ordinary working conditions is closed) is provided with a wing or lug *f'* on each side, the front surface of which lugs are planes inclined downward and backward, forming wedges which fit into corresponding recesses formed between the plate *h* and projecting catches h^2 provided thereon. (See Figs. 3, 4, and 5.) The door is adapted to be taken off and put on by the handle f^2. It will be plain that when the door is put on—that is, its lugs *f'* slipped into the recesses formed between the plate *h* and the catches h^2—the action which takes place, due to the wedge shape of said lugs and recesses, is that the door by its own weight automatically brings itself to a seat with the edge of the metal surrounding the aperture *h'* at all points and makes the required joint therewith. This construction of door is provided on all the examples of steam-generators having our improvements and shown in the drawings.

In the blower shown in Figs. 6 and 7 of the drawings the nozzle *e* is secured to a hollow bridge *o*, fixed across the inlet *b*, and the steam is conducted to the nozzle from the steam-pipe *i* by way of this bridge, the steam-pipe being connected to a hollow neck *o'*, connected with the bridge *o* and running at right angles thereto. Steam is led to one blower by the pipe *i*, while the steam to the other blower is supplied from the former blower by a pipe *i'*, (see Figs. 8 and 9,) connecting the said necks *o'* of the two instruments together. Of course in cases where one blower only is required one side of the neck *o'* can be dispensed with, and the passage in the neck and bridge is in the form of a simple elbow instead of a T-shaped one, or the steam may be led direct into the hollow bridge *o*. In this arrangement the bridge *o* and neck *o'* are fixed on or form part of the ring or nut *g*, which screws on the neck of the blower *a* and by which the blower is fixed to and held by the plate *h* in the manner of the ring-nut *g* specified with reference to Figs. 1 and 2; also, in this case a screwed plug e^4 is provided in the bridge *o* over the bore of the nozzle *e* for the purpose, mainly, of enabling the nozzle to be cleaned when required. When a blower of this type is not secured by the head to a plate, as in the above case, the hollow cross-bar *o* may still be fitted to the blower by a ring-nut such as *g*, or it may be connected in other suitable ways.

It will be seen upon reference to Figs. 1 and 2 that the ash-pit is wholly closed by the plate *h*, with its door *f*, and that the blowers are set in this plate one on each side of the door, the steam being led to the blowers by the pipe *i*. In Fig. 8 the steam is led to one blower by the pipe *i*, and from this it is carried to the other through the hollow neck *o'* of the first and the pipe *i'*, which couples the two blowers together.

The arrangement shown in Fig. 9 consists of the application of the parts herein described to a brick-work furnace. In this case the plate *h* is set in the front brick-work wall H in any suitable way, the door *f* being fitted to the plate in the manner above described, the blowers *a* passing through and being fixed to such plate. The blowers would in this case also be disposed under the grate-bars of the furnace in the same manner as set forth with reference to the above figures.

What we claim in respect to the herein-described invention is—

1. In a furnace to which air is adapted to be supplied to the ash-pit thereof under pressure, the combination, with the ash-pit, of a plate *h*, inclosing such ash-pit, a steam-jet blower or blowers *a*, consisting of a tapered inlet *b*, mixing-tube *c*, and diverging outlet *d*, and disposed substantially wholly within the ash-pit under the fire-bearers and in the horizontal plane, a plate or bar *o* across said blower-inlet, and a steam-supply nozzle *e*, supported by said plate or bar *o*, substantially as described.

2. In a furnace to which air is adapted to be supplied to the ash-pit thereof under pressure, the combination, with the ash-pit, of the plate *h*, by which said ash-pit is closed, a steam-jet blower or blowers *a*, consisting of a coned inlet, steam-jet nozzle, mixing-tube, and diverging outlet, as described, and disposed substantially wholly under the fire-bearers and within the ash-pit and in the horizontal plane, and a door *f* in said plate *h*, adapted to make an air-tight joint therewith, said plate and door at the sides thereof being provided with wedge devices adapted to cause said door to be drawn up to the plate and make said air-tight joint by its own weight, substantially as described.

3. In a furnace to which air is supplied to the ash-pit thereof by a steam-jet blower or blowers, the combination of front plate *h*, by

which said ash-pit is closed, a steam-jet blower *a*, consisting of a coned inlet *b*, steam-nozzle *e*, mixing-tube *c*, and diverging outlet *d*, a bridge plate or bar *o*, disposed across said inlet *b* and supporting said nozzle and through which steam is adapted to be conveyed to said nozzle, and a steam-supply pipe *i*, substantially as described.

4. In a furnace to which air is supplied to the ash-pit thereof by a steam-jet blower or blowers, the combination of front plate *h*, by which said ash-pit is closed, a steam-jet blower *a*, consisting of a coned inlet *b*, steam-nozzle *e*, mixing-tube *c*, and diverging outlet *d*, and connected to said plate at and by the outer end of said coned inlet by a screwed ring-nut *g*, a bridge plate or bar *o*, disposed across said inlet *b* and supporting said nozzle *e*, and a steam-supply pipe *i*, substantially as described.

5. In a furnace to which air is supplied to the ash-pit thereof by a steam-jet blower or blowers, the combination of front plate *h*, by which said ash-pit is closed, a steam-jet blower *a*, consisting of a coned inlet *b*, steam-nozzle *e*, mixing-tube *c*, and diverging outlet *d*, a bridge plate or bar *o*, disposed across said inlet *b* and supporting said nozzle *e* and through which steam is adapted to be conveyed to said nozzle, a plug e^4, by which access to the inside of the nozzle is had for inspection and cleaning purposes, and a steam-supply pipe *i*, substantially as described.

6. In a furnace to which air is supplied to the ash-pit thereof by a steam-jet blower or blowers, the combination of front plate *h*, by which said ash-pit is closed, a steam-jet blower *a*, consisting of a coned inlet *b*, steam-nozzle *e*, mixing-tube *c*, and diverging outlet *d*, and disposed horizontally and substantially wholly within said ash-pit under the fire-bearers and suitably fastened to said front plate *h*, and a plate *o*, disposed over the inlet *b* of the blower and adapted to serve as a dust or dirt guard thereto, substantially as and for the purposes described.

In testimony whereof we hereunto affix our signatures in presence of two witnesses.

JAMES JONES MELDRUM.
THOMAS FREDERICK MELDRUM.

Witnesses:
GEO. W. BOLTON,
THOS. COOPER,
Both of 25 *Cathedral Yard, Manchester.*