No. 676,072. Patented June 11, 1901.

J. J., T. F. & J. W. MELDRUM & F. CLAYTON.

MECHANICAL STOKER AND FURNACE.

(No Model.) (Application filed Aug. 22, 1899.) 4 Sheets—Sheet 1.

Fig. 1

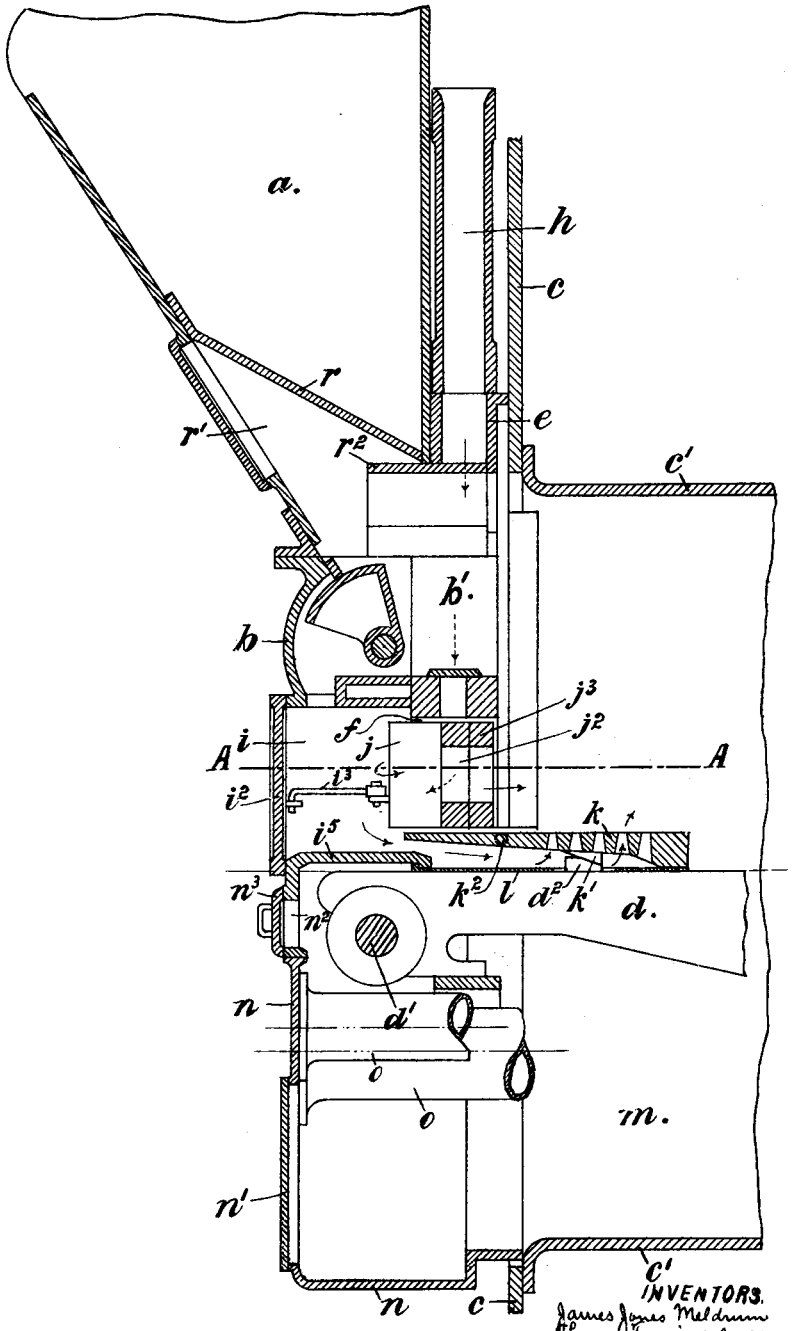

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Fig. 2.

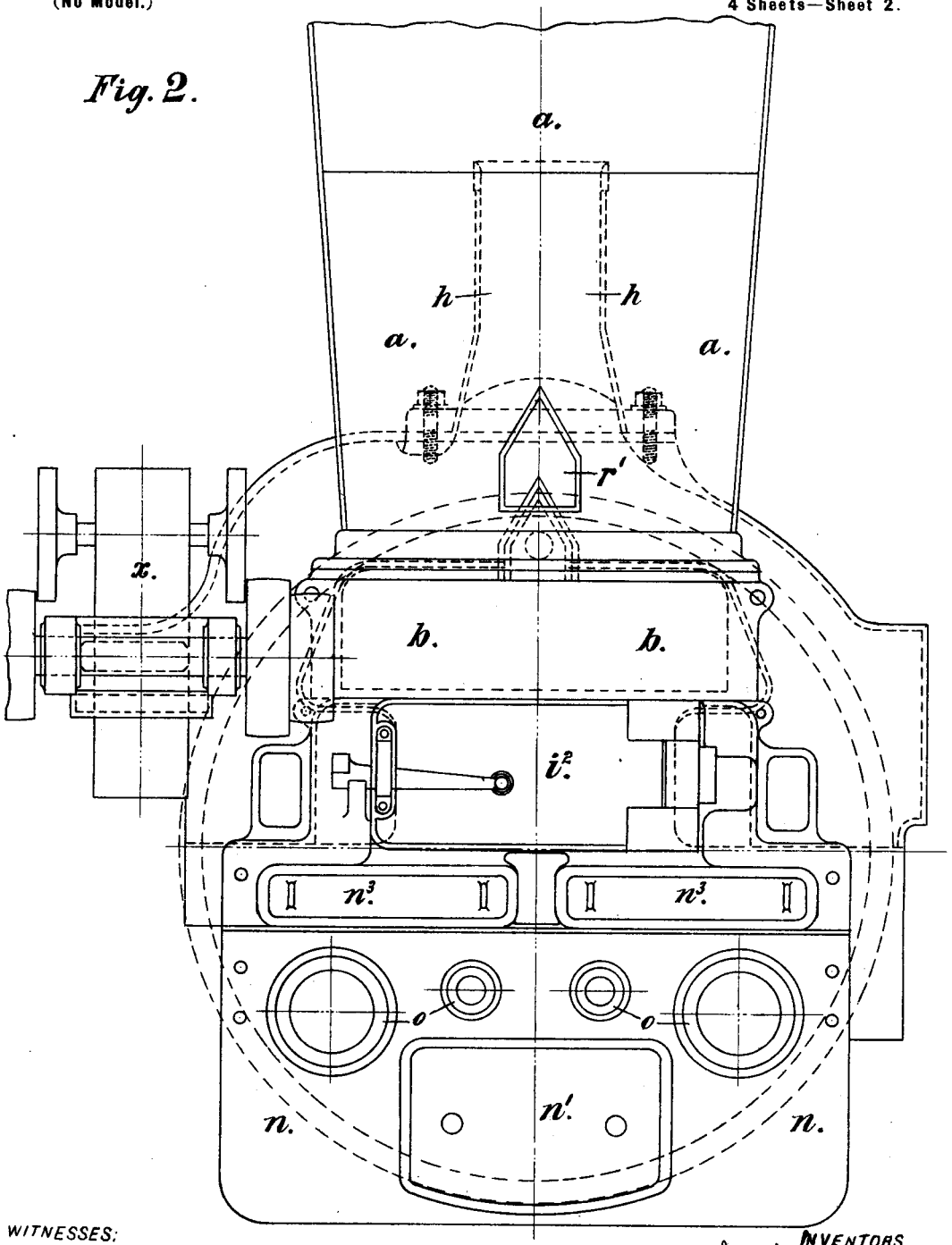

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Fig. 3.

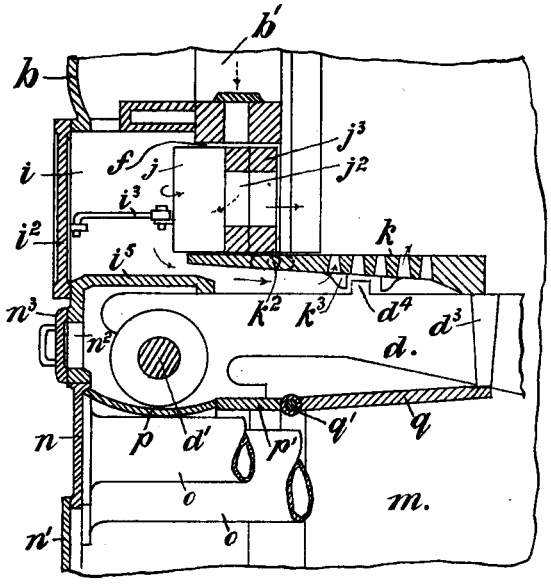

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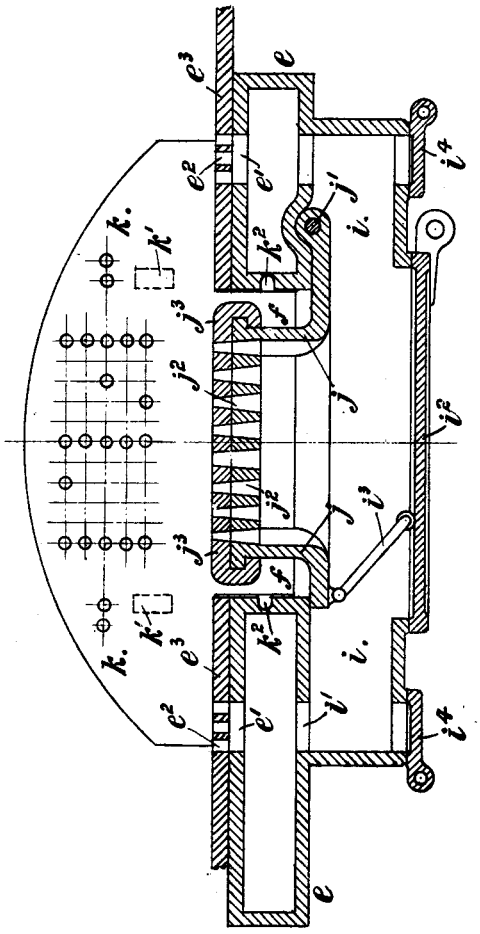
Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES JONES MELDRUM, THOMAS FREDK. MELDRUM, JOHN WESLEY MELDRUM, AND FRED CLAYTON, OF MANCHESTER, ENGLAND.

MECHANICAL STOKER AND FURNACE.

SPECIFICATION forming part of Letters Patent No. 676,072, dated June 11, 1901.

Application filed August 22, 1899. Serial No. 728,054. (No model.)

To all whom it may concern:

Be it known that we, JAMES JONES MELDRUM, THOMAS FREDERICK MELDRUM, JOHN WESLEY MELDRUM, and FRED CLAYTON, subjects of the Queen of England, and residents of Manchester, England, have invented certain new and useful Improvements Connected with Mechanical Stokers and Furnaces, of which the following is a specification.

This invention has reference mainly to mechanical stokers.

The type of such apparatus to which the invention mainly relates is that in which the fuel is piled up and coked at the front portion when it is first introduced; but it has also reference to furnaces, whether fired mechanically or by hand, in which the air supplied to the furnace for combustion of the fuel is artificially supplied—that is, where the draft is forced.

According to this invention in stokers of the coking type, in which the fuel is first fed and piled up near the point of introduction and coked in this position in the well-known way, air is supplied to this, the piled up part being coked, at regulated quantities and pressure and that supplied to the ash-pit and through the bars for the direct combustion of the fuel so coked is separated from the former supply, whereby the rates of carbonizing the portion at the front of the furnace and the direct combustion of the coked fuel on the grate proper can be regulated and specifically effected and also the rate of combustion of fuel on the whole of a grate of given area can be effectually increased beyond that hitherto possible and regulated to any rate desired within the extreme limits. According to one—viz., the preferred method—air under a pressure exceeding that employed in the ash-pit for burning fuel on the grate proper is artificially supplied to and passed through the piled-up fuel in front being coked. In some cases the air supplied to and existing in the ash-pit is at a pressure exceeding that of the atmosphere, and in such cases the air supplied in the front of the furnaces and passed through the pile of fuel being coked will be artificially supplied and at a pressure exceeding that supplied to the ash-pit.

Further parts of this invention will be set forth with the aid of the accompanying drawings, in which also the method above specified is illustrated.

In the drawings, Figure 1 is a sectional elevation, and Fig. 2 is a front elevation. Fig. 3 is a sectional elevation showing a modified construction of parts for carrying out the improvements referred to in connection with Fig. 1. Fig. 4 is a plan in section taken at A A, Fig. 1.

Referring in the first instance to Figs. 1 and 2, these drawings show a mechanical coking-stoker in which the air supplied to the part of the fuel being coked and that supplied through the bars for direct combustion of the coke so made at the back of the grate are separately supplied, and this supply is effected by steam-jet air-blowers.

In the drawings, a represents the fuel-hopper, and b is a vibrating feeding-plunger for supplying fuel from a to the front of the furnace, x being its operating engine or motor.

c is the front plate of a steam-generator, and c' represents the furnace.

d is one of the fire-bars, which in this case are movable, and d' is the operating-shaft for moving the bars.

The upper part of the apparatus—that is, the part above the level of the bars d, fitted to the front c—consists of a hollow cast-box front e, with an aperture b' through it from the front to the back in front of the fuel-feeder b, and an aperture or doorway f about the main door j, and there are openings through the metal forming the front of the box e, as hereinafter described, by which this front box communinicates with the doorway f and air admitted to it. The air is supplied by a steam-jet blower h into the hollow front through an opening at the top. Then in front of the doorway f and in a part of the front box e there is another box i, which incloses the doorway f and also the openings i' in the front plate of the box e, which make the communications between e and f. In a line with the openings i' in the back plate of the box e are openings e', and also grid-openings e^2 in the plate e^3, which is fitted onto the inner face of the box e, and through these open-

ings e' and grids e^2 the air from e will pass through the fuel piled up in front of the box and being under the operation of coking.

Within the box e there is a door j, hinged at j', having a perforated face j^2, with a removable perforated inner face j^3 thereon, and this projects inward to a point in line or nearly in a line with the face of the plate e^3, and on the outside of the box i there is a door i^2 opposite the doorway f and connected with the door j by a link i^3. There are also openings covered by doors i^4 on each side opposite the openings i'. Through the openings in the door j the air passes from the box i to the pile of fuel in front of it and effects the coking action, and through this doorway also access to the interior of the furnace is obtained for cleaning the grate or other purpose, while by the doors i^4 the opening e^2 can be got at from the front for any purpose and the fire attended to.

The dead-plate or coking-plate, which is designated k, onto which the fuel from the feeder b is delivered and on which it is coked, is perforated, as shown, and air at a pressure exceeding that in the ash-pit is supplied through these perforations. To supply air at this pressure, a chamber is formed below the plate k by the plate l below it, extending from the bottom plate i^5 of the box i to the front end of k, and by having the inner end of the plate k itself standing above the bottom of i^5, so that air is admitted direct from the box i to this space or chamber beneath k. Hence both the air supplied through the perforated parts j^3 and e^2 into the fuel and that supplied through the perforated coking-plate k is at a pressure exceeding that in the ash-pit.

m generally designates the ash-pit of the furnace c', and n is a box inclosing the end of this ash-pit and the ends of the fire-bars d, and the front of this box may be in about the same plane as the box i. In this box n there are openings n' to the edges of the metal about which the heads of the horizontally-disposed steam-jet blowers o, supplying air to the ash-pit, are attached, and an opening below, normally covered by the door n', for clearing out the ash-pit of ashes, &c.

Opposite the shaft d' and the ends of the fire-bars there are openings n^2, covered by the doors n^3, for gaining access to these parts.

The air supplied by the blowers o into the ash-pit m, as stated, will be at a lower pressure than that existing in the box-front e—say half the pressure—and this air from the ash-pit has access only to the coked fuel which lies on the bars d beyond the end of the coking-plate k. With regard to this chamber or space below the coking-plate k and the supply of air at a pressure above the atmosphere it may be applied to other types of stokers than coking-stokers and also with hand-fed furnaces, and it is applicable where the ash-pit is open to the atmosphere, as well as where closed and supplied with air under pressure. It is also applicable where artificially-induced draft is employed, as by an exhaust-fan or other mechanical apparatus. This plate k is also shown in the drawings adapted to be moved up and down automatically, by which the fuel is broken up and opened and the feeding from it onto the bars is assisted. This movement is effected by the employment of a wedge or inclined plane k' on the under surface at either side of the plate and oppositely-inclined planes d^2 on certain of the bars d, while the front part of the plate k is provided with hinge-pins k^2, which rest in suitable sockets in the box e. In action as the bars bearing the inclined planes d^2 are moved backward these inclines come in contact with k' and lift the plate k, and then in their return motion they move away from k' and allow the plate to again fall onto the bottom plate l. This plate l has a slot in it at parts where the inclines k^2 come to allow this motion, or it may move with the bars d.

In Fig. 3 the modification of the air-chamber below the plate k and the mode of actuating this plate are illustrated. In this case the fire-bars d are provided with projections d^3 at one end, so that they practically touch each other at these parts, and the plate e and plate q (which is hinged at q') together with the fire-bar-supporting plate p', close the space between the grids d^2 of the bars d and the front part of the box n. The air from the box e has access through the chamber thus formed, and so through the bottom of the fuel on the coking or dead plate k. The dead-plate k in this case is adapted to be moved longitudinally in order to break up and open the fuel on it, and it is effected by providing a projection d^4 on the upper side of, say, two of the bars d, and projections k^3 on the under side of k, so that in the movements of the bars d, they will come in contact with the projections k^3 and move the plate k to and fro. The sockets in this case for the pins k^2 are elongated to allow of this movement. By the plate q being hinged at q' dust, &c., which may fall through the openings of the plate k may by moving it about its hinge downward be discharged into the ash-pit below. In some cases the plate k may be adapted by means of the inclined planes d' and k^2 and the hinge-pins k^3 and slotted sockets to receive both an up-and-down and also a longitudinal to-and-fro movement.

In the accompanying drawings the ash-pit is shown provided with air-supplying means distinct from that for supplying air to the fuel above the bars on the plate k; but in some cases the air supplied to the ash-pit may be taken from that delivered by the air-supplying means, delivering its air into the box e, such air being conveyed by a suitable conduit connecting the box e with the ash-pit and having upon it a suitable regulating-

valve by which the respective pressures in the ash-pit and the box can be regulated—viz., the pressure in *e* adapted to be greater than that in the ash-pit. Further, according to this invention a sight or poking hole is provided through the hopper *a* and above the fuel-feeding device *b*. This is effected by providing a bridge-piece *r*, extending through the hopper just above the fuel-feeding device *b*, and a doorway and door *r'* on the hopper-front. A bridge-piece r^2 passes through the front box *e* and separates it from the fuel-inlet aperture *b'* and the space below the bridge-piece *r*.

Air, generally called "secondary air," may be supplied to the furnace above the fuel from the box *e* in regulated quantities, as through the poking-hole below the bridge-piece r^2 or any openings in the inner plate of the box having regulating devices in connection with them.

What is claimed in respect of the herein-described invention is—

1. In a furnace coking stoking apparatus, a hollow box-front above the fuel-bearers, having a fuel-feeding device at its upper part, an artificial air-forcing means connected with said hollow front, openings for admitting the air from the front into the fuel supplied by the feeding device and being coked, a front inclosing the ash-pit, and an artificial air-forcing means connected with said front separate from the upper hollow front air-forcing means for supplying air to the ash-pit separately, and said ash-pit being out of communication with the upper hollow front.

2. In a furnace coking stoking apparatus, a hollow box-front, *e*, above the fuel-bearers, having a fuel-feeding device at its upper part; a steam-jet air-forcing device *h* on said front for forcing air into it, openings in the inside of said hollow front for conducting air therefrom into the fuel supplied by the feeding device and being coked; a box *n* inclosing the front of the ash-pit, separated from and out of contact with the front *e*, and steam-jet air-forcing devices *o*, having their bodies disposed within the box and ash-pit for forcing air into same, substantially as set forth.

3. In a furnace coking stoking apparatus, a mechanical feeding device; a perforated plate below same, onto which the fresh fuel is fed; a perforated front between said feeding device and said plate; and a chamber behind said perforated front and below said plate, to which air is artificially supplied, and being out of communication with the ash-pit of the furnace; substantially as set forth.

4. In a furnace coking stoking apparatus, a hollow box-front, *e*, connected with a source of artificial air-supply, having a fuel-feeding device at its upper part, an opening, *f*, below, a chamber *i* directly in front of said opening, and in direct communication with the air-space of the box-front *e*, and a perforated body in said opening through which air from the chamber *i* passes to the furnace; substantially as set forth.

5. In a furnace coking stoking apparatus, a hollow box-front *e*, connected with a source of artificial air-supply, a fuel-feeding device at its upper part, a doorway *f* below said device, a chamber *i* in front of and communicating with the front *e*, a perforated door *j* fitting in the doorway *f*, and a door i^2 on *i* in front of the door *j*; substantially as set forth.

6. In a furnace coking stoking apparatus, a hollow box-front *e*, connected with a source of artificial air-supply, a fuel-feeding device at its upper part, a doorway *f* below said device, a chamber *i* in front of and communicating with the front *e*, a perforated door *j* fitting on the doorway *f*, and a door i^2 on *i* in front of the door *j*; and air-openings e^2 in the front *e* communicating between said front and the interior of the furnace; substantially as set forth.

7. In a furnace coking stoking apparatus, a front *e*; a fuel-feeding device *b*; a coking-plate *k* below, onto which the fresh fuel fed by the feeding device falls; a fuel-hopper *a* directly above said fuel-feeding device; and a passage extending through the bottom of the hopper directly above the feeding device, and communicating between the outside of the apparatus and the interior of the furnace; substantially as set forth.

8. In a furnace coking stoking apparatus a coking-plate *k* onto which the fuel is fed and piled in the front of the furnace, in combination with the moving fire-bars *d* below, and adapted to be engaged by said bars when moving, and be moved thereby; substantially as set forth.

9. In a furnace coking stoking apparatus, the combination of mechanically-moved fire-bars *d*; coking-plate *k*; a hollow front *e* above said bars out of communication with the ash-pit; a steam-jet air-blower *h* thereon supplying air thereto; a fuel-feeding device in said front; an opening in the front below said fuel-feeder, communicating between the air-space therein and the furnace; a box *n* inclosing the front of the ash-pit below the fire-bars; and steam-jet air-blowers *o* thereon for supplying air to said ash-pit; substantially as set forth.

In witness whereof we have hereunto set our hands in presence of witnesses.

JAMES JONES MELDRUM.
THOMAS FREDK. MELDRUM.
JOHN WESLEY MELDRUM.
FRED CLAYTON.

Witnesses to the signature of Thomas Frederick Meldrum:

WALTER KENNETH MELDRUM,
WALTER HERBERT SWIFT.

Witnesses to the signatures of James Jones Meldrum, John Wesley Meldrum, and Fred Clayton:

WM. HOLT,
A. J. GILL.