

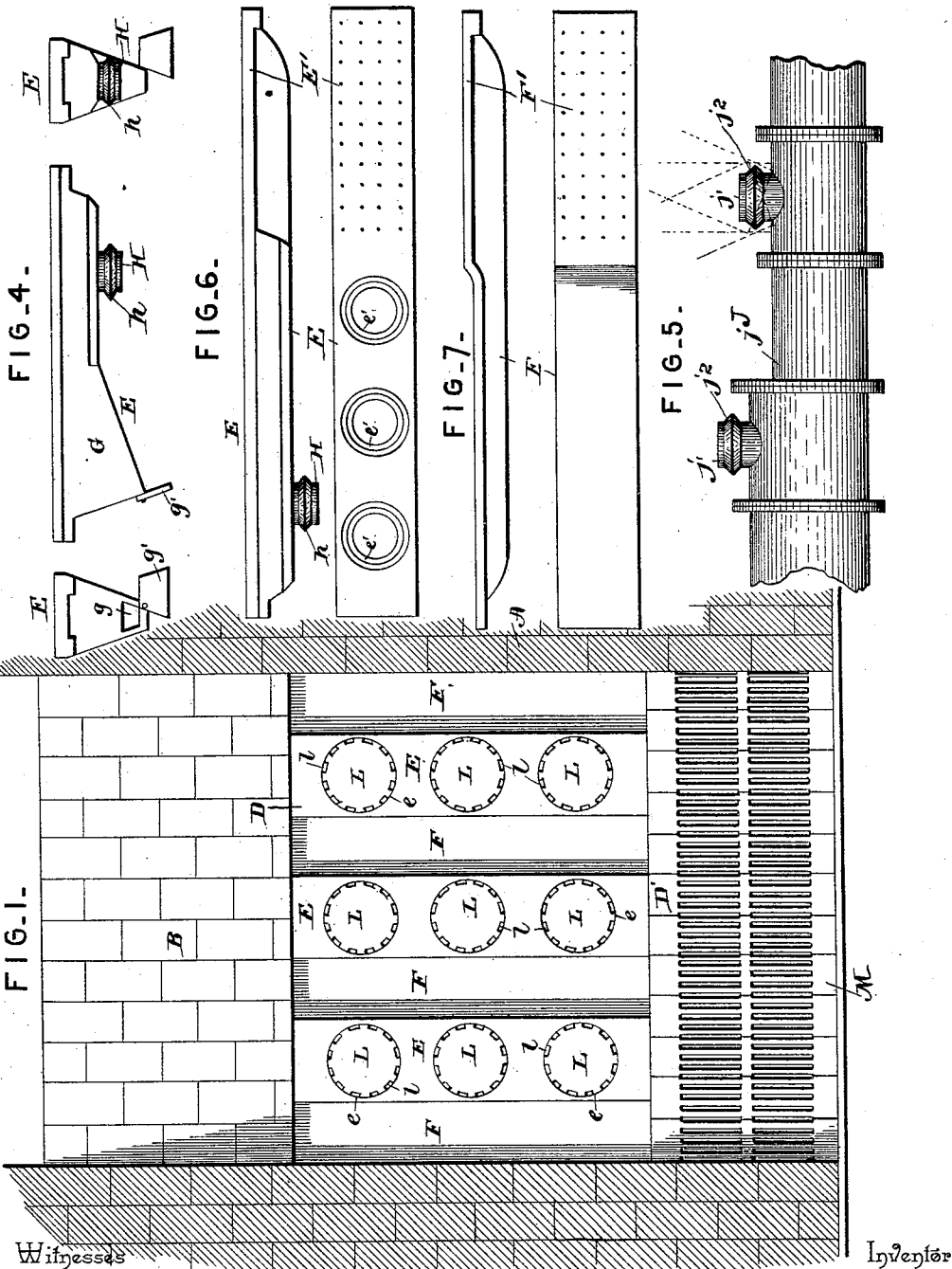
(No Model.)

2 Sheets—Sheet 1.

E. J. GORDON.
FURNACE GRATE.

No. 484,497.

Patented Oct. 18, 1892.



Witnesses

Inventor

Jas. H. McClathran
D. H. Hauptman

By his Attorneys, E. J. Gordon

Cash & Co.

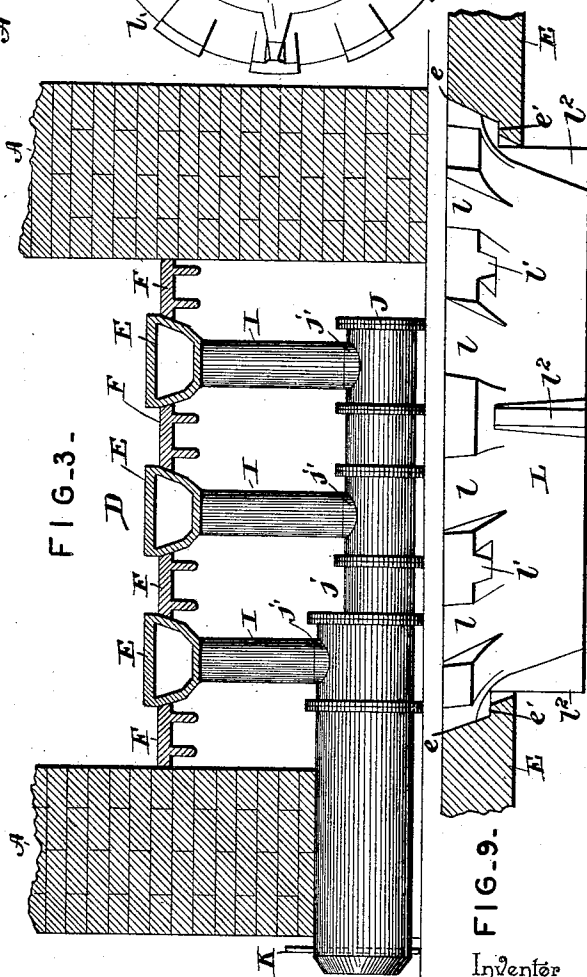
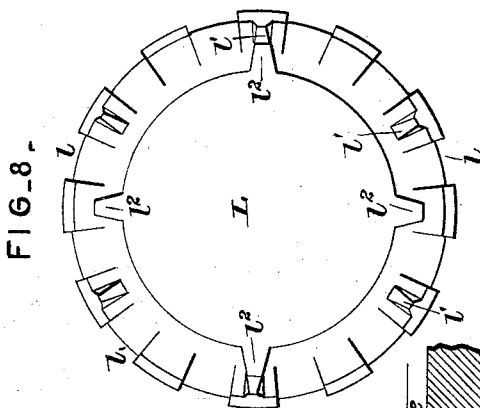
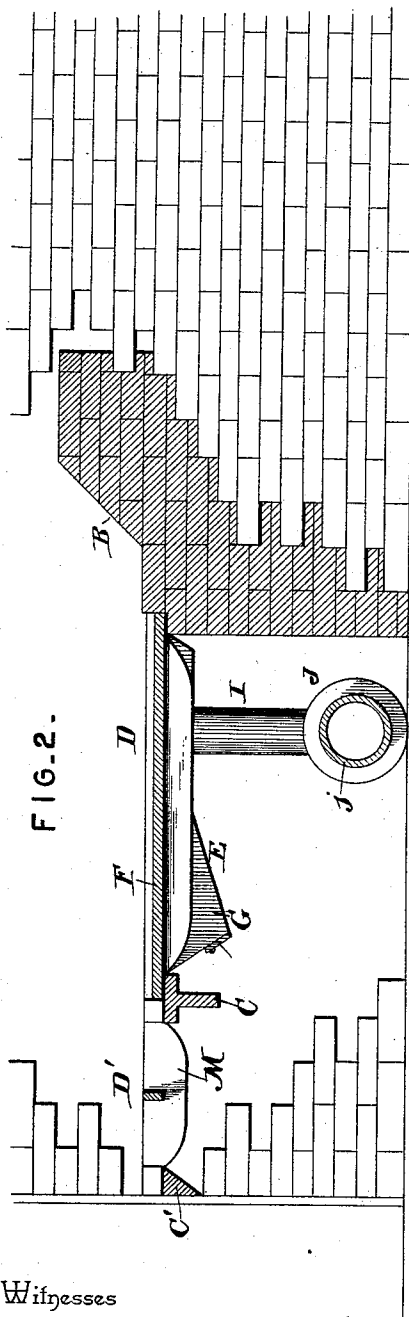
(No Model.)

2 Sheets—Sheet 2.

E. J. GORDON.
FURNACE GRATE.

No. 484,497.

Patented Oct. 18, 1892.



Witnesses

Jas. H. McLaughlin
D. P. Holhaupter

By *his* Attorneys,

E. J. Gordon

C. Snow & Co.

UNITED STATES PATENT OFFICE.

ELONSO J. GORDON, OF GREENVILLE, MICHIGAN, ASSIGNOR TO THE GORDON
HOLLOW BLAST GRATE COMPANY, OF SAME PLACE.

FURNACE-GRATE.

SPECIFICATION forming part of Letters Patent No. 484,497, dated October 18, 1892.

Application filed January 12, 1892. Serial No. 417,858. (No model.)

To all whom it may concern:

Be it known that I, ELONSO J. GORDON, a citizen of the United States, residing at Greenville, in the county of Montcalm and State of Michigan, have invented a new and useful Furnace-Grate, of which the following is a specification.

This invention relates to furnace-grates; and it has for its object to provide for an improvement in the arrangement and construction of furnaces with particular reference to the grates therein for the combustion of culm, slack, bagasse, sawdust, waste, refuse, and other fuels of such slow combustion as to be practically worthless for steaming and heating purposes when used in furnaces of the ordinary construction. It is to this end to provide an improved construction of grate-surface which will fully utilize the combustibles thereon and provide for the direct contact between the oxygen of the air and the carbonaceous portions of the fuel which is so essential to their complete and final union and combination in combustion.

With these and other objects in view, which will be quite obvious to those skilled in the art, the invention consists in a combined solid blast and open draft grate-surface arranged in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the accompanying drawings, Figure 1 is a plan or horizontal sectional view of a furnace at the grate-line, showing my improved grate therein. Fig. 2 is a side view of the same, the side of the furnace being broken away to expose the grate. Fig. 3 is a vertical transverse sectional view of the same. Fig. 4 is a detail elevation and end projections of a hollow grate-bar constructed in accordance with my invention. Fig. 5 is a detail elevation of a section of the flanged blast-pipe and the T connections therewith. Figs. 6 and 7 are detail elevations and projected plans of modified forms of the hollow grate-bars and grate-blanks, respectively. Fig. 8 is a bottom plan view of the gravity blast-valve. Fig. 9 is an enlarged detail sectional view of one of the valve-openings and valves.

Referring to the accompanying drawings, A A represent the side walls, and B the bridge-

wall, of ordinary construction in ordinary grate furnaces. Inclosed between said side walls and supported upon the front edge of said bridge and the intermediate transverse supporting-bar C is the rear solid blast grate-surface D. The said solid blast grate-surface D, forming the rear portion of the entire grate-surface and located at the regular grate-line, comprises a parallel series of hollow blast grate-bars E and a series of interposed grate-blanks F, separating and spacing the said hollow grate-bars from each other, and also supported upon the front upper edge of the bridge and said supporting-bar C in such a position that their upper surfaces are below the plane of the top of the hollow grate-bars. Depressions are thus formed between the hollow grate-bars, which depressions become receptacles or pockets for ashes, cinders, &c., the function and use of which will be more fully set forth. The said grate-blanks F are cast sections with plain or corrugated surfaces and are of widths suitable to secure the desired separation of the blast-grate or hollow grate-bars and the proper distribution of the blast throughout the blast-section of the furnace. The upper faces of these blanks are solid and tightly fit against the sides of the hollow grate-bars, which they separate and space, so that by their disposition below the upper plane of said grate-bars the depression or receptacle that said blanks form serves a double purpose—to wit, that the accumulation of ashes within said depressions protects the blanks from the intense heat of combustion, and thus prolongs their use, and also, as a most material point, the said accumulation of ashes serves to fill the joints and interstices between the blast-grates and the blanks, thus preventing the compressed air forced through the top outlets of the hollow grate-bars, which will be described, from taking a downward course. This is very important, as with heavy fuel, like culm or slack, the compressed air, after escaping through the outlets of the hollow grate-bars, is liable to take a downward course between the grates, carrying with it flame and smoke, thus burning out the grates or filling the fire-room with smoke. This sometimes occurs where heavy bodies of lighter fuel are piled up over the blast-outlets, and it is to ob-

viate this that the blast-section of the grate-surface is made solid, so that the compressed air cannot find a passage therethrough. By this construction, which provides against the possibility of the compressed air taking a downward course, which by reason of the weight of the fuel above would be the direction of least resistance, the air is forced directly through the body of the fuel, and thus utilizes its oxygen in supporting combustion.

All of the hollow grate-bars E are hollow their entire length, and are provided in their upper surfaces with a series of valve or blast openings *e*, and are provided at their front ends with an integral drop or enlargement G, extending below the bottom of the said bars and forming a waste-receptacle for the longitudinal air-chambers of the said bars, into which all solid matter that may chance to find its way into the air-duct of the grate-bar when in use falls. The said waste-receptacle or drop G is provided with a front opening *g*, closed by the door *g'* or any other suitable device, which provides means for the removal of such solid matter as may have accumulated within the said drop or receptacle. Each of said grate-bars E are further provided with the short pipe-collars H, communicating with the interior air-duct of the bars, and provided with an angular annular raised coupling-bead *h*, over which is placed the vertical connecting-pipes I, carrying the blast from the main blast-pipe J into the hollow grate-bars and through the valve or blast openings into the fuel supported upon the same. The main-blast-conducting pipe J comprises a series of flanged sections coupled together and supported or resting upon the floor of the ash-pit directly beneath the blast-grate surface, said flanges coupling the sections of the pipes together and forming the rests for the same. The said blast-pipe J is provided with a blast-reducing section *j* and the said main conducting-pipe is also provided with a series of T connections *j'*, all of which are also provided with the angular annular raised coupling-beads *j''*, over which are placed the lower ends of the vertical connecting-pipes I, engaging over the raised beads on the grate-bar's pipe collars. As illustrated in the drawings, it will be seen that this raised bead or coupling permits the vertical connecting-pipe to vary somewhat from the perpendicular without injury to the pipe or the impairment of the joint, which should be practically air-tight. This is rendered necessary by the unavoidable contraction and expansion of the grate-surface above. The main blast-pipe J extends through one of the side walls of the furnace and is connected with any suitable power fan or blower, and is provided with a sliding regulating-gate K, by means of which the fireman can perfectly control the blast, and it will be further observed that the reducing-section intensifies the blast and causes an even distribution of the same throughout all the grates, those farthest from

the entering of the blast as well as those adjacent to such point.

The valve or blast openings *e* are provided with the seats or shoulders *e'*, that are designed to receive and support the gravity-blast covers L. The said gravity-covers are provided with a series of circumferential blast openings or notches *l*, which when the valve is within its valve opening or seat in said grate-bars forms with the edge of said valve-openings a blast-opening through which the blast from the hollow grate-bar may pass into the fuel above. Intermediate of the circumferential notches *l* and at regular intervals the said flat gravity-cover L is further provided with a series of under supporting shoulders or ledges *l'*, that rest upon the circular shoulder or seat *e'* of the openings, and thus support the valves therein, and they effectually prevent their wedging fast in said openings. The said covers are further provided with a series of guide ribs or flanges *l''*, projecting beyond the body of the same below the plane of said supporting-shoulders, which resting against the edges of the valve-openings, serve as guides to hold the cover securely within the seat and prevent the same from canting. This construction of cover provides for the ready removal of the same, which must necessarily be frequently done, and also avoids the objections to having the bolted covers, which soon become defective on account of the heat burning out the threads. The cover is held in place by its own weight against the air-pressure from below.

Directly in front of the solid blast grate-section D and supported upon the cross supporting-bar C and the front supporting-bar C' is the front draft-grate section D' of the grate proper, and the same comprises a series of open or draft grates M of the ordinary bar pattern; but the same may be of any open or draft construction—as, for example, the perforated or the rocking-grate type, which will serve equally as well. As illustrated, the back section or blast portion of the grate occupies about two-thirds of the grate-surface, while the draft-grate portion D' occupies the remaining one-third of the grate-surface; but in practice these proportions will vary materially, according to the character of the fuel employed. The use of the draft-grate surface will be readily apparent, it being seen that the draft-grates facilitate the kindling or starting of the fire, the removal of ashes, clinkers, &c. They serve to retain the fresh fuel during a process of drying, baking, or coking, and as open or draft grates they will, if required, supply a portion of the oxygen necessary to support the combustion in the furnace.

As illustrated in the modifications in the drawings, instead of employing separate draft-grate sections, the hollow blast grate-bars E may be provided with front integral perforated grate-draft sections E' and the grate-blanks F provided with front perforated

draft-grate sections F', which not only simplify the construction of the grate, but also retain every principle thereof.

While the front draft-section of the grate subserves the important functions set forth, it may be additionally noted that the back section of blast grate bars and blanks, or of blast grate-bars alone, if desired, or of plates or sections provided with blast-outlets communicating with a chamber or duct supplied with compressed air, combines to form a practically-closed floor or hearth in this part of the furnace for the retention of fuel during combustion and will serve to confine and utilize every portion of the blast, as herein fully described.

The construction, operation, and advantages of the herein-described grate are thought to be apparent without further description.

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

1. A grate having a closed rear solid blast-section provided with a number of blast-openings and regularly-spaced receptacles or pockets alternating with said blast-openings and a front open draft-section forming a continuation of said solid blast-section, substantially as set forth.

2. In a grate, the combination, with the furnace, of a series of hollow blast grate-bars having blast-openings in the top thereof, a series of intermediate solid grate-blanks regularly separating and spacing said hollow grate-bars and closely meeting the sides thereof to form a solid blast-section, and an open draft-grate section in front of said grate bars and blanks and forming a continuation thereof, substantially as set forth.

3. In a grate, the combination of a series of elongated hollow blast grate-bars having blast-openings in the top thereof and a series of intermediate imperforate grate-blanks closely meeting the sides of said bars and between and below the upper plane of said hollow grate-bars, substantially as set forth.

4. In a grate, the combination of a series of parallel hollow blast grate-bars, a series of intermediate solid grate-blanks between and below the upper plane of said hollow grate-bars and forming intermediate depressions or re-

ceptacles and a solid grate-floor or hearth, and a front draft grate-section, substantially as set forth.

5. In a grate, a series of valved hollow blast grate-bars having integral enlarged waste drops or receptacles at one end and extended below the bottom of the bars, substantially as set forth.

6. In a grate, a series of parallel hollow blast grate-bars having valved outlets and elongated air-receiving ducts, integral enlarged waste drops or receptacles at one end of said air-ducts and dropping or extending below the bottom of the bars and having a front opening, and a drop or slide inclosing said front openings, substantially as set forth.

7. In a grate, a series of valved hollow blast grate-bars having a waste drop or receptacle, a series of intermediate solid grate-blanks between said hollow grate-bars and forming a rear solid grate-floor or hearth, and a front open draft grate-section, substantially as set forth.

8. The combination of a hollow blast grate-bar having shouldered valve-openings and circular gravity-covers having a circumferential series of notches forming, with the edges of said valve-openings, air escapes or outlets, a circular series of under supporting shoulders or ledges resting upon the shoulders of said valve-openings, and a circular series of depending ribs or flanges projecting within said valve-openings below the plane of said supporting-shoulders and working against the edges of the valve-openings, substantially as set forth.

9. In a grate, the combination of the hollow blast grate-bars having depending receiving-collars provided with raised coupling beads or flanges, the main blast-pipe having annularly-beaded collars or T-sections, and vertical connecting-pipes fitting over the raised beads of said collars, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ELONSO J. GORDON.

Witnesses:

CLARE S. FEASEL,
PAUL VAN DEINSE.