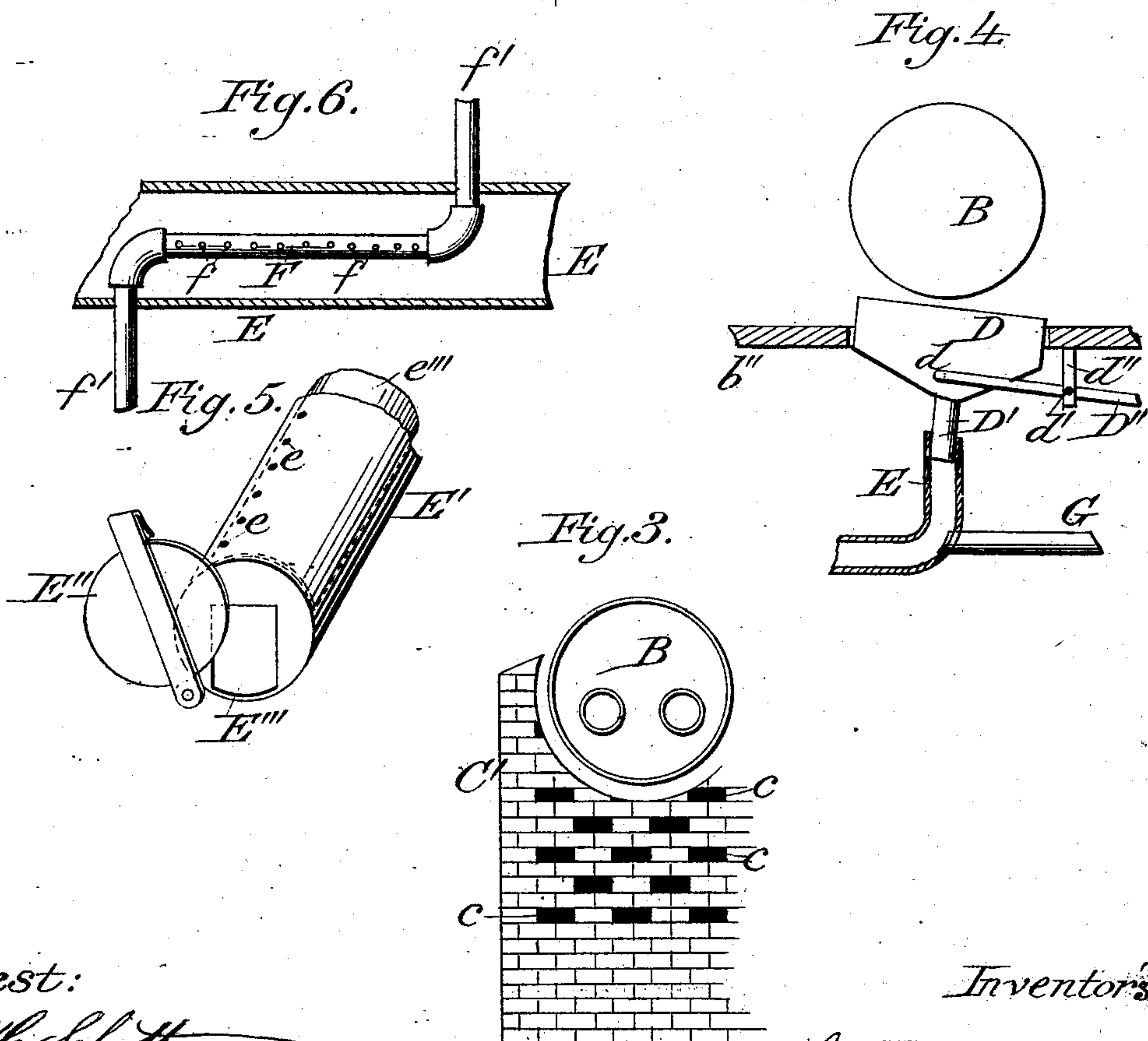
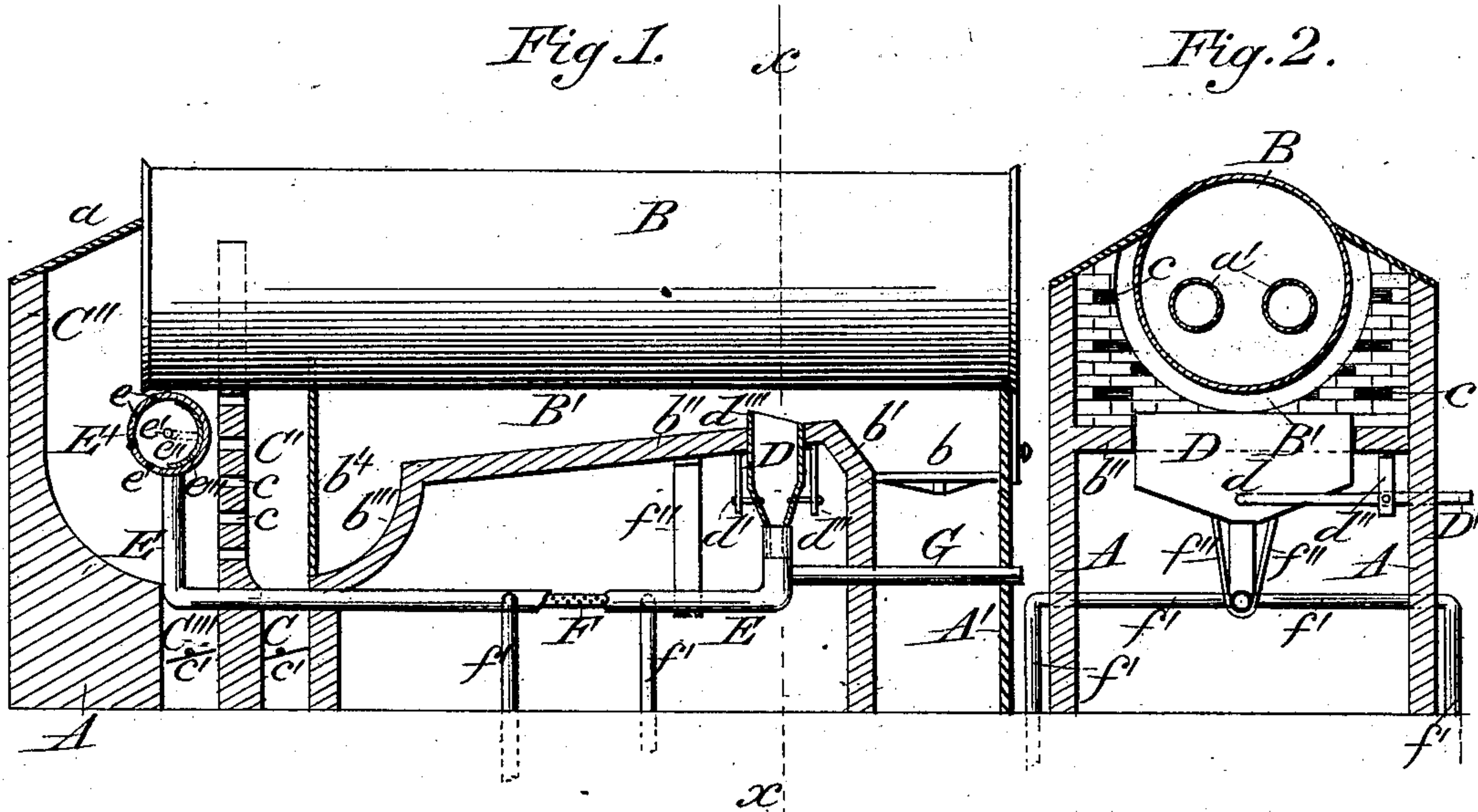


(No Model.)

C. H. & S. S. WILSON.
STEAM BOILER FURNACE.

No. 272,504.

Patented Feb. 20, 1883.



Attest:

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UNITED STATES PATENT OFFICE.

CHARLES H. WILSON AND SAMUEL S. WILSON, OF PADUCAH, KENTUCKY.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 272,504, dated February 20, 1883.

Application filed September 12, 1882. (No model.)

To all whom it may concern:

Be it known that we, CHARLES H. WILSON and SAMUEL S. WILSON, citizens of the United States, residing at Paducah, in the county of McCracken and State of Kentucky, have invented certain new and useful Improvements in Furnaces for Steam-Boilers; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in furnaces for steam-boilers for the purpose of consuming all the smoke and gases from the burning fuel and utilizing the waste-steam in producing such result, and thereby make a saving of fuel, as well as being rid of the annoyance of smoke, whether the fuel be wood or coal; and it consists in the construction and arrangement of parts whereby the result aimed at is obtained, as will be fully hereinafter described.

In the drawings, Figure 1 represents a side view of the boiler and part sectional view of the furnace and its necessary appliances. Fig. 2 represents a transverse sectional view on line *x x* of Fig. 1. Fig. 3 represents a broken perspective view of the perforated equalizer, and Figs. 4, 5, and 6 represent details of construction of parts.

A represents the ordinary supporting wall or frame to the boiler, which support may be made of fire-brick or any other material that will resist a high degree of heat.

A' is the front of the boiler-support, having the ordinary fire-doors to the furnace and ash-pit under the grate-bars, and other usual appendages.

B is the boiler, which may be a common flue or other constructed boiler.

B' is the flame or heat space under the boiler.

b is the common furnace-grate.

b' is a sloping or inclined bridge-wall.

b'' is a backwardly-inclined fire-bed, above which and under the boiler is the heat or flame space.

b''' is a curve downward of a quarter-circle

(more or less) in the fire-bed wall, terminating at the bottom in an ash-pit, C.

b⁴ is a support to the boiler from the edge of the ash-pit.

C' is an equalizer, built of fire-brick, forms the back side of the ash-pit C, and has numerous openings or perforations, *c*, transversely through it, to equalize the distribution of flame heat at the rear end of the boiler, as all the flame heat must pass through openings *c* to a combustion-chamber.

C'' is a combustion-chamber underneath and at the back end of the boiler, surmounted by a return or inclined plate, *a*.

C''' is a second ash-pit and in the rear of the equalizer C'. Ash-pits C and C''' each have in their width an overbalanced valve, *c'*, hinged so as to be turned to be perpendicular to allow any ash that may have fallen upon them, to be dumped into a still cold-air pit beneath the valve. Air-tight side or other doors are provided to these ash-pits to admit cold air when necessary.

D is a funnel or hopper shaped flame or smoke receiver, placed in an opening in the fire-bed, immediately in the rear of the bridge-wall, its bottom terminating in a pipe, D', and is constructed to be raised above the level of the fire-bed, when necessary, by means of the bifurcated lever D'', which is pivoted thereto at *d*, and fulcrumed at *d'* to depending straps *d''*, that are firmly secured to the bottom of the fire-bed or other convenient support. The back side, *d'''*, of the funnel D is higher than the front or the side next to the grate, so that when the funnel is raised the back side will touch or nearly touch the under side of the boiler, which will cause the flame or smoke to pass into the funnel, thence into a conducting-pipe when necessary, as the pipe D' enters into such conducting-pipe E, which is a bent pipe at its end toward the front of the furnace to receive the pipe D'. Pipe E, after receiving pipe D' at its upper end, and at a proper distance below, bends to a horizontal position and in a direction under the center of the boiler, to or nearly to the back end thereof, passing through the ash-pits and equalizer, then bending upward to and entering into a transverse perforated smoke-receiving drum, E', having

numerous perforations, *ee*, therein. This drum extends the entire width of the boiler-space, and by preference is constructed of fire-clay and burned; but it may be made from any material that will successfully resist continued intense heat. Centrally and longitudinally in said drum is secured shaft *e'*, having radial arms *e''* extending to and attached to a rotating cut-off valve or slide, *e'''*, which, when turned, will cut off the current of gases and stop the inflow of dust while the flues of the boiler are being swabbed out; but when not so used it will be turned away from the perforations, and thus allow a current of flame or smoke and heat to freely pass out through the perforations.

E'' is a swinging or hinged door, attached to the end of the drum *E'* to close the opening *E'''* in the head of the drum, which opening is for the purpose of cleaning the ash or dust that may at times accumulate in the inside of the drum.

F is a perforated pipe, placed centrally within the pipe *E* and at a point nearly midway of the length of the boiler, of the necessary length and terminating at each end in horizontal pipes *f'*, which pipes go at right angles to and horizontally through and turn down and enter wet clay or other suitable moist earth outside of the furnace-walls, as seen in Fig. 2. Pipe *E* and the internal perforated pipe, *F*, are supported by braces *f'' f''*, that are secured to the under side of the fire-bed *b''*, or to some other secure thing.

G is a pipe extending from the outside of the furnace to and into the end of pipe *E* at its backward bend, through which escape or waste steam or cold air may be forced into pipe *E* and around pipe *F*.

Fuel, either wood or coal, being placed upon grate *b*, fire is communicated thereto, and the fuel is ignited by the influence of a current of air passing from the ash-pit under the grate up through the grate and fuel over the fire-bed, or into the funnel and through pipe *E* to and into drum *E'*, through the perforations thereof into the combustion-chamber *C''*, thence through the flues *a'* of the boiler *B* into any receptacle to convey away the air, which will be freed from smoke, dust, and gases as soon as the fire is well kindled on the grate, when most of the products of the first combustion of the fuel will be received into funnel *D*, and especially so after steam is injected into pipe *E* through pipe *G*, as that will quicken the circulation of the smoke through pipe *E* up into drum *E'*, while the flame and most of the heat will pass under the boiler over the funnel and the fire-bed through the perforations of the equalizer *C'* into the combustion-chamber *C''*, where the two currents—one the hot flame, the other smoke—through the drum *E'* meet, and the second and complete combustion of all the consumable gases and substances of the fuel follows. The equalizer *C'* arrests the direct current of flame and any ash contained therein, and not only causes the ash to

fall into ash-pit *C*, but distributes the flame and heat that pass through the perforations *e* into a wider area, so that the heat is applied equally and at the point most needed—the back end of the boiler. The drum *E'* will accumulate more or less ash and dust, to remove which an opening, *E'''*, is made in the end thereof, the door *E''* opened, the funnel *D* is raised up under and to the boiler, forcing the flame through pipe *E* into the drum, the cut-off or turn valve *e'''* turned to cover the perforations *e*, and the flame will blow all the dust out of the drum into the ash-pit *C'''*. Flues *a'* in the boiler may also become foul by the collection of dust therein, and in swabbing them out into the combustion-chamber *C'''* some of the dust so forced out might fall through the openings *e* into the drum *E'*, to prevent which the valve *e'''* is turned to cover the openings and keep the dust from entering the drum.

In burning bituminous coal, or coal containing more or less sulphur, sulphurous gas is set free and mingles with the smoke, and in order to separate such gases from the smoke, pipe *F*, perforated with small holes *f*, is inserted centrally in pipe *E* with unperforated pipes *f'* leading therefrom through and outside of pipe *E*, and, when steam or cold air is admitted into pipe *E* through pipe *G*, a separation of such gases from the smoke takes place. Such gases, having a greater affinity for moisture than for heat, are conducted by the pipes *f'* into moist earth outside of the furnace, and are absorbed by the moisture in the earth.

A furnace thus constructed is believed by actual test in experiment to make a saving of about twenty per cent. in fuel in producing the same power in steam, which is mainly owing to the fact that the heat is equally distributed under and in contact with the boiler; that no cold air is allowed to come in contact with the boiler or to affect the application of heat to the boiler when feeding the furnace with fuel or cleaning the ash-pits from the ashes, and that all the heat-giving products are burned out of and utilized that existed in the fuel.

When it is necessary to stop the generation of steam for the purpose of a halt in the working of an engine, the hinged valve *e'* in ash-pit *C* is opened, and through such opening a current of cold air will arrest the further generation of steam, and by it the pressure of steam in the boiler can be regulated.

With this furnace and the heat applied to the boiler, as above described, the heat is expended equally upon all the surface of the boiler exposed. Consequently expansion and contraction would be also equalized upon the whole length of the boiler. Hence there is much less liability for a boiler to explode or crack where the expansion of the metal composing the boiler is so equalized.

The improvements above described can be applied to all kinds of boiler-furnaces, whether stationary or traveling, whether upon land or

afloat on water, and the improvements can also be attached to heating-furnaces, heating and cooking stoves, without in any way departing from the principle of construction or operation, as all the gases set free by cookery can be conducted into the combustion-chamber, and there be entirely consumed or all the odor neutralized.

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

1. In a smoke-consuming boiler-furnace, the combination of the backwardly-inclined fire-bed b'' , the circular drooping wall b''' , ash-pit C, equalizer C' , having perforations e , combustion-chamber C'' , second ash-pit C''' , the ash-pits having the turning valves c' , and the boiler B and the flame or fire space B' , as and for the purposes described.

2. In a smoke-consuming boiler-furnace, the combination of the backwardly-inclined fire-bed b'' , the open-mouthed funnel D, smoke-conducting pipe E, smoke-receiving drum E' , having perforations e , ash-pit C''' , having valve c' , the flame-space B' , and boiler B, as and for the purposes described.

3. In a furnace, such as above described, the combination of the rotating valve e'' with the smoke-receiving perforated drum E' , hav-

ing the perforations e , constructed and operating substantially as described.

4. The smoke-receiving drum E' , having the perforations e , opening E''' , door E'' , and rotating cut-off valve e''' , as and for the purposes described.

5. In a smoke-consuming furnace, the combination of the open-mouthed funnel D and pipe E with the interior perforated pipe, F, and conducting-pipes f' , and injecting-pipe G, constructed and operating substantially as and for the purposes described.

6. In a smoke-consuming furnace, the reciprocating funnel D, arranged substantially as shown, having its rear wall higher than the front wall to cut off and direct the flame into and through the funnel when raised, in the manner and for the purpose as described.

7. The ash-pits C and C''' , having air-tight and turning valves c' therein, and arranged with relation to wall C' as and for the purposes described.

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

CHARLES HENRY WILSON.

SAMUEL SMITH WILSON.

Witnesses:

W. F. REINHART,

J. W. SAUNER.