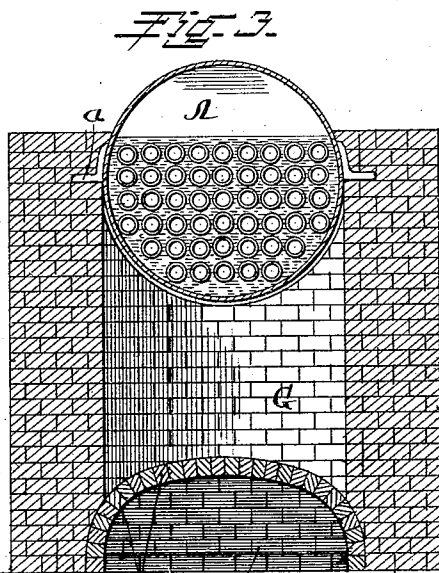
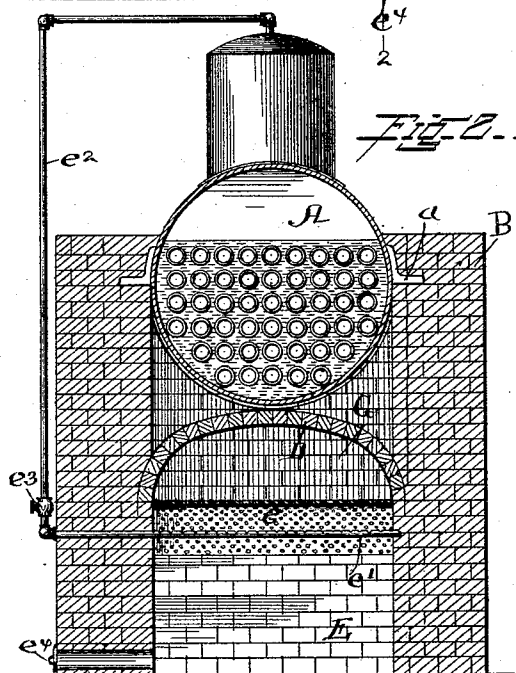
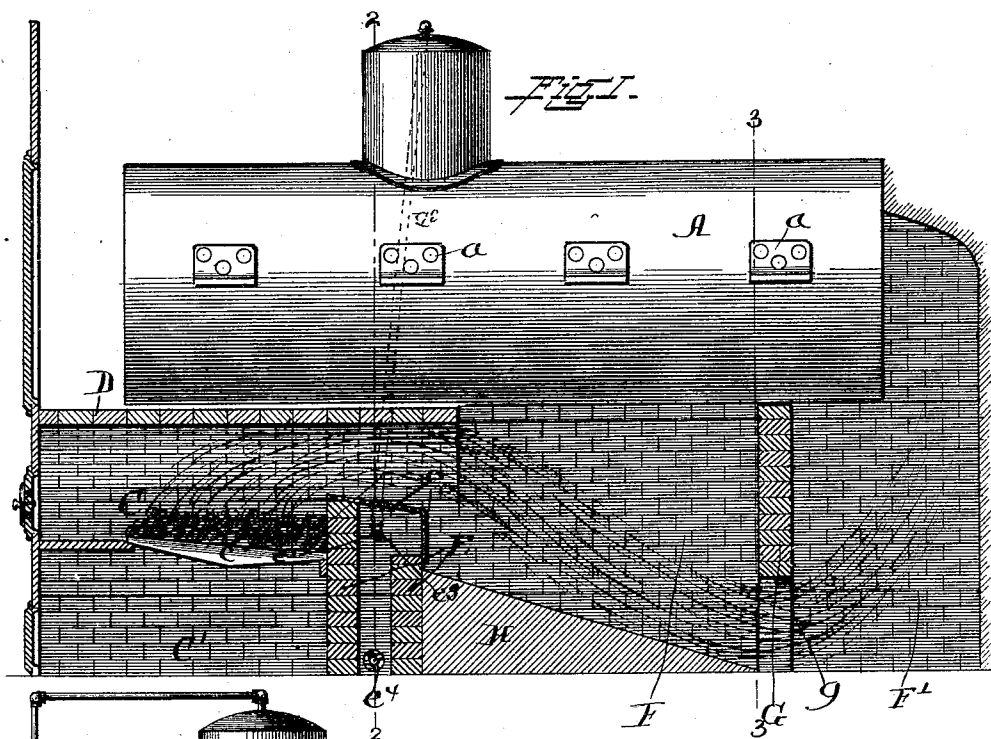


(No Model.)

J. KEENAN.
FURNACE.

No. 487,675.

Patented Dec. 6, 1892.



Witnesses:

Chas. Sherwood.
Gerald Quahong

James Kruman
By Wiles, George W. Bitter
attest.

UNITED STATES PATENT OFFICE.

JAMES KEENAN, OF CHICAGO, ILLINOIS.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 487,675, dated December 6, 1892.

Application filed March 16, 1892. Serial No. 426,096. (No model.)

To all whom it may concern:

Be it known that I, JAMES KEENAN, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

My invention relates to certain improvements in furnaces for steam-boilers, designed to insure as nearly as possible a complete combustion for the double purpose of prevention of smoke and economy of fuel.

To such ends it consists in certain combinations of the several portions of the furnace, whereby, first, the hot gases and vapors as they leave the fire are shielded from direct contact with the comparatively-cold surface of the boiler until their combustion is completed; second, an ample and unailing supply of air is introduced at the point where most needed, and, third, the furnace is guarded as much as possible against a rapid cooling down while a new supply of fuel is introduced.

I shall describe below my preferred construction in which my invention is fully illustrated, and shall thereafter point out the essential portions thereof. Said preferred form is shown in the drawings by means of three figures, of which—

Figure 1 is a vertical longitudinal section of the furnace; Fig. 2, a transverse vertical section in line 2 2 of Fig. 1; and Fig. 3, a similar section in line 3 3 of Fig. 1, the view in both of the last two figures being from left to right.

The boiler A rests upon the side walls B by means of brackets or saddle-plates *a*.

In the furnace C are a grate *c* and an ash-pit *c'*. Above the grate is an arch D, shielding the boiler from a direct contact with the fire and extending backward over a hollow bridge-wall E. Beyond this bridge-wall is a combustion-chamber F, containing in the rear portion thereof a division-wall or second bridge-wall G, having an arch *g* in the lower portion thereof. In rear of this division-wall there is a continuation F' of the combustion-chamber extending upward to form a communication with the boiler-flues. The hollow bridge-wall E is capped by a perforated plate *e*, preferably extending over the top and part way

down the rear side thereof, and from the bottom of said plate a filling H is made to form an incline downward and backward to the arch *g*. Within the bridge-wall a pipe *e'* extends from side to side of the furnace, containing a number of perforations and being connected by a pipe *e²* with the steam-space of the boiler. A stop-cock *e³* is arranged within easy reach of said pipe *e²*. The interior of the bridge-wall also connects by means of a hole *e⁴*, provided with a suitable cover, with an air-supply.

The operation is as follows: The hot gases and vapors from the fire upon the grate rising upward from the same impinge upon the arch D, heating the latter to a high temperature. From there they pass backward and are drawn downward by the draft through the arch *g*, from which they rise and pass backward through the boiler-flues. In the hot fires that are necessarily employed under steam-boilers, the gases rising from the coals contain a large proportion of fuel in an unburned condition. As long as these gases are kept at the high temperature at which combustion starts and sufficient air is supplied, the burning will continue until the fuel is entirely consumed. If, however, the gases are cooled down beyond the point of ignition, the unburned particles will be carried onward by the draft and discharged from the chimney in the form of smoke.

One of the most common faults in the ordinary steam-boiler furnace is that the hot gases from the fire impinge directly upon the boiler itself, which is necessarily of a much lower temperature and which constantly rapidly cools them down. It should be noticed that in the construction just described, the hot gases are prevented from coming directly into contact with the boiler-shell until they have passed backward through the arch *g* and then upward into the boiler-flues. In the mean time they can come in contact only with the arch D, the bridge-wall E, the filling H, and the division-wall G, all of which parts are heated to a great degree and hence assist rather than prevent the combustion. Their assistance is especially necessary when the doors of the furnace are open for the purpose of putting in a new supply of fuel. At such a time immense quantities of cold air

are let in directly above the fire, and were it not for these heated portions of the furnace, against which air and gases of combustion are carried before they reach the boiler, the latter would cool them down to a point at which large quantities of soot would be deposited upon the shell and still greater quantities carried upward through the chimney.

To insure an ample supply of air, the bridge-wall E is made hollow and connected with a suitable air-supply, and the perforated plate *e* is placed upon the top of said wall to discharge the air both upward and rearward in the best possible position and direction to assist in the combustion of the gases escaping from the fire.

The perforated pipe *e'*, connected with the

steam-space of the boiler, is provided so that steam may be blown into the interior of the bridge-wall now and then to clear out the perforations in the plate *e*.

I claim as new and desire to secure by Letters Patent—

In a steam-boiler furnace, the combination of the arch D, the hollow bridge-wall E, having the steam-pipe *e'*, the filling H, and the division-wall G, having an opening in the lower portion thereof, substantially as described.

JAMES KEENAN.

Witnesses:

H. BITNER,
CHAS. O. SHERVEY.