(No Model.)

F. L. BARTLETT.

FURNACE FOR BURNING COAL SCREENINGS.

No. 493,854. Patented Mar. 21, 1893.

Fig. 1.

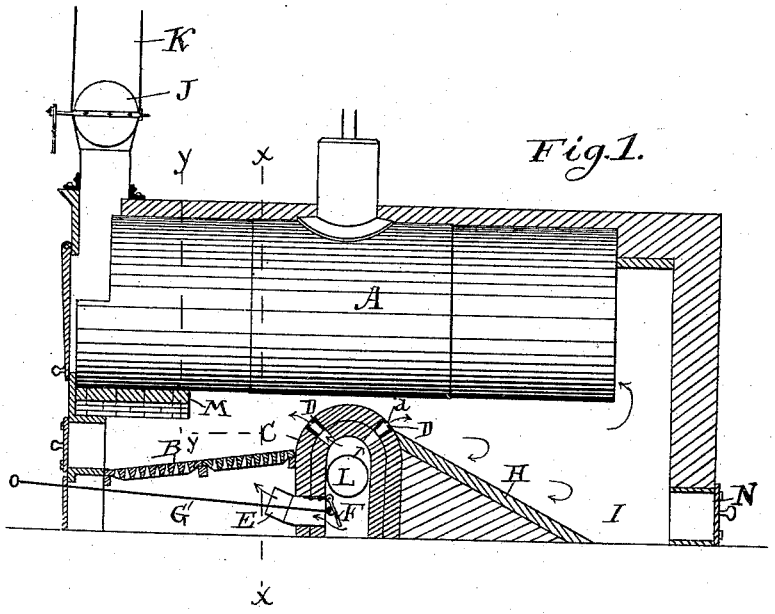


Fig. 2.

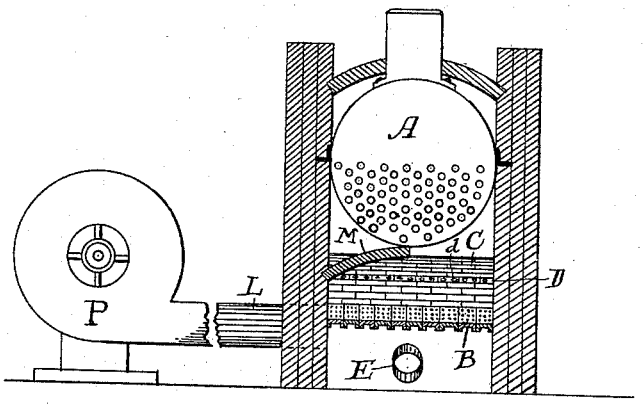


Fig. 3.

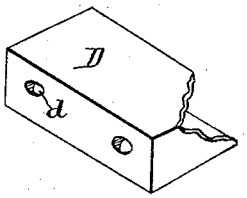
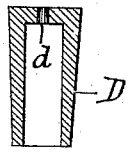


Fig. 4.



Witnesses:
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C. A. Mosley

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by J. M. Bates
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UNITED STATES PATENT OFFICE.

FRANK L. BARTLETT, OF PORTLAND, MAINE.

FURNACE FOR BURNING COAL-SCREENINGS.

SPECIFICATION forming part of Letters Patent No. 493,854, dated March 21, 1893.

Application filed March 25, 1892. Serial No. 426,330. (No model.)

To all whom it may concern:

Be it known that I, FRANK L. BARTLETT, a citizen of the United States, residing at Portland, in the county of Cumberland and State of Maine, have invented certain new and useful Improvements in Furnaces for Burning Coal-Screenings; and I do hereby 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.

The object of my invention is to provide means for burning finely pulverized waste coal under steam boilers and other furnaces. Waste coal from anthracite mines has heretofore been burned by mixing the fine coal with sawdust, spent tan bark or with bituminous coals. The problem of burning the waste from the soft lignite coals, such as are mined in Colorado, Wyoming, New Mexico and other Western States, has never been satisfactorily solved so far as I am aware. Such waste is extremely fine, fully one half being dust and often an impalpable powder, so that any device such as is economically used on the heavier and more dense coal slack of the Eastern or Middle States, fails to work on the lighter lignite coals of the Western States. All attempts at burning such coals with a heavy blast, results in filling the flues of the boiler and the conduits of the furnace with fine half burned coal, or else when the blast is lightened the grates are packed with the fine coal so that the air cannot force its way through. Again, no method has been found, so far as I know, for burning the dense volume of smoke which such coal gives off.

The object of the present invention is to overcome the difficulties mentioned and to effect the complete and economical combustion of this kind of coal dust without filling the flues with dust, without the production of smoke and without destroying the grates and the walls of the furnace.

The various features of my invention will be described in the specification and set forth in the claims.

In the accompanying drawings, I illustrate my invention as applied to a horizontal tubular boiler.

In the drawings Figure 1 is a central longitudinal section. Fig. 2 is a cross section, half being on line $x\,x$ and half on the line y y of Fig. 1. Fig. 3 is a perspective view of one of the hollow perforated brick used in the bridge wall, and Fig. 4 is a section through the same.

A represents the steam boiler and B is a perforated inclined grate which I prefer to make of solid cast bars having one-fourth inch perforations.

C is the bridge wall which in this case extends the entire distance across the furnace and is made hollow to admit the blast which enters through the pipe L. This pipe as herein shown is connected with a blower P. The top of the bridge wall, as herein shown, is arched and it contains on each side of the arch a row of perforations d adapted to discharge a hot air blast obliquely toward the front and rear of the furnace. These perforations d are formed in hollow bricks D preferably of cast iron which are set in the brick work of the arch. The inner edge of the brick D is open and allows the air to pass through the perforations.

In the front partition of the bridge wall is an opening for admitting air beneath the grate. I prefer to use for this opening a pipe E which is fixed in the lower part of the wall and points obliquely upward. This opening is controlled by a damper F which is opened and closed by means of a rod G. In rear of the bridge wall is an inclined surface H where the ashes collect as they come over the bridge wall and in rear of this is the ash collecting chamber I.

N is the ash door.

K represents the stack and J is the damper which controls the draft in the stack.

In operating the furnace a light blast from a fan or other device is delivered into the hollow bridge wall at a low pressure, say two ounces to the square inch. The air will pass out of the perforations $d\,d$ in the top of the wall as a hot blast, being heated in its passage through the bridge wall. The colder air will be discharged through the pipe. A fire having been started before hand and the brick work of the furnace thoroughly heated, a thin layer of the coal slack is spread over the en-

tire grate; then by means of the rod G the damper F is regulated until the blast is sufficient to make a rapid combustion of the fuel. At the same time the damper J in the smoke stack is turned so that the draft will just barely carry off the products of combustion. The backward direction of the cold blast issuing from the pipe E beneath the grate and the hot blast through the front row of holes *d d* tend to hold back the smoke and light dust from the coal giving it a rotary motion, while the stack *k* tends to draw it slowly forward and through the flues of the boiler. The result is that the coal is burned in passing over the perforated bridge wall and meeting the heated air currents from the openings *d d* and the fine completely burned ash drops in the ash chamber I, accumulating at the bottom of the incline H where it may readily be removed through the ash door N. It will be observed that the chamber I grows gradually larger from the bridge wall backward to the rear end of the boiler. This construction of the apparatus is of great importance for the reason that the combustion of the dust begins in the vicinity of the bridge wall and as it proceeds it requires an expanding chamber or flue in which to effect a complete combustion and to prevent counter currents. The flue grows gradually larger as the volume of gas caused by the combustion of the dust expands.

In practice the light clinker which forms on the grate is not disturbed for several hours, the fuel being frequently spread over the hot clinker thus formed, and burned off until the porous clinker has become too thick to allow the blast to penetrate, when it is broken up and removed.

It will be seen that the operation of this invention is nearly the reverse of ordinary firing, inasmuch as the fine coal is burned in the air and the ash deposited in the rear of the boiler instead of under the grates as is customary. By means of the cold blast under the grates and the hot blast through the perforations of the bridge wall, complete combustion is not only secured, but the grates last much longer and the wear on the boiler and furnace is lessened, the smoke ceases to be a nuisance, the flues do not fill up and a very cheap and hitherto unutilized class of fuel can be burned. For effective work under boilers and stills it is found necessary to have the grate quite near the boiler to be heated, much nearer in fact than is customary with ordinary firing.

When this invention is applied to furnaces already set in the usual way, the rear ends of the grate are raised and a fire brick arch M turned at the front end near the charging door. The object of this arch is to prevent the cold air from the lower blast from passing through and impinging on the cooler surface of the boiler plates and thus reducing the temperature of the blast below the point of combustion. This device is not necessary when the grate is constructed to be within say eighteen or twenty inches.

I claim—

1. In a furnace for steam boilers and other like purposes, the combination of a perforated grate, a hollow bridge wall forming an air chamber, perforations at the top of said bridge wall for supplying a hot blast from the upper part of said air chamber, an opening through the lower portion of said bridge wall beneath said grate for discharging the cooler air from said air chamber, substantially as described.

2. The herein described method of burning fine coal under steam boilers consisting of spreading the coal in a thin layer over a perforated grate, forcing an air blast beneath said grate sufficient to lift the fine coal dust from said grate, blowing jets of heated air into the suspended coal dust immediately after it leaves said grate and burning it while held in suspension, and slowly drawing off the products of combustion through the stack, substantially as described.

3. In a furnace for steam boilers and other like purposes, the combination of a finely perforated grate, an air blast apparatus for delivering air under pressure beneath said grate, a bridge wall having air discharge openings therein and a gradually enlarging or expanding chamber in rear of said bridge wall extending without substantial diminution of section to the rear of the furnace, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK L. BARTLETT.

Witnesses:
HENRY LLOYD,
FRANK MCFARLANE.