

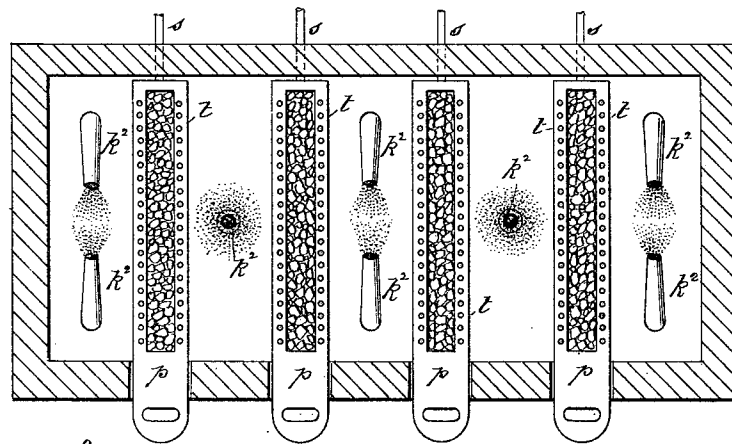
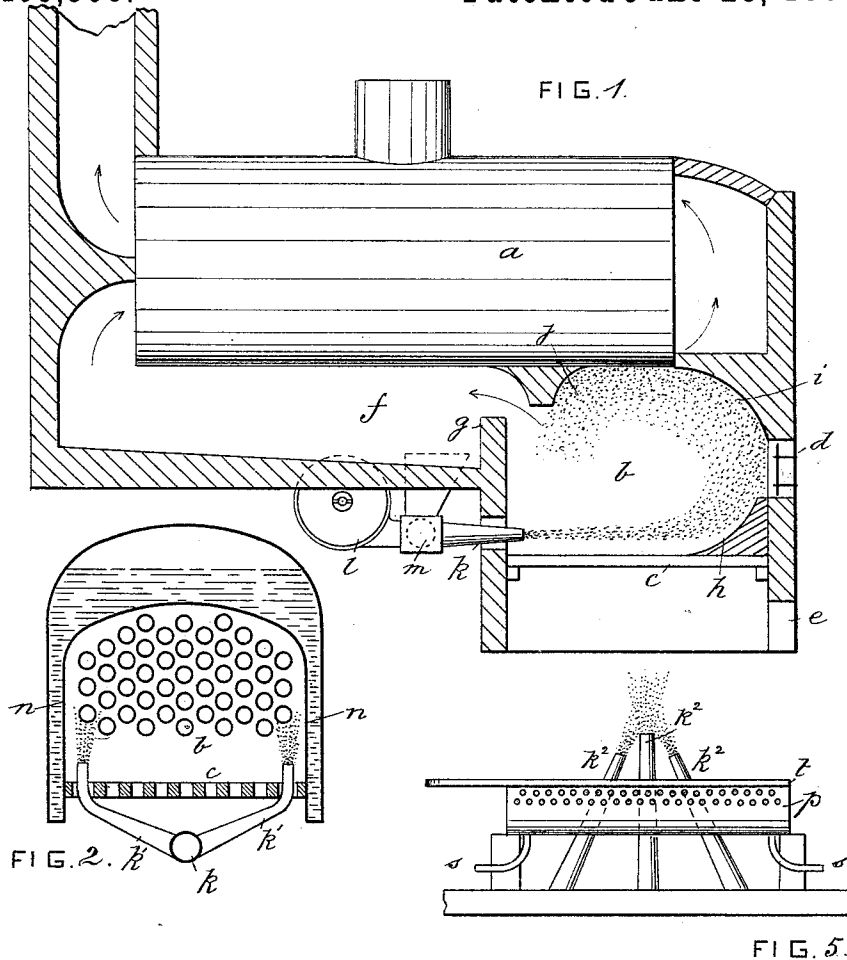
(No Model.)

A. MASON.

PROCESS OF BURNING CULM OR PULVERIZED COAL.

No. 405,966.

Patented June 25, 1889.



WITNESSES

Wm. A. Lowe
Chas. J. Morgan

INVENTOR

Allen Mason
By A. P. Thayer atty.

UNITED STATES PATENT OFFICE.

ALLAN MASON, OF BROOKLYN, ASSIGNOR TO HERBERT H. SANDERSON,
TRUSTEE, OF NEW YORK, N. Y.

PROCESS OF BURNING CULM OR PULVERIZED COAL.

SPECIFICATION forming part of Letters Patent No. 405,966, dated June 25, 1889.

Application filed March 5, 1888. Serial No. 266,281. (No model.)

To all whom it may concern:

Be it known that I, ALLAN MASON, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Processes of Burning Culm or Pulverized Coal; and I 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.

My improved process of burning pulverized coal consists of a method of introducing and supplying the same, which enables more effectually maintaining the particles in suspension and general distribution throughout the combustion-chamber together with the air for effecting the combustion, so that the mixture and union of atoms is in process of operation among and throughout the moving particles in all the space and in far greater amount and intensity than commonly injected into the furnace or as burned in a mass or bed on the grate, with correspondingly more effective or perfect combustion and greater production and intensity of heat in a given space. While I propose to avail myself of any approved efficient means of maintaining the suspension of the atoms of coal a sufficient length of time to effect the mixture and union of atoms which results in combustion while in suspension, as by the showering of the same from the upper portion of the chamber slowly downward into or along with the air for combustion, the means which I represent in this example consist of air jets or blasts, introduced in such manner as to produce currents, counter-currents, eddies, and cycles calculated to bear up and distribute the coal till consumed, the coal being preferably introduced along with and by said jets, but may be otherwise introduced, if preferred, all as hereinafter described, reference being made to the accompanying drawings, in which I have represented several forms of jet apparatus for the purpose, and also means for maintaining an auxiliary fire of coal in the lower part of the combustion-chamber.

Figure 1 is a longitudinal sectional elevation of a boiler-furnace, showing one contrivance of apparatus that may be employed for maintaining the suspension and distribution by the cycling currents produced in the furnace by an injecting-blast of air laden with the atoms of coal. Fig. 2 is a transverse section of a locomotive-boiler furnace with a modified arrangement of the injecting apparatus adapted for that kind of furnace. Fig. 3 is a horizontal section of a furnace with apparatus for injecting and maintaining the suspension of the coal atoms, together with apparatus for maintaining an auxiliary fire of coal in the lower portion of the combustion-chamber. Fig. 4 is a transverse sectional elevation of Fig. 3 on line *x x*, and Fig. 5 is a transverse section of the burners of the auxiliary fire.

In Fig. 1^a, represents an ordinary return-flue boiler; *b*, the combustion-chamber of the furnace; *c*, the fire-grate; *d*, the fire-door; *e*, the ash-pit door, and *f* the flue back of the bridge-wall *g*. In such a furnace I provide deflectors *h i j* of refractory material, as shown, or in any approved arrangement, with an injector *k* for air, to be forced in, preferably, at the back of the chamber by a fan *l* or other means, and coal-dust charged into the air-spout by a screw-feeder *m* or other means, to be carried along for feeding the furnace and for being mixed and combined with the air and held in suspension for combustion by it.

It will be seen that the blast first traverses the chamber a little above the grate, spreading more or less, but leaving a comparatively still air-space below for reception of the ashes. Then it is turned upward violently by the deflector *h*, and, coming in contact with deflector *i*, is then projected forward against *j*, which turns it downward into the incoming blast, which takes along with it any yet unconsumed particles and prevents them from falling on the grate or into the ash-pit.

It will also be seen that these appliances may be readily fitted to a common boiler-furnace already in use without material expense of fitting, and may be as readily removed.

For adaptation of the same process to the combustion-chamber *b* of a locomotive-boiler

fire-box *n* the injecting-nozzle *k* may have branches *k'* entering near each side from below the grate *c* and being suitably upwardly curved to constitute deflectors for projecting the coal upward into the opposite upper angles, and be thereby deflected, so as to meet over the center of the chamber and produce gyrating cycles by their counter action adapted to maintain the suspension of the coal atoms until consumed. To begin with, fire may be started on the coal-grate to produce the heat necessary for igniting the coal-dust, or a torch may be introduced through the fire-door. By this method all the combustible matters in the coal will be effectually consumed with greater economy of fuel, and an especial advantage is gained in the total prevention of clinker and slag. What ash is developed may fall in part into the ash-pit through some localities where the eddies favor it, while some may be carried over the bridge-wall and descend where the cycles have less suspending effect. Together with the fire of coal atoms thus maintained throughout the chamber generally it will be desirable to maintain an auxiliary fire of lump coal in the lower portion of the furnace at or about the locality of the ordinary fire-bed, mainly for the purpose of renewing the fire of coal-dust in cases of interruption, to which it is liable by irregularity or clogging of the fuel and other causes, but also for adding to the capacity of the furnace for useful effect. As an ordinary coal fire or other fire of uniform spread over the area of the chamber would fail of this purpose, because it would soon be clogged with ashes from the fire above, I employ sectional burners *p* with wide spaces between them, through which the falling ashes from the upper fire may descend into the pit, said burners being of such limited transverse extent as that the ascending currents from them will turn away into the pit such matters as might tend to fall into them, and thus be self-protecting so far as the falling matters of the upper fire are concerned. In this case the injected fuel will preferably be projected upward between burners *p* from numerous feeding-nozzles *k²*, some of which may be directed directly upward and others inclined, so as to converge and to take effect in other ways calculated to produce gyrating and conflicting currents competent to hold up the

coal-dust until consumed. These burners may consist of trough-shaped drawers adapted to slide in and out of the furnace through one side for receiving and introducing the coal. The troughs will be perforated in the sides and bottom for the supply of air for supporting combustion. The upper edges of the troughs are flanged over horizontally, as at *t*, and these flanges are perforated with numerous small holes through which air will be distributed in jets from below for the better admixture with the gases and vapors rising from the burners. Such a coal fire may be replenished in each burner separately without interruption of the coal-dust fire, as it would be in replenishing an ordinary coal fire.

I disclaim herein the process of burning culm and hydrocarbon described in my application for a patent thereon filed March 5, 1888, Serial No. 266,282; also, the apparatus for burning culm or pulverized coal described in another application for a patent filed by me March 8, 1888, Serial No. 266,556.

I disclaim herein the apparatus for burning culm and lump coal described in my application for a patent filed June 8, 1888, Serial No. 276,529.

What I claim, and desire to secure by Letters Patent, is—

1. The method of burning culm or fine coal, which consists of injecting it into the furnace-chamber and deflecting the injected stream backward over and into the incoming jet or jets in continuous suspension during combustion over a still air-space in which the ashes collect separately from the burning coal and maintaining therewith an igniting and renewing fire, substantially as described.

2. The method of burning culm or pulverized coal and lump coal in combination by injecting the pulverized coal into and for a time maintaining it in suspension in the furnace-chamber by the injecting forces and at the same time burning the lump coal below the injected fine fuel in independent or separate burners between which the coal-ashes are precipitated, substantially as described.

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

ALLAN MASON.

Witnesses:

W. J. MORGAN,
S. H. MORGAN.