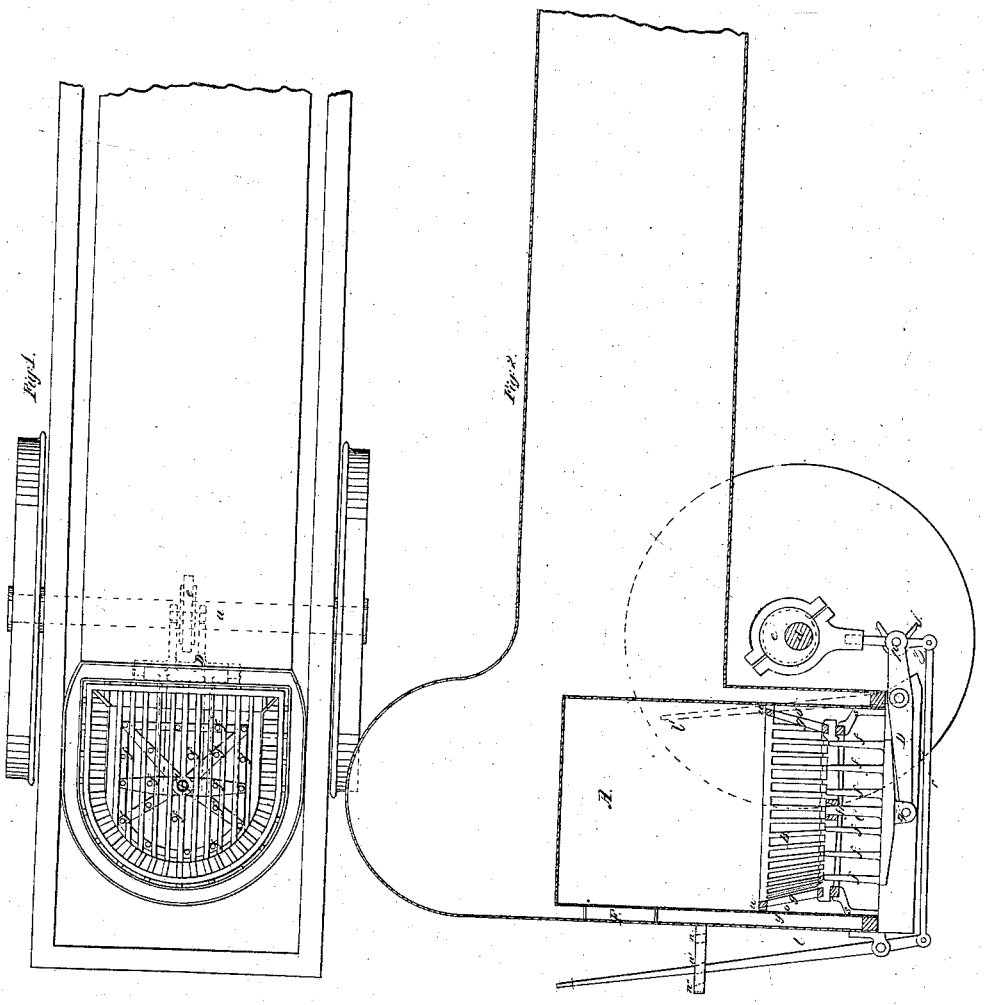
Nichols & Boyes,

Furnace Grate.

No. 7,306. Patented Apr. 23, 1850.



UNITED STATES PATENT OFFICE.

WM. R. NICHOLS AND B. C. BOYES, OF PHILADELPHIA, PENNSYLVANIA.

COAL-STIRRER FOR FURNACE-GRATE.

Specification of Letters Patent No. 7,306, dated April 23, 1850.

To all whom it may concern:

Be it known that we, WILLIAM R. NICHOLS and BURRITT C. BOYES, of the city and county of Philadelphia and State of Pennsylvania, have invented a new and useful Furnace-Grate for Locomotive and other Steam Boilers, and that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing, making part of this specification.

The purpose of our invention is to secure the furnaces of locomotive and other engines from the destruction of their fire boxes and grate bars while using anthracite or other fuel which tends to produce the overheating and corrosion of their materials.

A second purpose is to maintain sufficient activity in the fire and avoid the clogging of the grate, without opening the fire door for that purpose, and without disturbing the uniform distribution of the fuel over the surface of the grate, at the same time burning effectually the combustible gases produced by the fuel.

The nature of the improvement is such as to avoid all direct contact of the solid fuel with the metallic plates composing the boiler;—to form the grate in such manner as to be exposed on all sides to currents of air which may keep its temperature so low as to avoid burning out the bars, and to allow its contents to be kept sufficiently open for maintaining combustion. This latter effect is produced by a series of vertically moving rake-teeth, or fingers moving vertically, endwise, and actuated either by hand (through the lever C) or by the action of the engine. When moved by the engine, they are furnished with machinery for regulating the extent of their upward movement or for throwing them out of action altogether.

The construction of our grate is shown in the drawings, whereof

Figure 1 is a horizontal section and Fig. 2 a vertical longitudinal section, correspondingly lettered.

A, is the fire box; B, the grate sustained on the projecting supports *s*, *s*, or in any other convenient manner.

o, *o*, are the spaces between the upright or sloping sides of the grate and the sides *y*, *y*, of the fire box.

u u are narrow spaces between the upper rim of the grate and the sides of the fire box intended to allow a limited quantity of air to pass up by the grate for the purpose of keeping the rim of the grate from overheating, and to afford a supply of air for burning such combustible gases as may arise from the body of fuel within the grate.

C is the vertically moving rake, actuated by means of the lever D, set in motion by the hand lever *l'* (represented in dotted lines) or by the eccentric *e* or other equivalent machinery set in action by the revolution of the axis *a* of the engine. When the engine works its own rake the eccentric is connected through a connecting rod *r*, with a hand lever *l* which, at the will of the engineer, can be drawn back and set as seen in the drawing in the notch "*u*," or pushed forward to the notch *u'* when the jaws *j*, *j*, on the eccentric rod *z* will be drawn partly out of the reach of the pin *p* and by reason of their flaring will only come momentarily at each revolution, in contact with the pin *p*, so as to raise the fingers, *f*, *f*, *f*, &c., a short distance, and when *l* is pushed forward so far as to stand in the notch *n*, the jaws *j*, *j*, will not touch the pin *p* at all, and no stirring of the fire will then take place.

The advantage obtained by our grate is, that it withdraws the intensely heated fuel wholly out of contact with the sides of the fire box while allowing direct radiation from the fuel to the sides of the boiler around it; keeps the grate bars at a moderate temperature, furnishes an adequate supply of heated air to consume the combustible gases which ordinarily escape burning in the locomotive engine furnace, or only burn at the top of the chimney; and stirs the fire without disturbing the uniform distribution of the fuel over the grate bars and without opening the fire door which is always attended with loss by admitting a large volume of cold air above the grate and proportionally diminishing the activity of the fire and the efficiency of the steam.

Instead of the joint-pin, *q*, the rake C may have a knife edge, to fit into a notch on the lever D and there may in such case be a guide rod *f'* coming down from the bottom of the grate on which the rake plays freely while it is sufficiently guided in its vertical ascent and descent.

The form which we give to our grate enables and indeed requires us to give a greater depth to the mass of fire than is ordinarily employed in locomotives, which use anthracite. From this arises the necessity

of using with our grate a rake or poker of peculiar construction and action; one which can penetrate to a considerable distance to elevate without throwing laterally the pieces of coal. It is by the combination of a stoking apparatus of the kind herein described, with the air passages around the sides of the grate, that we are enabled to cause a constant current of inflammable gas to rise through the body of fuel and a supply of atmospheric air to rise around the grate to mingle with and burn the gas, thereby giving rise to an extensive and powerful sheet of flame around and throughout the firebox and flues.

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

1. The rake frame, having numerous vertically moving fingers constructed and operating to stir and clean the fire only by a vertical movement, said fingers being distributed beneath the grate, substantially in the manner and for the purposes described.

2. We also claim in combination with the passages around the rim of the grate admitting warm air above the fire, the vertically moving rake teeth which open passages for the full escape of combustible gases to be burned by said warm air, thereby maintaining a copious volume of flame, all around the interior of the firebox, as herein set forth.

WILLIAM R. NICHOLS.
BURRITT C. BOYES.

Witnesses:
W. G. CONNOR,
JOHN NORTHROP.