R. S. DILLON & W. SCULLY.

Automatic Furnace-Feeder.

No. 220,901. Patented Oct. 21, 1879.

Fig. 1

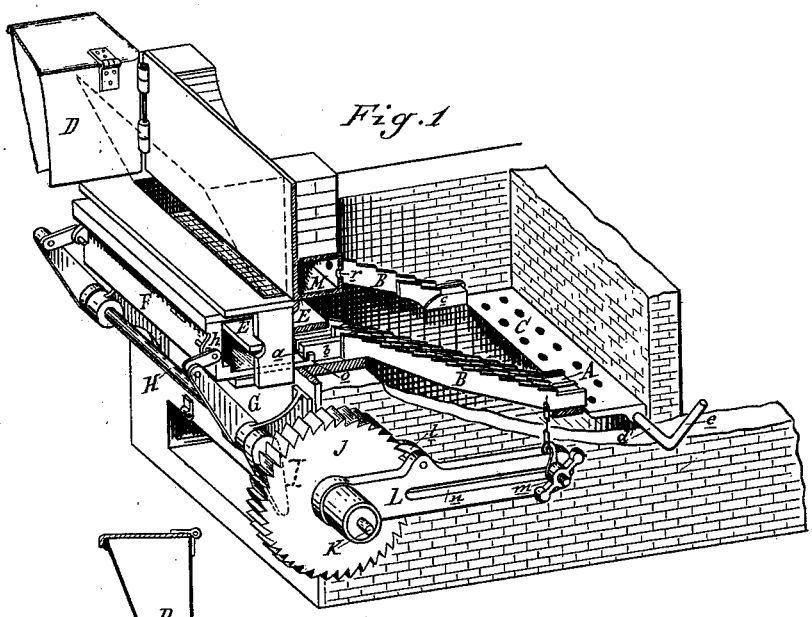


Fig. 2

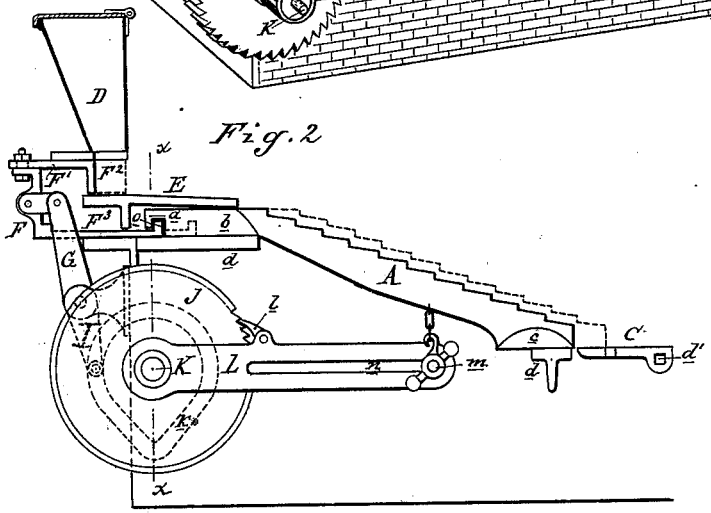


Fig. 3

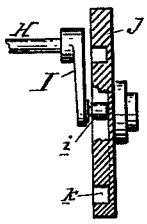
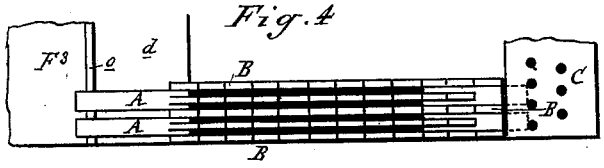


Fig. 4



Attest:

A. Barthel

Thos. S. Day.

Inventor:

R. S. Dillon

Wm. Scully

By Atty

Thos. S. Sprague

UNITED STATES PATENT OFFICE.

RICHARD S. DILLON AND WILLIAM SCULLY, OF DETROIT, MICHIGAN, ASSIGNORS TO DETROIT IRON AND BRASS MANUFACTURING COMPANY, OF SAME PLACE.

IMPROVEMENT IN AUTOMATIC FURNACE-FEEDERS.

Specification forming part of Letters Patent No. **220,901**, dated October 21, 1879; application filed January 13, 1879.

To all whom it may concern:

Be it known that we, RICHARD S. DILLON and WILLIAM SCULLY, of Detroit, in the county of Wayne and State of Michigan, have invented an Improvement in Automatic Furnace-Feeders, of which the following is a specification.

The nature of our invention relates to certain new and useful improvements in a device for mechanically feeding fuel to boiler-furnaces in regulated quantities and at desired intervals of time, for the purpose of keeping up a uniform fire under the boilers.

As ordinarily fed through furnace-doors opened for the purpose, so much cold air is usually admitted that, when coals are thrown in, a large quantity of smoke is instantly made, which passes off unconsumed through the flue-passages, and the coals thus fed and, in the usual way, spread over the surface of the fire upon the grates, interpose between the incandescent fuel and the boiler a cold surface, the tendency being to deaden the fire, and consequently lower the pressure of steam.

Our object is to avoid these difficulties in the way of keeping up a steady fire and uniform pressure of steam by simple and efficient means.

The invention consists, first, in a boiler-furnace without doors or other openings above the grate and between the same and the hopper, in combination with a closed hopper, a sliding and reciprocating pusher, a longitudinally-progressing grate, and suitable operating mechanism, whereby the fuel is fed intermittently to the boiler-furnace in certain quantities, and is progressed regularly upon the grate without admitting cold air above the grate to chill the surface of the incandescent fuel; second, in the combination of a closed hopper and reciprocating grate-bars, of a feed-slide at the lower end of the hopper, and a frame intermittently reciprocated by connection with the driving mechanism connecting the grate-bars and the feed-slide; and, further, in the combination of said parts with the peculiar devices for imparting the reciprocating movement to the feed-slide and grate-bars, as fully hereinafter explained.

In the drawings, Figure 1 is a perspective view of a boiler-furnace, taken from near the front thereof, and showing our various devices attached, and with a portion of the side wall removed, the more clearly to show the operation of the various parts. Fig. 2 is a side elevation of the mechanically-moving parts detached from the furnace. Fig. 3 is a vertical section on the line *x x* in Fig. 2. Fig. 4 is a plan view of a pair of grate-bars.

In the accompanying drawings, which form a part of this specification, A represents a series of grate-bars set upon an inclination from front to rear, as shown. The front ends of these bars terminate in a hook, *a*, by means of which and their connections they have a short reciprocating movement. Both ends of these bars are provided with bearing-surfaces *b c*, each of which are supported upon suitable bars *d*, extending across the furnace. These bearing-surfaces project on each side of the bars to form shoulders to keep the bars apart, to allow spaces between them for the admission of air upward and the ashes to fall through them into the ash-pit. B B are another series of bars, set upon the same angle, and resting upon the same supports, and are alternated with the bars A, and are susceptible of no reciprocating movement. All these bars are made in a series of steps, as shown, for the purposes hereinafter described.

Coal being placed upon the upper step, and the bars A given a forward motion, as shown in dotted lines in Fig. 2, the coal is carried to the next step below, where the retraction of the bar leaves it, and the first step is cleared, ready for another supply. As this reciprocating movement takes place at intermittent intervals, the coal is advanced downward one step at a time, in an incandescent condition, the ashes are shaken out, and when the fuel reaches the last and lower step the next forward motion of the feeding-slide, hereinafter described, will force the débris onto the supplemental and independently-acting grate-plate C, the bearing ends *c* of said bars passing over or under said plate, which latter acts as a stationary shovel to receive such débris. This plate C is supported upon a shaft, *d'*, which projects through the side wall of the furnace, and is provided with a crank, *e*, by

means of which the shaft is turned or tilted to throw the débris upon the plate into the ash-pit, whence it may be withdrawn through the usual ash-pit doors.

If preferred, the upper surfaces of these grate-bars may be plain or corrugated, and set upon an inclination downward from front to rear and diagonally across the furnace, when, each alternate bar being forced forward and retracted, will gradually force the fuel toward the rear of the furnace; or other constructions may be employed to accomplish the desired result without departing from the spirit of our invention, which is to gradually force the fuel from front to rear of the furnace, substantially by means of the devices for mechanically measuring and intermittently feeding the fuel onto inclined grate-bars, as described. Neither is it necessary that the bars should slide under the dumping-grate, as the same result will be obtained if said plate is supported below the ends of the bars.

D is a hopper to contain a fuel-supply, which latter is supported in a column upon the table E, which is so placed as to discharge immediately upon a stationary plate upon a plane with the upper ends of the grate-bars.

F F′ F² F³ represent the four plates, which form a rectangular box or frame and slide or strike, which, on a forward motion being given to it, will pass under the discharge end of the hopper and over the face of the table, and force so much of the fuel as is resting thereon and below the said discharge end onto the upper end or step of the plate. When withdrawn, this slide or strike discloses a well or recess, which will be filled with coal from the hopper, to be, in like manner, fed onto the grate-bars. This slide may be made adjustable, so that the quantity of coal at each motion and discharge may be regulated as desired. Motion intermittently reciprocating is given to this frame and slide by the crank-pitman G on the shaft H, which latter is supported in suitable bearings. The upper end of this pitman is pivoted to the frame F, or to plates *h*, secured thereto. The other arm, I, is provided with a small wheel or wrist-pin, *i*, which travels in the cam-shaped channel *k* upon the face of the ratchet-wheel J. This wheel, sleeved upon the shaft K, is provided around its periphery with a series of ratchet-teeth, as shown, and is actuated by the pawl *l*, pivoted to the slotted lever L, one end of which is attached to the shaft K, while to its opposite and free end is attached a chain or other device, (not shown,) which may be attached to any motive power, so that said lever may be raised and lowered at regular intervals of time. This chain is attached to an adjusting-bolt, *m*, working in the slot *n* in the lever, so as to adjust the length of its stroke. The shorter its stroke the more rapidly will it rotate the wheel, and, through the connections hereinbefore named, the oftener will the fuel-supply be replenished. The longer its stroke, the longer the wheel will be in performing a revolution, and the less often will the fuel be fed. The frame F³ also actuates the reciprocating grate-bars, by means of the flange *o* engaging with the hooks *a* upon the ends thereof, so that every forward or retrograde motion of said frame is communicated to said bars, as hereinbefore described.

The grate-bars project into the boiler-furnace from the front through an opening therein, and the measuring and feeding apparatus are so secured and placed that the fuel is fed through such opening onto the stationary plate; and as the hopper should be closed at top for the exclusion of cold air, no other doors or openings are required in the front of the furnace, through which air can enter the combustion-chamber, except the draft-doors in the ash-pit and below the grates, through which any air entering said ash-pit must pass to furnish oxygen to the fuel thereon.

In the front wall of the furnace, immediately above the opening through which the fuel is fed, there is placed a flue, M, provided with openings *r*, to discharge air onto the fuel as soon as it has been fed onto the stationary plate. This flue communicates with flues (not shown) in the sides of the furnace-wall, which said flues take air from outside of said wall. The air thus taken in is highly heated before it is passed into the furnace, so that it assists in burning the gases and prevents the throwing off of smoke from the fuel as it is fed into the furnace, substantially as described.

What we claim as our invention is—

1. A boiler-furnace without doors or other openings between the grate and hopper, in combination with a closed hopper, a sliding and reciprocating pusher, longitudinally-progressing grates, and suitable operating mechanism, whereby the fuel is fed intermittently in certain quantities, and is progressed regularly, without admitting cold air above the grate to chill the surface of the incandescent fuel, substantially as described.

2. In a boiler-furnace, the combination of a closed hopper and reciprocating grate-bars with a feeding-slide at the lower end of the hopper, and an intermittently-reciprocated frame connecting the grate-bars with said feed-slide, substantially as described and shown.

3. In combination with an inclosed hopper and mechanically-measuring and intermittently fuel-feeding device, the means herein described, consisting of the crank-pitman G, shaft K, wrist-pin I, channel *k* upon the face of the ratchet-wheel J, pawl *l*, lever L, constructed substantially as described, and attached to any suitable motive-power for giving said measuring and feeding device an intermittent reciprocating motion.

RICHARD S. DILLON.
WILLIAM SCULLY.

Witnesses:
H. S. SPRAGUE,
THEO. S. DAY.