

T. HENDERSON.

FURNACE-FEEDING MECHANISM.

No. 179,017.

Patented June 20, 1876.

Fig. 1.

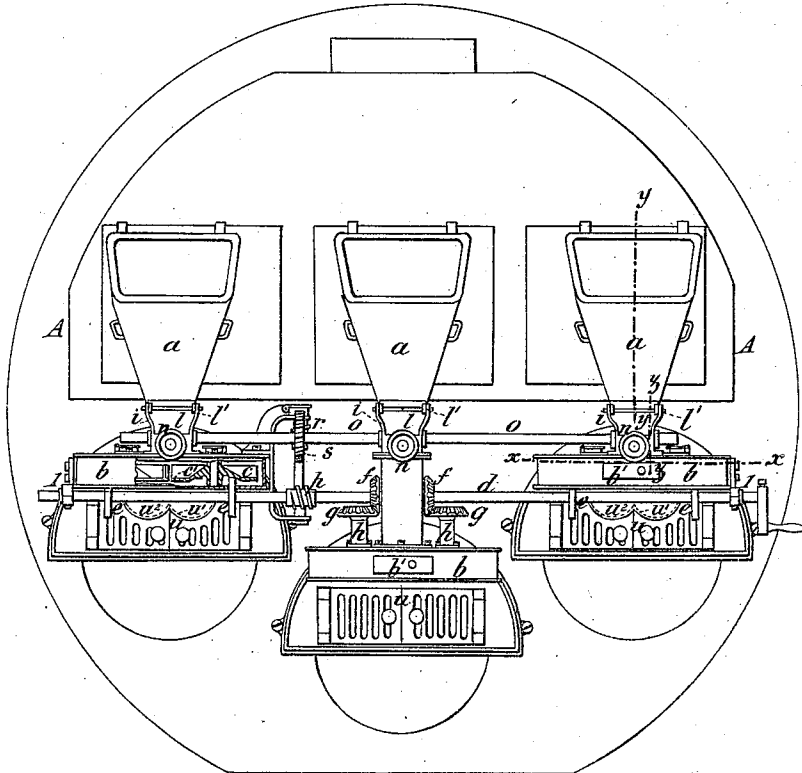


Fig. 3.

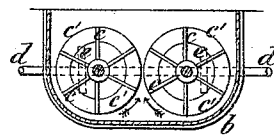


Fig. 2.

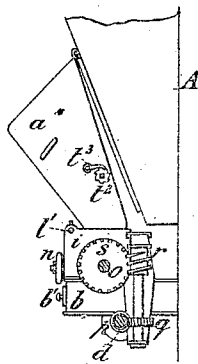


Fig. 4.

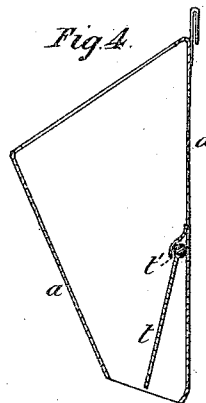
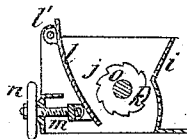


Fig. 5.



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# UNITED STATES PATENT OFFICE.

THOMAS HENDERSON, OF LIVERPOOL, ENGLAND, ASSIGNOR TO DILLWYN SMITH, OF BURLINGTON, NEW JERSEY.

## IMPROVEMENT IN FURNACE-FEEDING MECHANISMS.

Specification forming part of Letters Patent No. **179,017**, dated June 20, 1876; application filed January 20, 1876.

*To all whom it may concern :*

Be it known that I, THOMAS HENDERSON, of Liverpool, England, mechanical engineer, have invented an Improved Apparatus for Supplying Fuel to Furnaces, of which the following is a specification :

My said invention relates to novel apparatus for automatically supplying fuel to steam-boiler and other furnaces, where it is necessary or desirable that the quantity of fuel in the furnace should be uniform during the working of the same, and that the fuel should be evenly distributed over the entire surface of the fire-bars. The said apparatus comprises rotating feeders, consisting of disks provided with blades or beaters inclosed in a box or case arranged in front of the furnace. The said box or case is supplied with fuel from a hopper furnished with crushing or grinding devices, and the blades or beaters throw the said fuel in a continuous stream into the furnace. The said apparatus is provided with means for regulating the quantity of fuel supplied to the furnace and its distribution in the same.

My said invention is illustrated in the accompanying drawing, which I will now proceed to describe, and of which Figure 1 is a front elevation of a steam-boiler with my apparatus applied to the same. Fig. 2 is a side elevation of a portion of the said apparatus. Fig. 3 is a horizontal section on the line *x x*, Fig. 1. Figs. 4 and 5 are vertical transverse sections, drawn to an enlarged scale, on the lines *y y* and *z z*, Fig. 1.

Like letters indicate the same parts throughout the drawing.

*A* is the front of the boiler or fire-box. *aaa* are hoppers for the reception of the coal. *bbb* are the boxes or cases inclosing the aforesaid rotating feeders. *c c* are the blades or beaters of the said feeders, which are clearly shown in Fig. 3. By referring to the last-named figure it will be seen that the two disks *c'*, which carry these beaters, are arranged in close proximity to each other. Below the cases or boxes *b* there is a horizontal shaft, *d*, supported to turn freely in bearings *l l*, and provided with friction wheels or rollers *e*, which project through the bottom of the said cases, and run

in contact with the said disks, thereby imparting motion to the same in the direction of the arrows, Fig. 3. In practice, this shaft *d* is driven by a belt or shaft from the main shaft of the engine, or any other suitable shaft connected with the same, and thereby imparts to the said blades or beaters a rapid rotary motion. The cases *b* are provided with inspection-apertures, closed by doors *b'*.

In the drawing I have shown the boiler constructed with three furnaces, each of which is fitted with my improved feeder. For driving the beaters of the feeder of the lower furnace I provide the said horizontal shaft with bevel-toothed pinions *f*, which gear with similar pinions *g* on the beater-shafts, that extend up through the sleeves or necks *h* on the top of the lower case or box *b*. At the bottom of each hopper is a chamber, *i*, inclosing the crusher *j*, which is a roller, *k*, with teeth formed as shown in Fig. 5, and arranged in combination with the adjustable plate *l*. This plate is hinged or pivoted at *l'*, and is adjustable with regard to the said roller by means of the screw *m* and hand-wheel *n*. The rollers *k* are mounted on a horizontal shaft, *o*, which extends through the chambers *i*, and the shaft *o* receives a slow rotative motion through the worm or screw gearing *p q r s*, or by equivalent means.

In each of the hoppers *a*, above the said crushing device, I arrange a flap or door, *t*, which is suspended upon an axis or spindle, *t'*, whose end projects through the side of the hopper, and is provided with a ratchet-wheel, *t''*, arranged in combination with the pawl *t'''*. By means of this flap or door the passage or area through which the coal passes down the hopper can be more or less contracted or diminished to regulate the supply of coal to the crusher. The said door, when set in any required position, is held fast by the said pawl and ratchet-wheel.

In applying my invention to a marine or land boiler-furnace, where the space in front of the furnace is limited, the wheels *e* on the horizontal shaft *d*, if arranged as shown in the drawing, will obstruct the opening of the furnace-doors *u*. To obviate this difficulty I cut in the top of the doors *u* apertures

$w^1$ , and to prevent the entrance of air into these apertures when the doors are closed I provide the same with hinged covers  $w^2$ , which permit the said doors to open and close freely, and which drop down automatically over the said apertures when the doors are closed.

I claim as my invention—

1. In an apparatus for feeding furnaces, the combination of the shaft  $d$ , extending across or partially across the front of the furnace, and the friction-wheels on said shaft, with rotating feeders resting on and driven by said friction-wheels, all as set forth.

2. In an apparatus for supplying fuel to furnaces, the fuel-crushing device, consisting of the toothed roller  $k$  and plate  $l$  and its adjusting-screw, all combined and operating substantially as above set forth.

3. In combination with the disks  $c'$ , the shaft  $o$ , carrying the crushing-rollers  $k$ , and geared with the shaft  $d$  by the worms and worm-wheels  $p q r s$ , as herein set forth, and for the purpose specified.

4. In combination with the rotating feeder, the hopper  $a$ , supported on or above the case  $b$ , and provided with the crushing-roller  $k$  and adjustable plate  $l$ , in combination with the flap or door  $t$ , for regulating the passage of the fuel through the hopper, substantially as herein set forth and for the purposes specified.

5. The fuel-supply apparatus applied to the front of a boiler, and consisting of the horizontal shaft  $d$ , the feeders above said shaft, and the feeder or feeders below the same, arranged in combination with the hoppers  $a$  and crushing devices  $k l$ , and operated by frictional or other wheels geared with the said shaft, substantially as herein set forth.

6. The combination of the folding doors  $u$ , having apertures  $w^1$ , with the self-closing covers  $w^2$ , as and for the purpose set forth.

THOMAS HENDERSON.

Witnesses:

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BENJAMIN PATCHETT.