E. REES.

AUTOMATIC FURNACE STOKER.

APPLICATION FILED OCT. 23, 1915.

1,180,737.

Patented Apr. 25, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

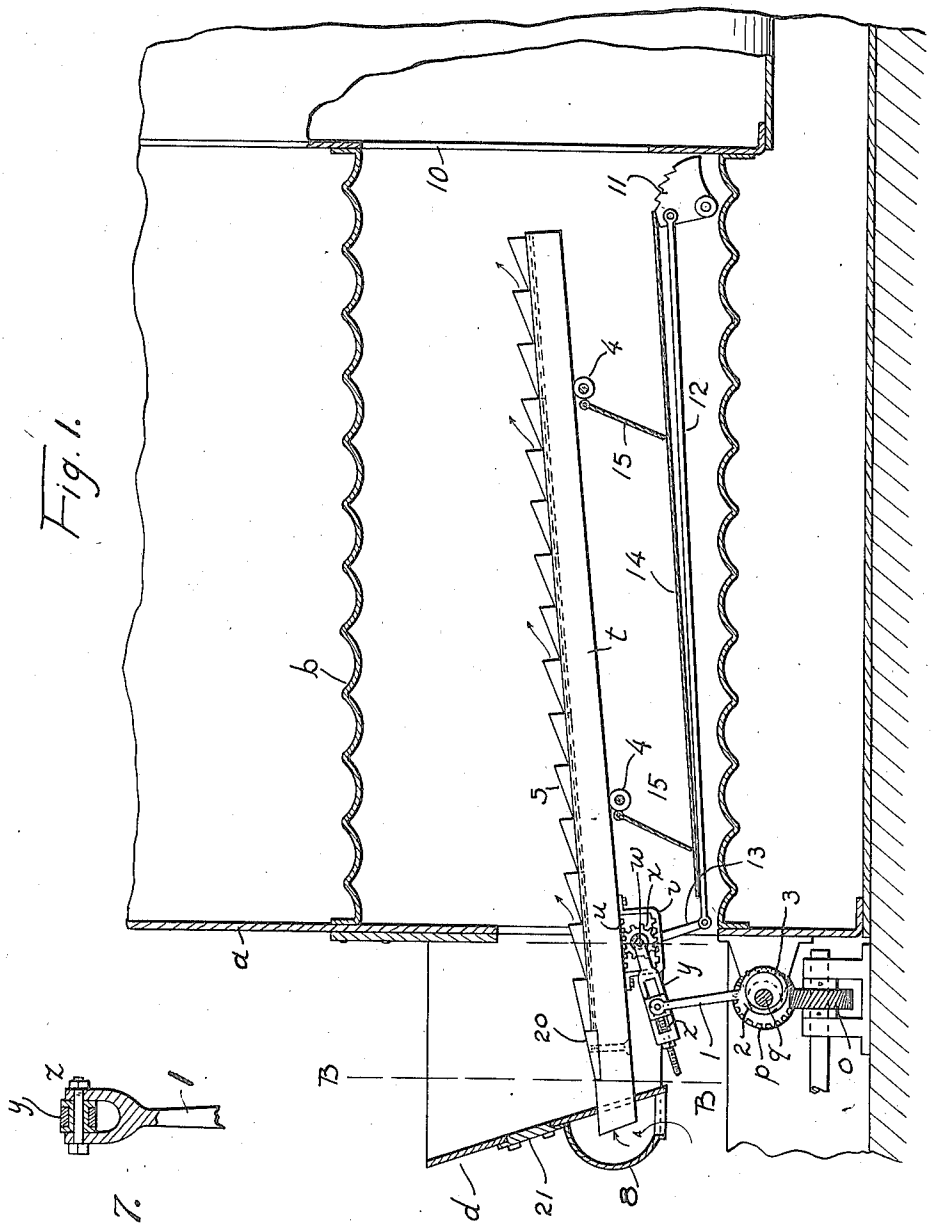


Fig. 7.

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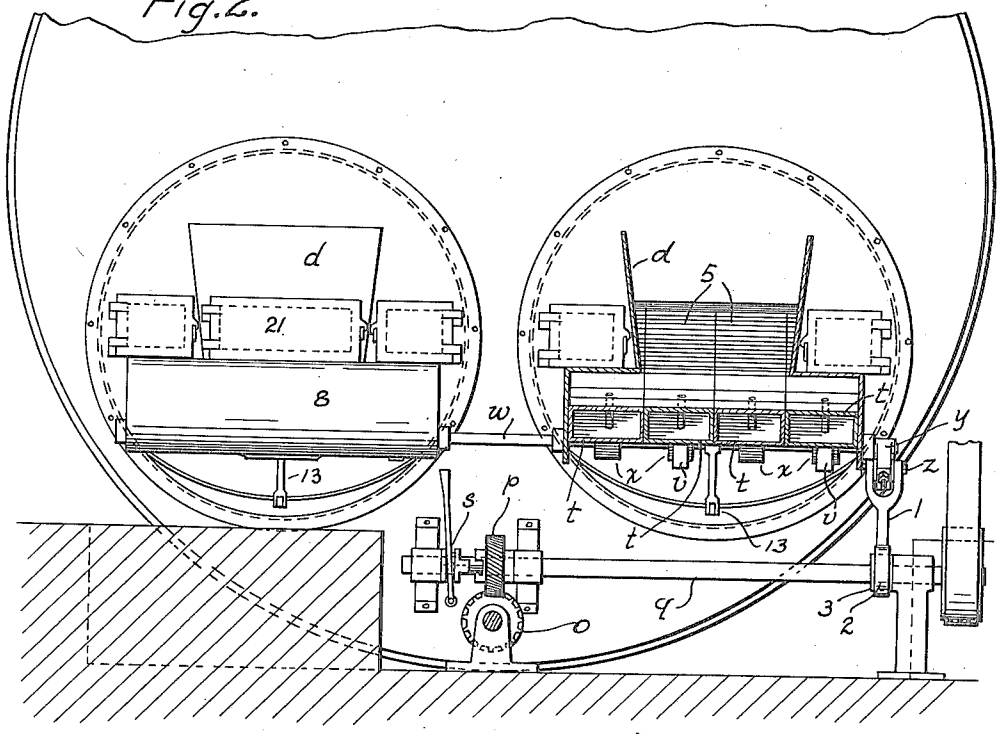
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2 SHEETS—SHEET 2.

Fig. 2.



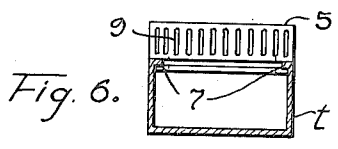
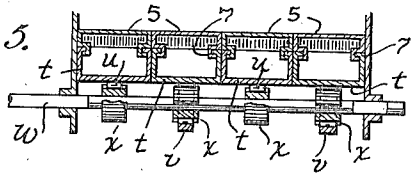


Fig. 6.

Fig. 5.



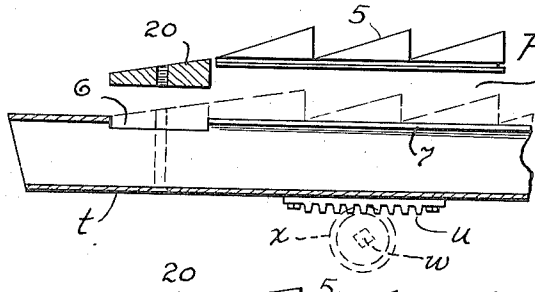
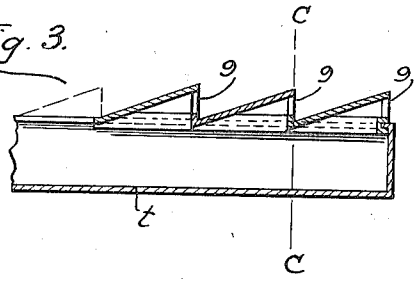


Fig. 3.



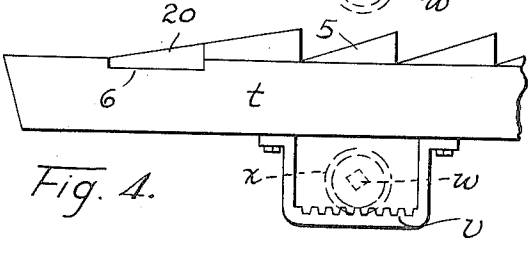


Fig. 4.

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AUTOMATIC FURNACE-STOKER.

1,180,737. Specification of Letters Patent. Patented Apr. 25, 1916.

Application filed October 23, 1915. Serial No. 57,389.

To all whom it may concern:

Be it known that I, ELIAS REES, who am a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Automatic Furnace-Stokers, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to automatic furnace stokers and has for its object oscillating devices within the furnace itself, which are not only adapted to progressively carry the burning coal from the front to the rear of the furnace, but also act as twyers to provide the air for combustion. The mechanism which oscillates these devices also serves to oscillate an additional apparatus for forcing the ashes and clinkers to a point where they may be easily removed. These general statements of the nature of the invention will be more readily understood after the detailed description which follows has been read.

In the drawings,—Figure 1 is a vertical longitudinal section of a furnace showing in elevation the fuel shifting apparatus located in the furnace and in the feed hopper. Fig. 2 is a front view of the boiler showing at the left hand the attachments thereto in elevation and at the right hand showing the hopper and the coal shifting devices on the section line B—B of Fig. 1. Fig. 3 is a longitudinal vertical section of one of the fuel shifting devices showing how the twyer caps are assembled. Fig. 4 is a fragmentary side elevation of one of the fuel shifting devices showing by comparison with Fig. 3 the rack by which the same is driven located below the driving pinion instead of above, so as to cause travel in a direction contrary of alternate fuel shifting devices. Fig. 5 is a cross section through the fuel shifting devices and air ducts. Fig. 6 is a cross section through one fuel shifting device and air duct and more particularly a section taken on the line C—C of Fig. 3. Fig. 7 is a detail of the upper end of the connecting rod whose lower end carries the eccentric strap.

The boiler is designated *a*, the furnace *b*, the feed hopper *d*, (Fig. 1). Coal can be dumped into the feed hoppers *d*, but here it would soon choke and not be delivered throughout the furnace where it can be burned, were it not for the shifting devices. These shifting devices comprise a plurality of oscillating bars, alternate bars of which oscillate at a given moment in contrary directions. In Fig. 2 I have shown those bars as four in number and they are designated *t*. One bar is provided with downwardly-projecting teeth of a rack *u* (see Fig. 3) while the next adjacent bar is provided with upwardly-projecting teeth of a rack *v* (see Fig. 4). A cross shaft *w* (see Fig. 5) is provided with a plurality of pinions *x* which mesh with these two differently disposed racks. It will, of course, be understood that by reason of the location of some of the racks above and some below the pinions the two groups of the bars will be oscillated at any given time in opposite directions. This cross shaft *w* is a rocking shaft. The rocking is imparted to it by a rocker arm *y* (Fig. 1) which is connected by a screw and nut adjustable connection *z* (detailed in Fig. 7) to the connecting rod 1 which at the other end is provided with an eccentric strap 2 which engages around the eccentric 3 on the drive shaft *q*.

Rollers 4, 4 are provided in the furnace for supporting the shifting bars and allowing their sliding movement. The open tops of the channeled lower portions of these shifting bars are covered with a plurality of castings which form caps similar in general arrangement to ratchet teeth. Each casting comprises three cap formations or ratchet teeth 5. These cap formations are hollow and form twyer caps while the block 20 is solid and adapted to receive a screw bolt (Fig. 3) by which it may be bolted into its seat in the shifting bar *t*, that seat comprising a notch 6. The sides of the twyer caps of the castings are grooved to slide (the notch 6 allowing the castings 5 to be started onto the tracks) in the inwardly projecting flanges 7, (Fig. 5) of the shifting bars, these flanges forming tracks upon which the grooved twyer cap portions may be slid. The purpose of this kind of an assembly is to allow the disassembling of the twyer caps to replace those that may become broken or burnt out.

Another feature is that one shifting bar can be removed to replace a casting with-

out stopping the operation of the furnace. The pinion x being slidable on the shaft w, may be driven to one side on the rock shaft w, the bar slid toward the rear of the furnace and then the front end of the bar raised until level with the door 21. Where the bar is one of those with the upwardly directed teeth, the yoke-like rack will have to be first removed from the bar. The whole bar may then be drawn out and the worn out or broken casting replaced and the bar reinserted.

It will be noted that the shifting bars are hollow and in connection with the caps 5 form tubes which serve as air ducts. The hollow shifting bars extend to the front of the feed hoppers d and into the air boxes 8 which are open at the bottom for the entry of air. The consequence of this arrangement is that the air is drawn into the air boxes, into the hollow shifting bars or air ducts and is delivered through the twyer caps which have openings 9 (Fig. 6) at the front of the caps or teeth. It is advantageous to have these twyer openings at the front of the teeth and on the vertical wall of the same for it is apparent that they will be kept much freer than would be the case if they were horizontally disposed where the ashes and clinkers and burning coal would fall upon them. They are also directed in the direction of the draft through the furnace. When these shifting bars and air ducts are vibrated the fuel will be shaken forward on the gradually sloping backs of the ratchet teeth but it cannot travel backward on account of the steep fronts of the ratchet teeth or caps. The result is that it is made to gradually travel forward in the furnace until it reaches the back of the same adjacent the bridge wall 10 that leads into the combustion chamber. By this time practically all the combustible products have been taken out of the fuel and it drops from the end of the vibrating bars in the form of ash or clinkers onto the ash and clinker propeller 11. This comprises a ratchet tooth block in the form of the segment of a cylinder which extends clear across the furnace at its rear. This is oscillated by a connecting rod 12 which runs to the front of the furnace where it connects with a depending rocker arm 13 that is fixed on the cross rocker shaft w (see Fig. 2). This ash and clinker propeller serves to propel the ash and clinkers down the gradually sloping ash and clinker slide-way 14 which brings the ashes to the forward end of the furnace where they may be easily taken out. Below the shifting bars t and above the ash and clinker slide-way 14 are located a pair of swinging air gates 15, the purpose of which is to prevent the air being drawn under the shifting bars through the ash chamber and thereby checking the draft through the fuel. These swinging air gates, however, can swing to allow the ashes to be propelled forward through them.

What I claim is:

1. In an automatic stoker, the combination of a plurality of vibratory bars, a furnace in which the same are contained, an ash and clinker propeller located below and at the rear end of said bars and comprising an oscillated segment of a cylinder provided with teeth for propelling the ashes and clinkers down the slide-way.

2. In an automatic stoker, the combination of a plurality of vibratory hollow bars provided with notches and provided at the tops with in-turned flanges forming tracks at the top, and castings forming one or more sets of twyer caps, having grooved sides adapted to slide into the flanges of the hollow bars, and blocks for fitting into notches of the bars to hold the assembled twyer caps.

3. In an automatic stoker, the combination of a furnace chamber, a feed hopper secured to the front thereof, an air box secured to said feed hopper, a door in said feed hopper, a plurality of oscillatory grate bars, and disconnectible driving connections for oscillating said plurality of grate bars, whereby the grate bar or grate bars may be disconnected from the driving connections and taken out of the furnace through the door in the hopper for repair.

4. In an automatic stoker, the combination of a plurality of oscillatory grate bars, means for supporting the same to allow them to oscillate, the said grate bars being provided alternately with oppositely facing racks, and a cross shaft having a rocking movement and provided with a plurality of pinions which mesh with the oppositely faced racks to give the grate bars opposite movements at a given moment.

5. In an automatic stoker, the combination of a plurality of grate bars, bearings therefor to allow oscillation of the grate bars, said grate bars being provided alternately with oppositely faced racks, a cross shaft arranged to rock, a plurality of pinions on the cross shaft engaging with the oppositely faced racks, a rocker arm secured to said cross shaft, and a connecting rod for oscillating the rock shaft, having an adjustable connection lengthwise of the rock arm to alter the arc of rocking movement of the cross shaft.

6. In an automatic stoker, the combination of a furnace chamber, a plurality of grate bars extending upwardly from front to rear and having ratchet teeth at the top to force the coal to the rear, a slide-way from front to rear of the furnace chamber, high at the rear and low at the front, an ash propeller wholly located at the rear of the furnace chamber and at the end of the

oscillatory grate bars and the rear of the slide-way, the said ash propeller adapted to force the ashes down the inclined slide-way to the front of the furnace.

7. In an automatic stoker, the combination of a furnace chamber, a plurality of oscillatory grate bars sloping upwardly from front to rear, an ash slide-way sloping downwardly from rear to front and under the said grate bars, an ash propeller located at the rear of said ash slide-way and at the rear of said grate bars, and one or more air gates coöperating with the ash slide-way to allow passage of the ashes to the front but closing when force is exerted on the front of said air gate or gates.

In testimony whereof, I sign this specification.

ELIAS REES.