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E. J. HART.
AUTOMATIC STOKER.
APPLICATION FILED MAY 26, 1917.

Patented Aug. 5, 1919.
4 SHEETS—SHEET 1.

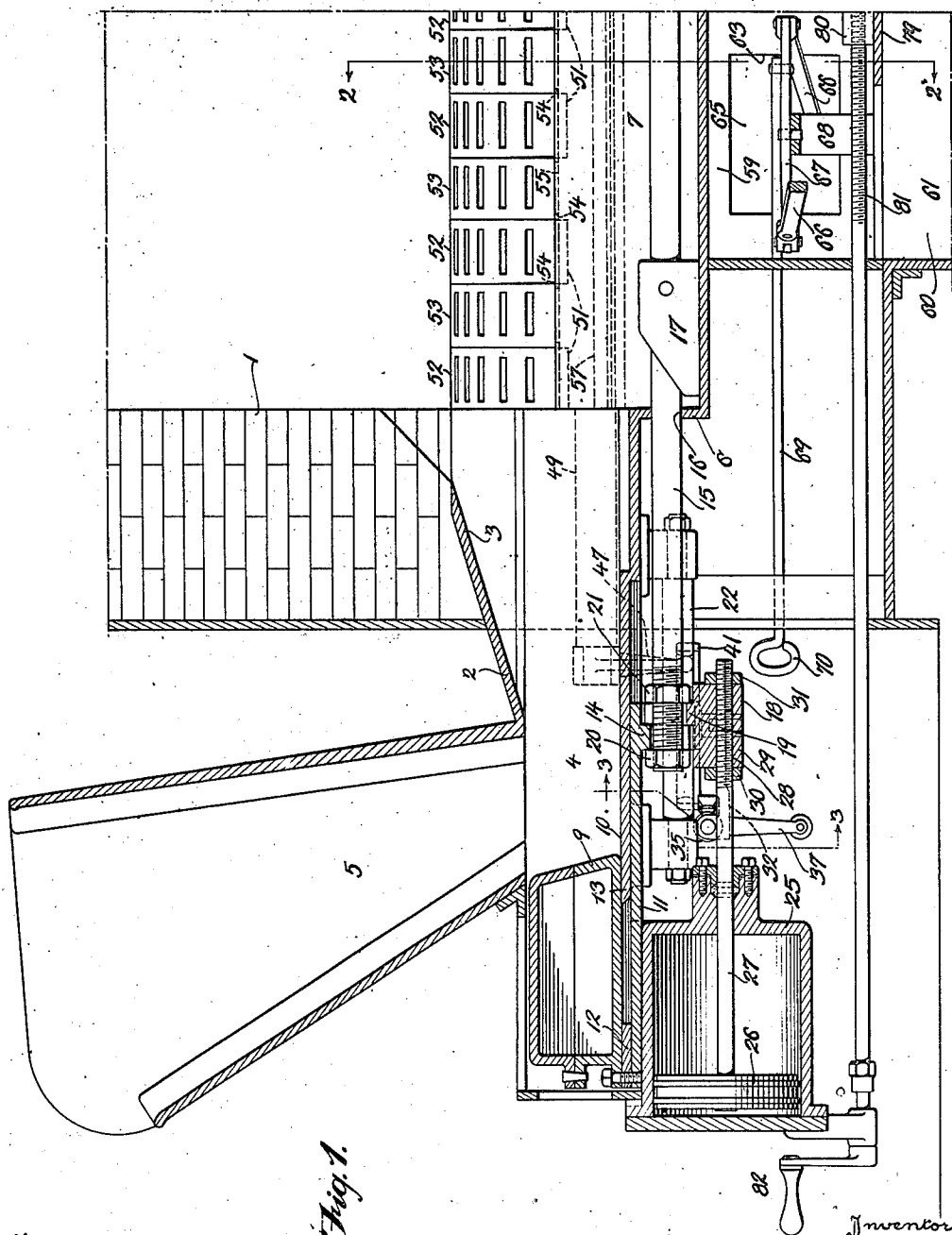


Fig. 1.

Witnesses

H. Hamwood.
C. R. Ziegler.

Edwin J. Hart.

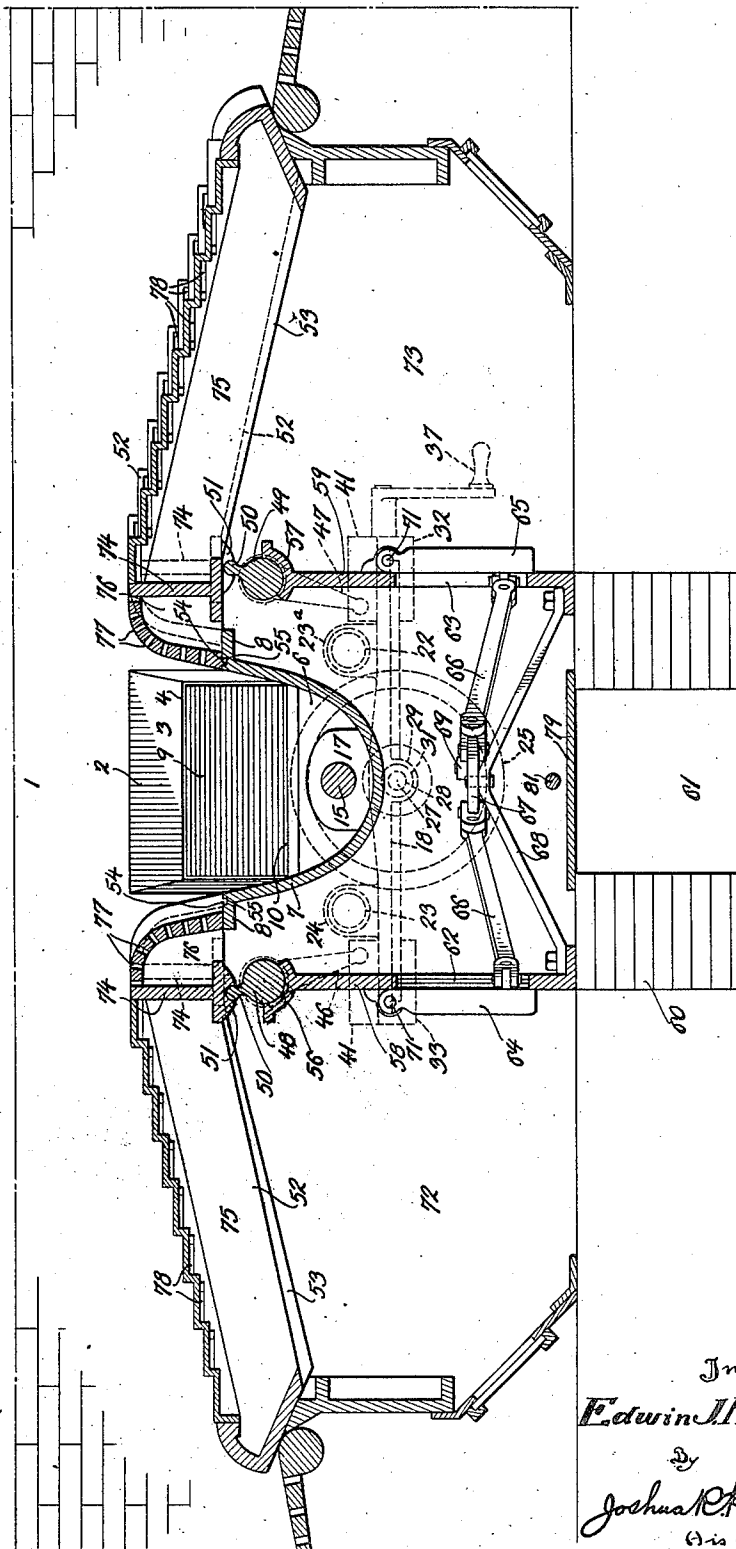
By Joshua R. H. Potts.
His Attorney

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Fig. 2.



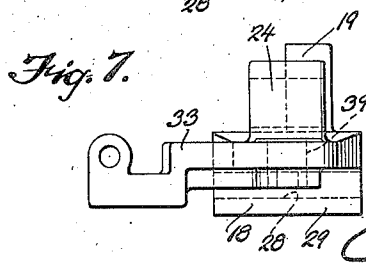
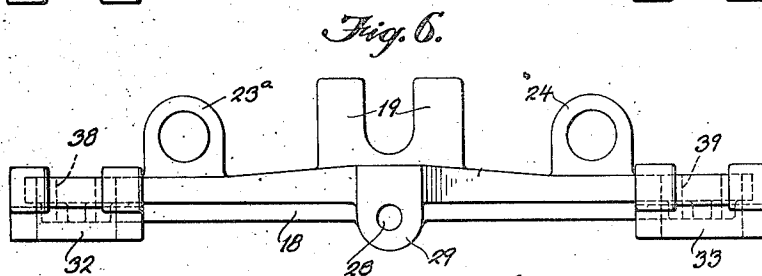
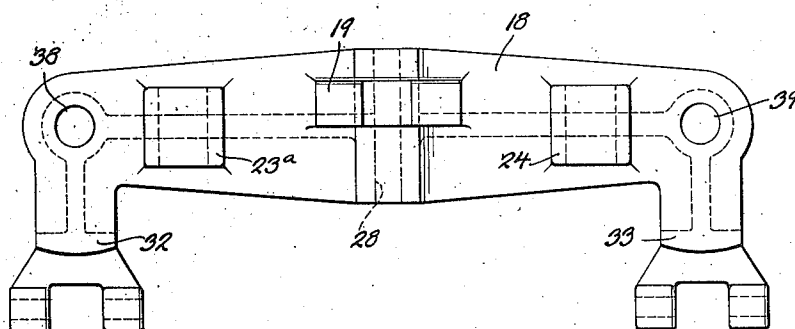
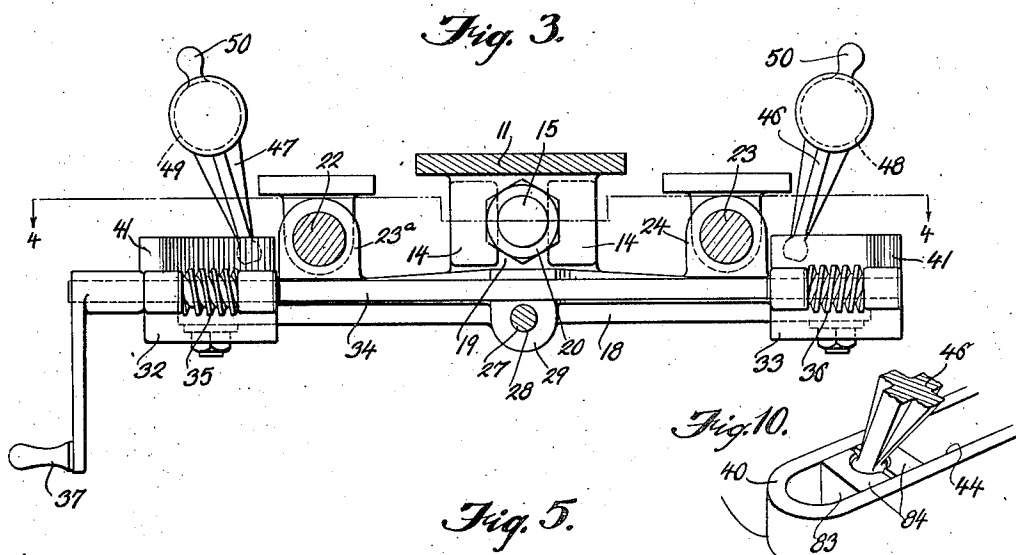
Witnesses
C. F. Hamwood
C. R. Ziegler.

Inventor
E. J. Hart.
By
Joshua K. H. Potter
His Attorney

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4 SHEETS—SHEET 3.



Witnesses
H. R. Harwood
C. R. Ziegler

Inventor
Edwin J. Hart
By
Joshua H. Potts
His Attorney

UNITED STATES PATENT OFFICE.

EDWIN J. HART, OF PHILADELPHIA, PENNSYLVANIA.

AUTOMATIC STOKER.

1,312,397.

Specincation of Letters Patent.

Patented Aug. 5, 1919.

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To all whom it may concern:

Be it known that I, EDWIN J. HART, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Stokers, of which the following is a specification.

My invention consists of an improved automatic stoker. One object of my invention is to provide a stoker including a fuel-injecting pusher, means for raising the injected fuel to the grate bars, and means for actuating the grate bars, and to operate all of said elements directly from a reciprocable cross head.

Another object is to so make the connection of said elements to said cross head that they will be of simple construction and can be quickly and easily attached and detached.

A further object is to provide improved means for varying the amount of movement of the grate bars.

A still further object is to provide an improved construction and arrangement of fuel injecting passage and receiving trough whereby the jamming of the fuel is prevented and an even movement of the fuel is insured.

These objects, and other advantageous ends which will be described hereinafter, I attain in the following manner, reference being had to the accompanying drawings in which—

Figure 1 shows a sectional elevation of my improved stoker, said section being taken longitudinally through the center thereof.

Fig. 2 is a transverse section of my improved stoker taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged transverse section taken on the line 3—3 of Fig. 1 and showing my improved cross head and certain of the elements which are actuated directly therefrom.

Fig. 4 is a fragmentary sectional plan view taken on the line 4—4 of Fig. 3.

Fig. 5 is a top plan view of my improved cross head.

Fig. 6 is a front elevation of Fig. 5.

Fig. 7 is an end elevation of the cross head.

Fig. 8 is a top plan view of an adjustable cam arm which forms a part of my invention.

Fig. 9 is a section on the line 9—9 of Fig. 8.

Fig. 10 is a fragmentary perspective view showing a modification of certain of the elements of my invention.

Referring to the drawings, 1 represents the wall of a furnace having a casing 2 set therein, said casing having a sleeve portion 3 which fits an opening within the wall 1 and flared inwardly as clearly shown in Fig. 1.

This casing 2 provides a fuel injecting passage 4 which has a hopper 5 leading thereto. The casing 2 adjacent the inner surface of the wall 1, has a depending portion 6 which forms a drop from the fuel injecting passage 4 to a trough 7 which extends longitudinally through the furnace. This trough has its sides flared upwardly as clearly shown in Fig. 2 and each side terminates in a flange 8 at the top thereof.

A fuel injecting pusher 9 is designed to slide upon the bottom surface 10 of the passage 4 and is secured to a plate 11, a block 12 being interposed between the plate 11 and said pusher, it being noted that the end 13 of the bottom of said passage 4 terminates forward of the block 12 which permits a sliding movement of said fuel injecting pusher 9 under the hopper 5 to push fuel which is fed therethrough into the inner portion of the passage 4 and eventually into the trough 7 in a manner hereinafter more fully described.

The plate 11 has a depending fork 14 which has prongs spaced apart to embrace the outer end of a rod 15 which is slidably movable through a hole 16 in the depending portion 6 of the casing 2. The rod 15 moves longitudinally within the trough 7 and has secured thereto fuel raising members 17 only one of which is illustrated in the drawing, but it will be understood that the number of these members 17 will vary in proportion to the length of the furnace and may be spaced apart at desirable intervals.

A cross head 18 has an upwardly projecting fork 19, the prongs of said fork being designed to embrace the outer end of the rod 15, together with the fork 14 on the plate 11. Nuts 20 and 21 on the rod 15 are designed to engage the forks 14 and 19 respectively. Guide bars 22 and 23 are mounted in suitable bearings supported by the casing 2, and on these guide bars slide the cross

head 18, it being noted that said cross head has lugs 23^a and 24 through which said guide bars 22 and 23 extend.

A cylinder 25 has a piston 26 operative therein by steam or other fluid pressure, and this piston has a connecting rod 27 which extends through a hole 28 in a lug 29 on the cross head 18, nuts 30 and 31 being provided to secure said piston rod to the cross head.

The cross head 18 has forwardly projecting arms 32 and 33 (see Figs. 3 to 7 inclusive). These arms are bifurcated at their forward ends and form bearing supports for an adjusting rod 34 which has two worms 35 and 36 secured thereto. The worm 35 is located between the bifurcations of the arm 32 and the worm 36 is located between the bifurcations of the arm 33.

A hand lever 37 is secured to said rod 34 so that the latter can be rotated for a purpose hereinafter described. Pivot holes 38 and 39 are formed in the opposite ends of the cross head 18, and through each of these pivot holes extends a pivot pin 40 which depends from an adjustable cam or cam arm 41.

Each cam arm 41 has a segment 42 including a row of teeth 43 designed to engage with a respective worm 35 or 36 as clearly shown in Fig. 4, it being noted that the teeth 43 are arranged in an arc concentric with the pivotal axes of the pivot pins so that by rotation of the worms 35 and 36, the cam arms 41 will be swung on their pivot pins 40 in opposite directions.

It will be noted that the pitch of the worms 35 and 36 extend in opposite directions, so that by rotating the rod 34, the arms 41 will be simultaneously rotated in opposite directions.

In Figs. 1 to 9 inclusive, the arms 41 have elongated slots 44, in which are fitted bushings 45. Rocking arms 46 and 47 have their lower end portions designed to extend within the slots in the cam arms 41. These rocking arms 46 and 47 are secured respectively to rock shafts 48 and 49. The rock shafts have extensions 50 designed to fit within recesses in depending portions 51 on grate bars 52, so that when the arms 46 and 47 are rocked, the grate bars 52 will also be moved longitudinally to agitate the fuel carried thereby.

It will be noted that other grate bars 53 are provided which, as illustrated, alternate with the grate bars 52 and these grate bars 53 are not movable, but on the contrary have lips 54 which extend within grooves 55 in the flanges 8 at the tops of the trough 7.

By turning the cam arms 41, through the medium of the hand lever 37 and worms 35 and 36 so that the slots are positioned at an angle as illustrated in Fig. 4, it will be noted that if the cross head 18 is moved

longitudinally of the furnace, the arms 46 and 47 will be oscillated to rock the rock shafts 48 and 49 and thereby actuate the grate bars 52. The extent of this rocking movement can be varied by changing the angular positions of the cam arms 41. This can be easily done by rotating the adjusting rod 34.

The rock shafts 48 and 49 are mounted in bearings 56 and 57 respectively, the latter being positioned at the tops of walls 58 and 59. These walls are supported upon a base 60 including an air inlet passage 61 which communicates with a space between the walls 58 and 59. Openings 62 and 63 are provided in the walls 58 and 59, and these openings can be closed by doors 64 and 65.

Each of the doors 64 and 65 has an arm 66 connected thereto and these arms 66 are pivotally connected to a toggle lever 67 which is pivotally supported on a bracket 68. A hand-operated rod 69 is pivotally connected to the toggle lever 67 and extends to the outer portion of the casing 2 where it is provided with a handle 70 so that by movement of the rod 69 longitudinally, the doors 64 and 65 will be moved on their hinges 71 into an open or closed position according to the direction of movement of said rod 69.

Chambers 72 and 73 are provided below the grate bars at the outside of said walls 58 and 59. Each of the grate bars 52 and 53 has a partition 74 which divides the grate bar into two separate compartments 75 and 76 (see Fig. 2). The partitions 74 are positioned above the rock shafts 48 and 49 so that the partitions, the rock shafts, and the walls serve to isolate the chambers 72, 73, and compartments 75 of the grate bars from the compartments 76 and the space between the walls 58 and 59, so that air passing upwardly between the walls 58 and 59 cannot pass to the compartments 75 other than through the openings 62 and 63 and this amount of opening can be regulated by the position of the doors 64 and 65.

The portions of the grate bars providing the compartments 76 are perforated as shown at 77, so that all of the air passing into said compartments 76 will pass outwardly through the perforations 77 into the fuel as it is raised from the trough 7 onto the tops of the grate bars. The portion of the air which passes through the openings 62 and 63 will enter the compartments 75 and pass outwardly through perforations 78 in the fuel supporting tops of the grate bars which are shown in an inclined stepped form in the accompanying drawings.

The amount of air passing upwardly through the inlet passage 61 can be regulated by a damper 79 which has a screw-threaded lug 80 into which fits a threaded portion of a rotatable rod 81, said rod extending to the outer portion of the casing 2 and is pro-

vided with a hand lever 82 whereby the rod 81 can be rotated and the damper 79 will be caused to travel across the top of the inlet passage 61 to control the amount of air passing upwardly between the walls 58 and 59.

It will thus be understood that with my improved stoker, the cross head 18 directly controls the movement of the fuel injecting pusher 9, the fuel raising members 17 and rod 15, and means for actuating the grate bars. Furthermore, the construction of the several parts is such that they may be connected or disconnected from the outside of the casing.

In operation, the piston rod 27 reciprocates the cross head 18 and the fuel injecting pusher 9 pushes the fuel along the passage 4 and into the trough 7. At the same time, the rod 15 is reciprocated by the cross head 18 to agitate the fuel within the trough 7 and to raise it to the top level of the grate bars. Simultaneous with this action, the cam arms 41 which are mounted on the cross head 18 are reciprocated, and by the angular disposition of the slots 44, the rocking arms 46 and 47 effect the movement of the grate bars.

In the form of my invention shown in Fig. 10, instead of having the lower end of the rocking lever 46 extend directly into engagement with the adjusting cam arm, I provide a block 83 which slides within the slot in the cam arm. The block 83 is preferably made in two sections 84 which are recessed to receive the lower end of the rocking lever 46, thus instead of having the wear come directly on the end of the rocking lever, the block 83 will wear and can be quickly replaced from time to time.

While I have described my invention as taking a particular form, it will be understood that the various parts of my invention may be changed without departing from the

spirit thereof, and hence I do not limit myself to the precise construction set forth, but consider that I am at liberty to make such changes and alterations as fairly come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination in a stoker of a plurality of sets of grate bars; rock shafts adapted to respectively rock grate bars of each set, a cross head, adjustable cams on said cross head and adapted to oscillate the respective rock shafts due to the reciprocation of the cross head, said cams having rows of teeth thereon, a common adjusting rod, and worms on said adjusting rod for respective engagement with the teeth of said cams for simultaneously adjusting said cams when the adjusting rod is actuated, substantially as described.

2. The combination in a stoker, of grate bars, a reciprocable cross head, a rock shaft operative to actuate said grate bars, an arm on said rock shaft, a worm, a cam movably mounted on said cross head and having worm teeth meshing with said worm, said cam having a portion adapted to effect the movement of the arm on said rock shaft to actuate the grates when the cross head is reciprocated, said cam being operated by the movement of said worm to change the angular position of said portion to vary the oscillating movement of said arm, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWIN J. HART.

Witnesses:

JOSHUA R. H. POTTS,
CHAS. E. POTTS.