No. 859,151. PATENTED JULY 2, 1907.

H. P. TIPPETT.

FURNACE FEEDING DEVICE.

APPLICATION FILED MAR. 26, 1906.

3 SHEETS—SHEET 1.

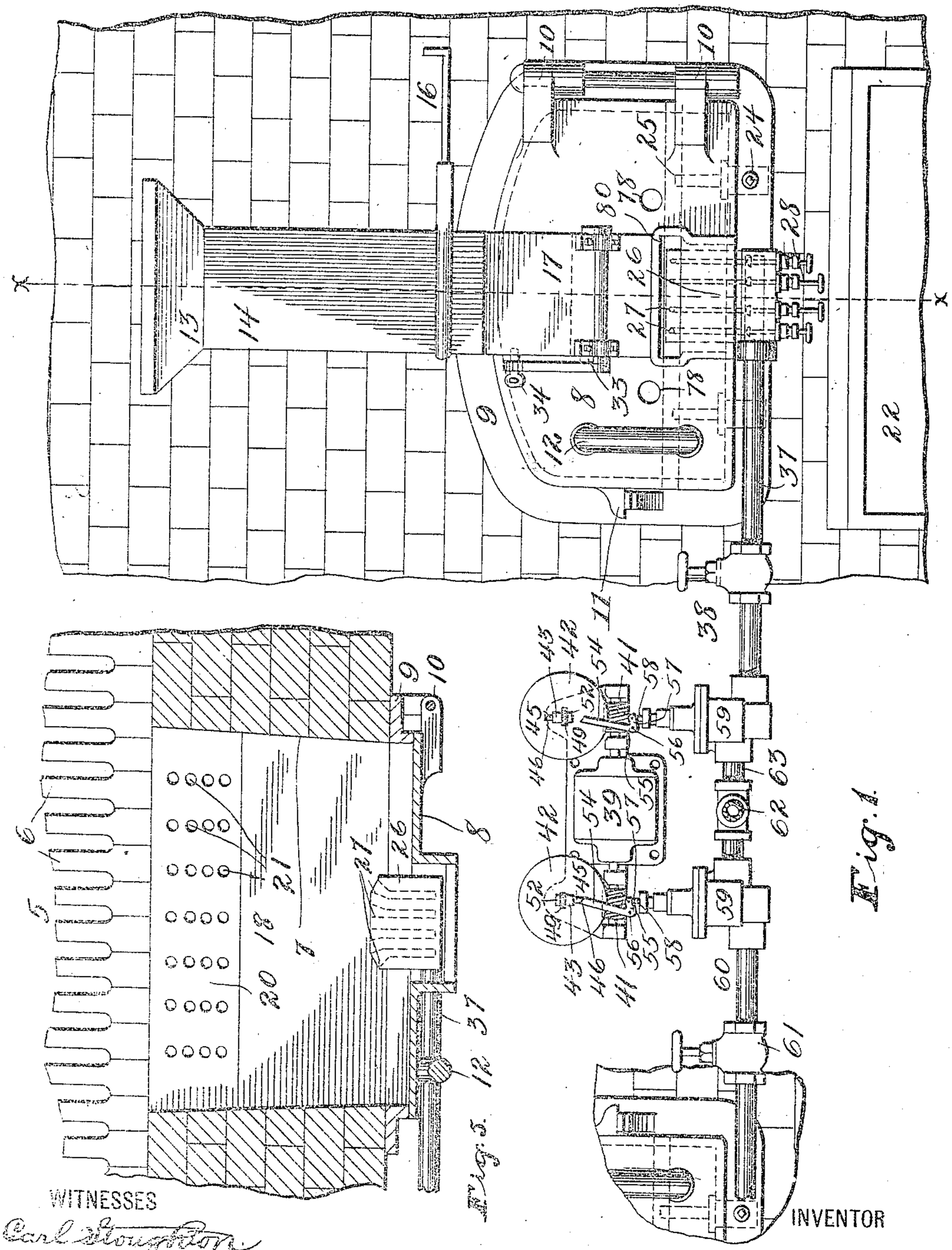

Fig. 1.

Fig. 5.

WITNESSES

Earl Stoughton.

Frank E. Campbell.

INVENTOR

Harold P. Tippett.

BY

Shepherd & Parker

ATTORNEYS.

No. 859,151. PATENTED JULY 2, 1907.

H. P. TIPPETT.

FURNACE FEEDING DEVICE.

APPLICATION FILED MAR. 26, 1906.

3 SHEETS—SHEET 2.

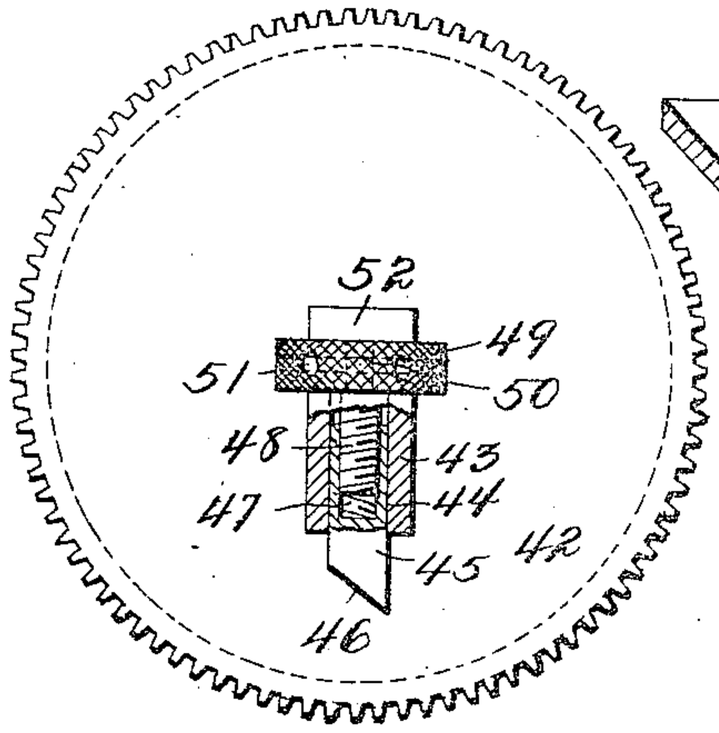

Fig. 4.

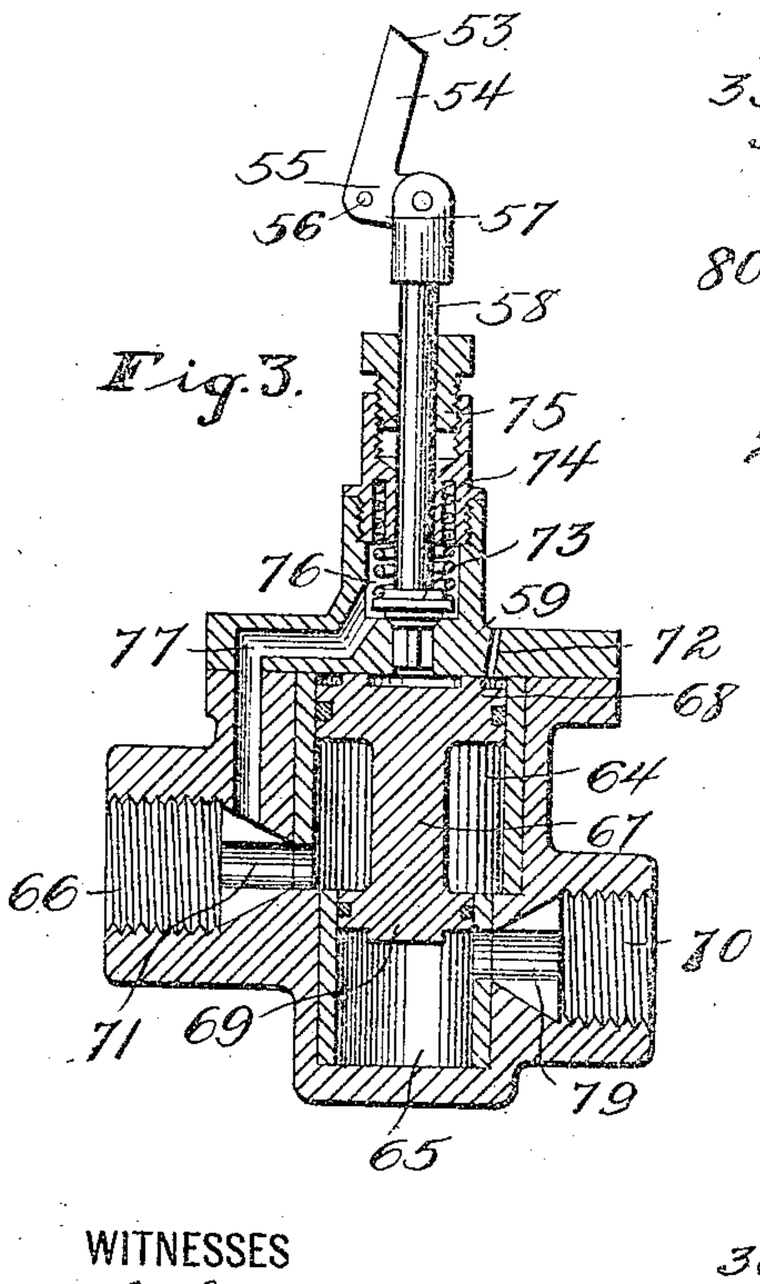

Fig. 3.

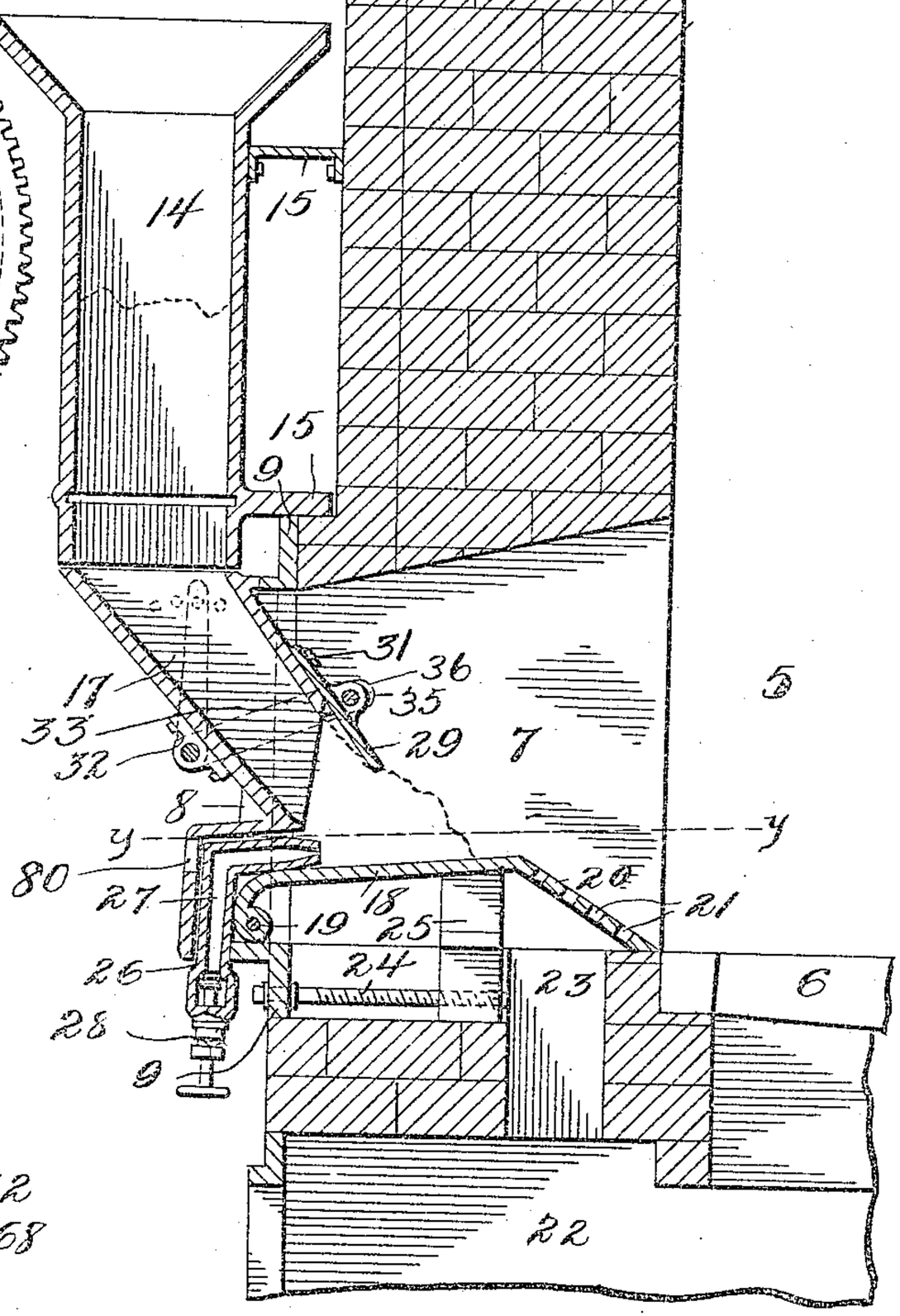

Fig. 2.

Fig. 6.

WITNESSES

Carl Stoughton.

Frank G. Campbell.

INVENTOR

Harold P. Tippett.

BY

Shepherd & Parker

ATTORNEYS

No. 859,151. PATENTED JULY 2, 1907.

H. P. TIPPETT.

FURNACE FEEDING DEVICE.

APPLICATION FILED MAR. 26, 1906.

3 SHEETS—SHEET 3.

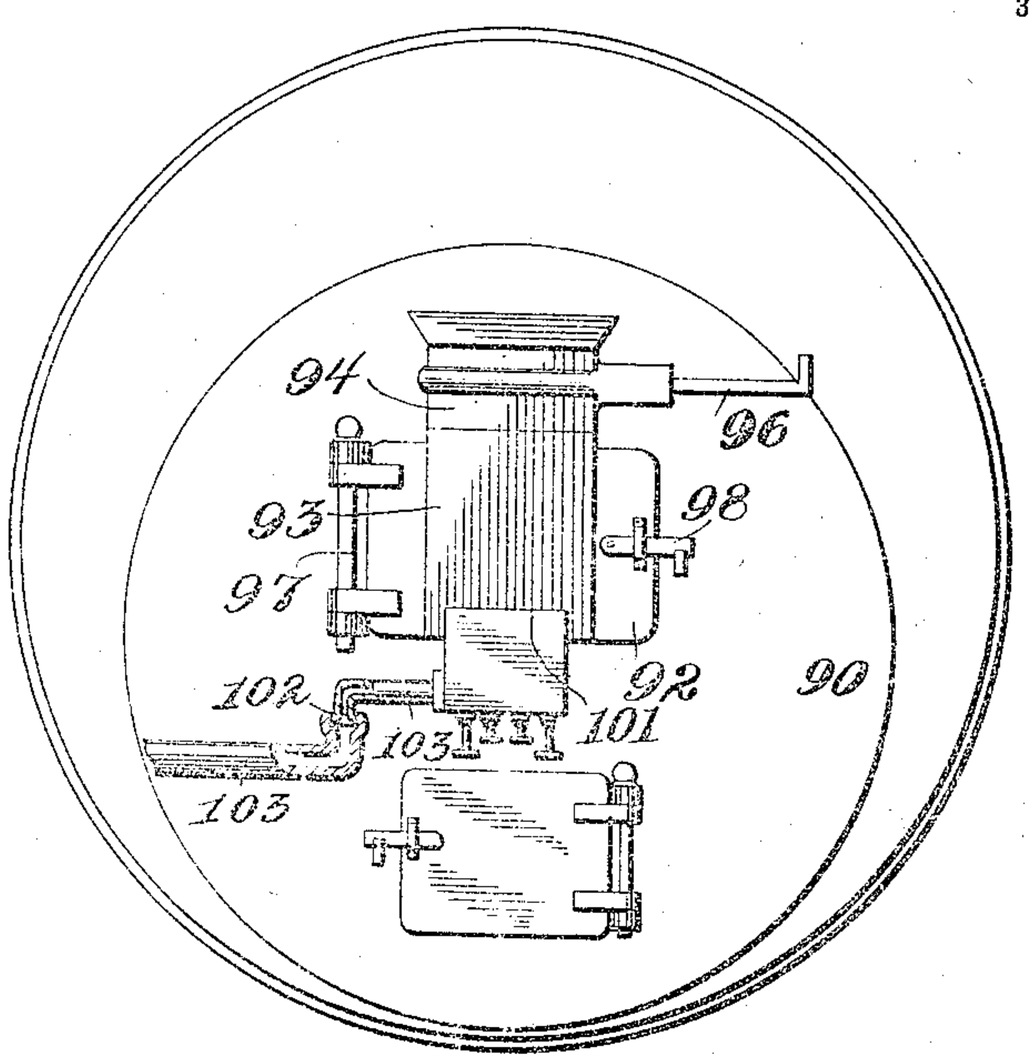

Fig. 7.

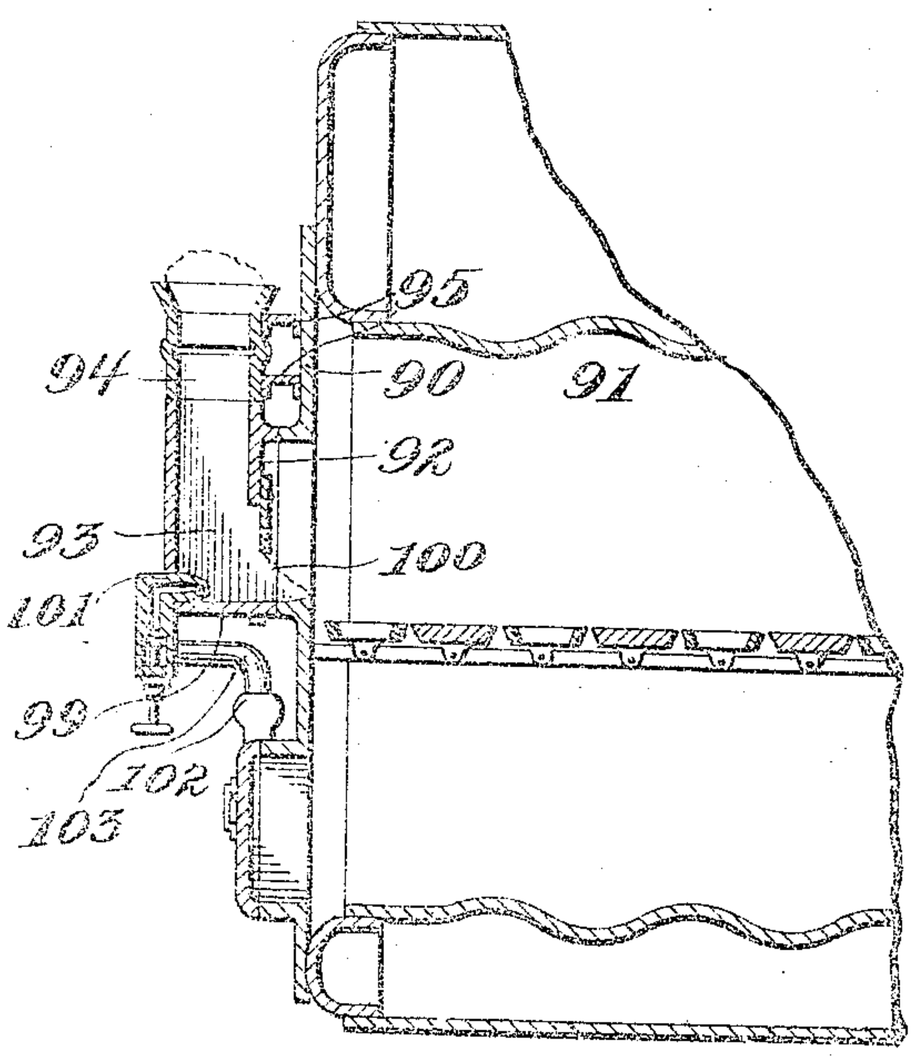

Fig. 8.

WITNESSES

Carl Stoughton

Frank E. Campbell

INVENTOR

Harold P. Tippett

BY

Shepherd & Parker.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

HAROLD P. TIPPETT, OF COLUMBUS, OHIO.

FURNACE-FEEDING DEVICE.

No. 859,151. Specification of Letters Patent. Patented July 2, 1907.

Application filed March 26, 1906. Serial No. 307,952.

To all whom it may concern:

Be it known that I, HAROLD P. TIPPETT, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Furnace-Feeding Devices, of which the following is a specification.

My invention relates to a furnace feeding device, and has for its object the provision of improved means for continuously maintaining a supply of fuel at the mouth of the furnace and for intermittently discharging any desired amount of said fuel into said furnace.

A further object of the invention is the provision of simple means for supplying coal to a furnace in such manner as to continuously maintain a supply of fuel at the mouth of the furnace, said means comprising an unobstructed chute leading into the mouth of the furnace, the fuel which fills said chute forming an air-seal to preserve the draft of the furnace.

A further object of the invention is the provision of improved means for continuously maintaining a supply of fuel at the mouths of a plurality of furnaces and for alternately admitting fluid under pressure to said furnaces, in such manner as to distribute a portion of said fuel over the grates.

A further object of the invention is the provision of an improved blast for discharging fuel into a furnace, together with means for regulating both the force and duration of said blast, said means permitting the regulation of the force of the blast independent of the duration thereof and also permitting the regulation of the duration of the blast independent of the force of said blast.

A further object of the invention is the provision of a furnace having improved coal receiving means, which may be adjusted to any desired angle to thereby direct the coal at a corresponding angle.

A further object of the invention is the provision of an improved blast for scattering fuel over the grates of a furnace, together with means for mixing a certain amount of air and steam with the products of combustion when said blast takes place.

Further objects and advantages of the invention will be set forth in the detailed description which now follows.

In the accompanying drawings: Figure 1 is a front elevation of a portion of a furnace having my invention applied thereto; Fig. 2 is a vertical section upon line *x x* of Fig. 1; Fig. 3 is a detail sectional view of a blast controlling valve hereinafter described; Fig. 4 is a detail view of a worm wheel and trip finger hereinafter described; Fig. 5 is a horizontal section upon line *y y* of Fig. 2; Fig. 6 is a detail plan view of a regulating door hereinafter described; Fig. 7 illustrates a furnace feeding device embodying the principles of my invention, secured to the plate which closes the mouth of one of the furnaces of a Scotch marine boiler, said furnace feeding devices lying entirely upon the exterior of the furnace, and Fig. 8 is a vertical section of the parts illustrated in Fig. 7.

Like numerals designate corresponding parts in all of the figures of the drawings.

Referring to the drawings the numeral 5 designates the fire box of a furnace, and 6 designates the grates thereof. The opening 7 which forms the mouth of the furnace is adapted to be closed by a door 8. This door is hinged to the usual door frame 9 by hinges 10 and is provided with the usual latch 11 and handle 12. A hopper 13 is continued downwardly to form a chute 14, said chute and hopper being secured to the face of the furnace by braces 15. A slide 16 which is slidably disposed in the chute serves to close said chute and forms either a damper or a fuel retarding device as may be desired. An inclined portion 17 of the chute is carried by the door and swings outwardly with said door when the latter is opened. A fuel receiving plate or table 18 is pivoted at 19 in the mouth of the furnace and has its surface inclined slightly upward as is clearly illustrated in Fig. 2. A downwardly inclined portion 20 of this table rests upon the bottom of the mouth of the furnace and has a series of perforations 21 formed therein. The space beneath this plate 18 is in communication with the ash pit 22 through an opening 23. A screw 24, the head of which is journaled in the door frame 9 is threaded into a sliding wedge 25 and is adapted to impart bodily movement to said wedge when turned. The upper face of the wedge contacts with the under face of the plate 18. It will be readily understood that by moving the wedge through the medium of the screw, the angle of the plate 18 may be readily adjusted. A nozzle 26 is located in the mouth of the furnace directly beneath the mouth of the chute and is provided with a plurality of jet openings 27 which are directed in such manner as to throw fuel to all parts of the fire box as will be hereinafter described. Valves 28 control the flow of fluid to these jet openings, there being one of these valves for each jet opening, so that the flow of fluid through each jet opening may be regulated independently of the flow of fluid through the other jet openings. It is a well known fact that steam boilers possess individual characteristics, in other words, one boiler will burn fuel faster at one side of the grate than at the other, while in another boiler the reverse may be the case. By adjusting the valves 28 to give the proper blast through the jet openings 27, the peculiarities of each boiler may be accommodated.

The amount of fuel thrown into the furnace will be determined by the strength of the blast, the duration of the blast and the amount of fuel upon the fuel receiving plate 18. A plate 29 having slots 30 formed therein is slidably mounted at the mouth of the chute. Bolts 31 which pass through the slots 30 and are screwed into the wall of the chute, serve to retain this plate in position.

Pivotally mounted in bearings 32 is a bell crank lever 33, one arm of which carries a pin 34 and the other arm of which is slotted for the reception of a pin 35 which passes through ears 36 carried by the plate 29. The pin 34 is adapted to engage recesses or openings 40 formed in the wall of the portion 17 of the chute. This bell crank lever provides means controllable from the exterior of the furnace for adjusting the degree to which the lower edge of the plate 29 projects below the upper wall of the chute and consequently determines the size of the pile of coal which lies upon the plate 18 and in front of the nozzle. Fluid under pressure and preferably steam, though air may be employed if desired, is supplied to the nozzle 26 through a pipe 37. An ordinary globe valve 38 controls the force of the blast through this pipe. For controlling the time and duration of the blast, I have provided the motor and valves shown at the left of Fig. 1. Fixed upon the shaft of the motor 39 which may be of any desired type, are worms 41 which mesh with and impart motion to worm gear wheels 42. Secured to the faces of these worm gear wheels are sleeves 43 having angular openings 44 formed therethrough. Slidably disposed in these angular openings are trip fingers 45 having their lower ends beveled as at 46. These trip fingers are internally threaded as at 47 for the reception of screws 48. Secured to the upper ends of these screws by pins 49 are disks 50 having openings 51 formed therein for the reception of a suitable tool. Lugs 52 which are carried by the worm gear wheels 42 overlie the upper portions of the disks 50 and together with the screws and sleeves 43 hold said disks in place.

It will readily be understood that when rotation is imparted to the disks 50 by a tool inserted in the openings 51, the action of the screw 48 will move the finger 45 in the sleeve 43 to enable any desired adjustment of said finger to be secured, as will hereinafter be described. The beveled ends of the trip fingers 45 are adapted to contact with the beveled upper ends 53 of the longer arms 54 of bell crank levers 55. These bell crank levers are pivoted as at 56 and have their short arms 57 secured to the upper ends of a valve stem 58, the movement of which controls the flow of fluid through the valve casing 59 as will be presently set forth. Two of these controlling valves have been indicated at the left of Fig. 1, one of the valves controlling the flow of fluid to the furnace therein indicated, and the other of said valves controlling the flow of fluid through a pipe 60 and globe valve 61 to a companion furnace, indicated. A main steam supply pipe 62 communicates with a branch 63 leading to the controlling valve casings. Since both of these fluid controlling valves are alike in construction and operation, it is necessary to describe but one of them. A detail sectional view of this valve has been illustrated in Fig. 3 and by referring to said figure, it will be seen that the valve casing is provided with a chamber 64 which communicates with a somewhat smaller chamber 65. The branch 63 of the steam supply pipe is threaded into the casing at 66 and admits steam to the chamber 64. Mounted for reciprocatory movement in this chamber is a valve which comprises a stem 67, a piston 68 carried by the upper end of said stem, and fitting snugly within the chamber 64, and a somewhat smaller piston 69 which is carried upon the lower end of the stem and fits snugly within he chamber 65. The pipe 37 is threaded into the valve casing at 70. Steam passes from the pipe 63 to the chamber 64 through a port 71. A comparatively minute exhaust port 72 leads from the upper portion of the chamber 64 to the exterior of the valve casing. Mounted upon the lower end of the valve stem 58 is a valve 73 which is normally held upon its seat by a spring 74. This valve stem passes through a suitable stuffing box 75 which is of the usual and well known construction and requires no further description. Steam passes to a chamber 76 in which the valve 73 is located, through a by-pass 77. Openings 78 formed through the door 8 permit the passage of suitable implements, such as a slash bar or fire hook through said door without opening the same.

The operation of the device is as follows: Fuel being fed into the chute 14 through the hopper 13 in any desired manner, rests in a pile upon the table 18 in front of the nozzles. The size of this pile may be determined by regulating the position of the plate 18 as has been hereinbefore described. The motor 39 having been set in motion, movement is imparted to the worm gear wheels 42, which rotate and carry the trip fingers 45 bodily around. When the beveled ends 46 of these trip fingers contact with the beveled ends 53 of the bell crank levers 55, said bell crank levers are rocked upon their pivots 56 to lift the valve stems 58. This results in lifting the valves 73 from their seats. Since the area of the underside of the piston 68 exceeds the area of the upper face of the piston 69, it follows that the pressure in the chamber 64 will when the valve 73 is seated, hold the main valve in the position illustrated in Fig. 3, at which time communication between the chamber 64 and the pipe 37 is closed by the piston 69. When the valve 73 is lifted from its seat against the tension of the spring 74 in the course of the rotation of the worm gear wheel 42, steam flows through the by-pass 77 and chamber 76 to the upper portion of the chamber 64. The pressure upon the upper surface of the piston 68 combined with the pressure upon the upper surface of the piston 69 is sufficient to overcome the pressure upon the underside of the piston 68 and causes the main valve to move downward with a very quick movement. This downward movement of the main valve brings the piston 69 below a port 79 and establishes communication between the chamber 64 and the pipe 37.

It will readily be understood that the duration of the blast may be determined by the adjustment of the tripping finger 45. If this finger be adjusted to such position that only the extreme point thereof contacts with the beveled ends of the bell crank levers 55, the blast will be of but a few seconds duration, while if this finger be adjusted to such position that practically the whole of the beveled surface of the lower end thereof contacts with the beveled upper end of the bell crank lever 55, the blast will be of considerable duration, for the gear wheels 42 revolve at a comparatively slow rate of speed. The fluid controlling valves herein set forth, are constructed to open so quickly, that the full force of the blast is received instantaneously at the nozzles. It will

readily be understood that if these valves opened slowly and the blast reached the pile of coal gradually, while the comparatively weak flow of fluid would start the coal moving, it would not carry it to the rear portion of the furnace, but said coal would bank up at the forward portion of said furnace. The quick opening of the valves herein set forth is a very important element in the successful operation of a device of this character. By referring to Fig. 1, it will be seen that the trip fingers 45 are arranged in such manner as to alternate the blasts at the furnaces. If these blasts occurred simultaneously, the force of the blast would be divided between the furnaces. By alternating the blasts the full force thereof is received at each furnace. When the trip finger 45 moves out of contact with the bell crank lever 55 (see Fig. 3) the spring 74 acts to force the valve 73 upon its seat. This closes communication between the chamber 76 and the upper portion of the chamber 64. The minute discharge opening 72 permits the escape of steam from the upper portion of the casing 64 at this time. The pressure having been removed from the upper side of the piston 68 the pressure upon the underside of said piston, acts to return the main valve to the position indicated in Fig. 3 to thereby cut off the blast.

It has been found that when the openings 21 are not provided in the portion 20 of the coal receiving plate, a partial vacuum is formed about said plate, which tends to destroy the direct action of the blast in throwing the coal into the furnace. The provision of the openings 21 and 23 corrects this evil and permits a direct undiverted action of the blast. An opening 30 formed through the door immediately in the rear of the nozzles and on a line with the jets thereof, permits air to be drawn into the mouth of the furnace when the blast occurs, the air, steam and products of combustion being mixed in the fire box.

It will of course be understood that more than two furnaces may be fed by the devices herein shown and described, for it requires but the proper timing of the action of the blast controlling valves to feed several furnaces as effectively as though only one furnace were being fed. The position assumed by the coal has been illustrated in dotted lines in Fig. 2, from which it will be seen that the coal contained in the chute, forms an effective air seal to preserve the draft of the boiler. When it is desired to open the furnace door for any reason, the slide 16 is shoved in to close the chute. The coal is then permitted to work out of the lower portion of the chute, after which the door may be opened.

The herein described furnace feeding device is particularly adapted for use with marine or stationary boilers, though it may also be applied to locomotive boilers if desired. When used in connection with marine or stationary boilers where a plurality of furnaces are to be fed, it provides means for controlling the rate of feed to one furnace independently of the rate of feed to the other furnaces. It will also be seen that the strength of the blast may be varied without affecting the duration thereof and that the duration of the blast may be varied without affecting the strength thereof.

The present invention provides simple, efficient and inexpensive means for feeding fuel to furnaces in a manner calculated to insure the best results. It is a well known fact that means for preventing the emission of an excessive amount of smoke from stacks located in cities have been long sought. The even alternate firing of the boilers produced by this device, will in a large measure prevent such excessive amount of smoke, for at no time is a large quantity of green fuel thrown upon the fire.

The two doors indicated in Fig. 1, may lead to separate furnaces; or they may lead to the same furnace or fire box and it is anticipated that this latter condition will usually exist. When the blast devices herein shown and described are located upon opposite sides of a fire box, it will be seen that one-half of the fire will always be in an incandescent state; in other words, while fresh fuel is being fed to one portion of the fire box, the coal which has previously been fed to the opposite side thereof, has an opportunity to catch and burn.

The furnace feeding device herein shown and described possesses a further advantage in the fact that should the blast devices fail for any reason, the door of the furnace may be opened in the usual manner to permit the furnaces to be fired by hand, thereby obviating the delays occasioned by the breakage of parts in stokers which completely close the front of the furnaces.

It is to be understood that in the accompanying claims, the term "plurality of furnaces" may mean separate furnaces or they may mean furnaces fed through separate doors and which are in communication with each other.

A furnace feeding device embodying the principles of the invention is illustrated in Figs. 7 and 8, secured upon the plate 90 which closes the mouth of one of the furnaces 91 of an ordinary Scotch marine boiler. The door 92 of this furnace carries an unobstructed chute 93 which receives fuel from a stationary chute 94 which is secured to the plate 90 by brackets 95. A slide 96 serves the same purpose in this form of the device that the slide 16 serves in the form illustrated in Fig. 2. The door 92 is hinged as at 97 to the plate 90 and is provided with the usual latch 98. The chute 93 is provided with a bottom 99 which receives the coal which passes through the chute. An opening 100 permits fluid under pressure from jets formed in a nozzle 101 to discharge the fuel through said opening and into the furnace. When it is desired to mount all of the parts of this furnace feeding device, upon the exterior of the furnace in the manner shown in Figs. 7 and 8, the nozzle 101 swings with the door when said door is opened. To accommodate this swinging movement of the nozzles, a hinge joint 102 is formed in the pipe 103 which conducts fluid under pressure to the jets of the nozzle 101. It will be seen that the structure provided in Figs. 7 and 8, renders it possible by merely substituting the door shown therein for the ordinary door of the furnace and by securing the brackets 95 in position, to apply this device without altering the boiler in any other manner. The structure therein set forth is so simple that it may be placed in position in a few hours, rendering it possible to entirely equip a vessel with these furnace feeding devices between the time of the arrival of said vessel in port and its departure therefrom. This is a matter of importance where the loss of a trip means the loss of a large amount of money.

Expensive and complicated mechanism for feeding fuel to the mouth of the furnace, has been avoided in the present device; gravity alone has been relied upon to carry the fuel in front of the nozzles. It will be seen that most of the mechanism that is to be applied to the boiler proper, is carried by the door. By virtue of this construction the device may be readily applied to boilers already in use, by merely substituting this door for the old doors of the furnaces. This is a matter of importance where the dismantling of a boiler may mean the closing of a large manufacturing plant for a week or more.

While the elements herein shown and described are well adapted to serve the purposes for which they are intended, it is to be understood that the invention is not limited to the precise construction set forth, but includes within its purview such changes as may be made within the scope of the appended claims.

What I claim, is:

1. The combination with a furnace, of a fuel receiving means, a blast device adapted to distribute the fuel from said fuel receiving means, means for admitting a blast fluid to said blast device, and means for adjusting both the force and duration of said blast.

2. The combination with a furnace, of a fuel receiving means, a blast device adapted to distribute fuel from said fuel receiving means, means for supplying a blast fluid to said blast device, and means for controlling both the duration and force of said blast, the force of said blast being controllable independently of the duration thereof.

3. The combination with a furnace, of a fuel receiving means, a blast device adapted to distribute fuel from said fuel receiving means, means for supplying a blast fluid to said blast device, means for controlling both the force and duration of said blast, the duration of said blast being controllable independently of the force thereof.

4. The combination with a furnace, of a blast device, a valve for controlling the blast to said blast device, a rotative member, a trip member carried by said rotative member, and means for adjusting said trip member.

5. The combination with a furnace, of a blast device, a valve for controlling the blast to said blast device, a rotative device, and a trip member carried by said rotative device and adapted to actuate the valve, said valve comprising means for causing the valve proper to move suddenly when the trip member acts.

6. The combination with a plurality of furnaces, of blast devices located in said furnaces, valves controlling the blast to said blast devices, a motor, a plurality of rotative members actuated by said motor, and a plurality of trip members carried by said rotative members and adapted to alternately actuate the valves.

7. The combination with a plurality of furnaces, of blast devices, valves controlling the blast to said blast devices, a motor, a plurality of rotative members actuated by said motor, and a plurality of trip members carried by said rotative members and adapted to alternately actuate the valves.

8. The combination with a furnace, of fuel receiving means located in said furnace, a plurality of blast jets adapted to distribute fuel from said fuel receiving means, means for conducting fluid to said jets, means for admitting the full force of said fluid to said jets instantaneously, means for controlling the force of the fluid through said means, and means for controlling the flow of fluid to each of the jets independently of the rest of said jets.

9. The combination with a furnace, of a normally unobstructed chute leading to said furnace, and fuel receiving means located in said furnace, means for adjusting the angle of said fuel receiving means, a blast device adapted to distribute fuel from said fuel receiving means, and automatic means for admitting the full force of the blast to said blast device instantaneously.

10. The combination with a furnace, of a blast device, and means for controlling the blast to said blast device, said means comprising a casing, a stem mounted in said casing, a rotative member, trip mechanism between said rotative member and said stem for intermittently actuating said stem, and members actuated by said stem which control the flow of the blast through said casing.

In testimony whereof I affix my signature in presence of two witnesses.

HAROLD P. TIPPETT.

Witnesses:
FRANK G. CAMPBELL,
A. L. PHELPS.