A. HEBERER & H. A. HYNE.

APPARATUS FOR FEEDING FUEL TO FURNACES.

APPLICATION FILED APR. 19, 1910.

1,022,550.

Patented Apr. 9, 1912.

5 SHEETS-SHEET 1.

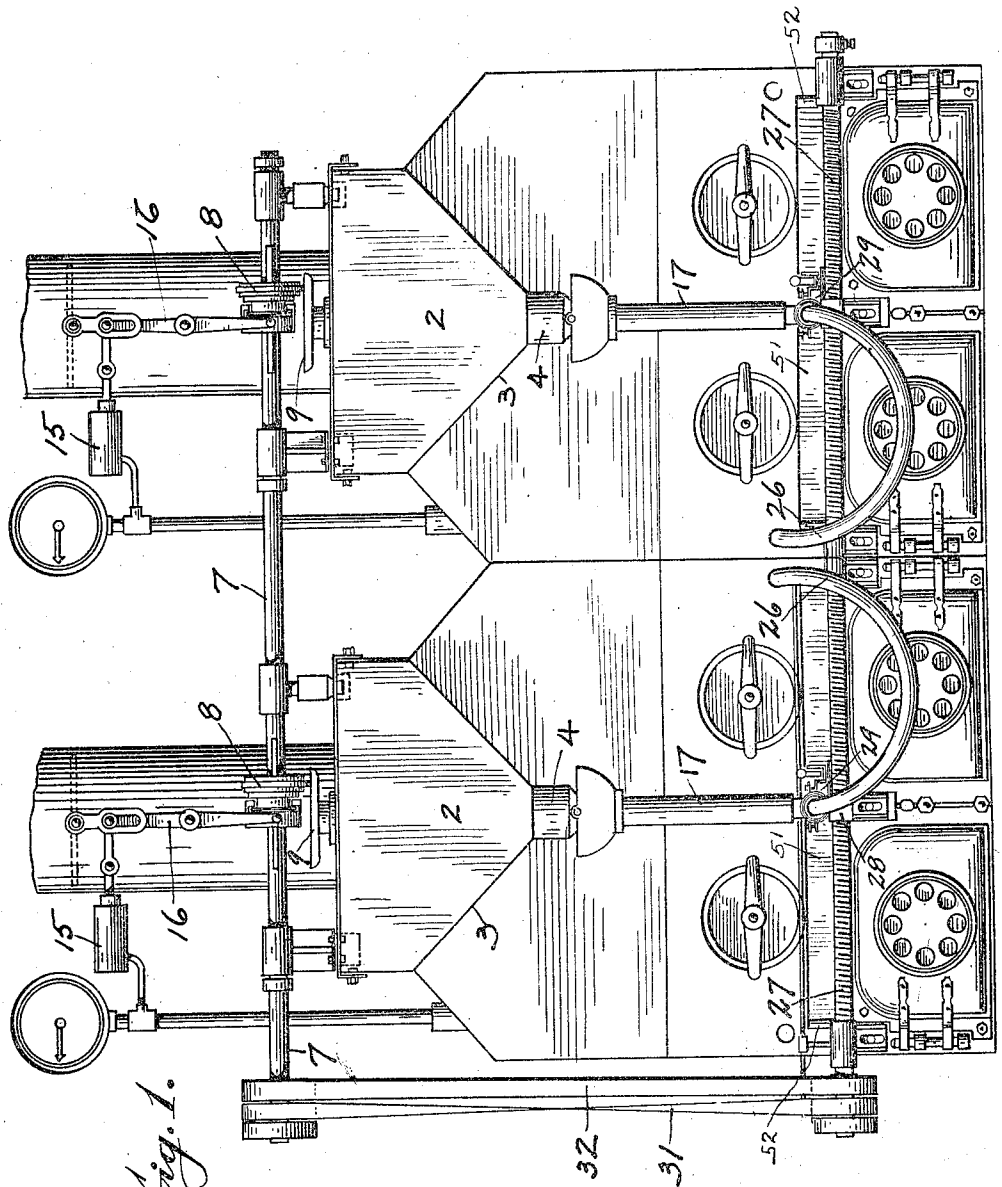

Fig. 1.

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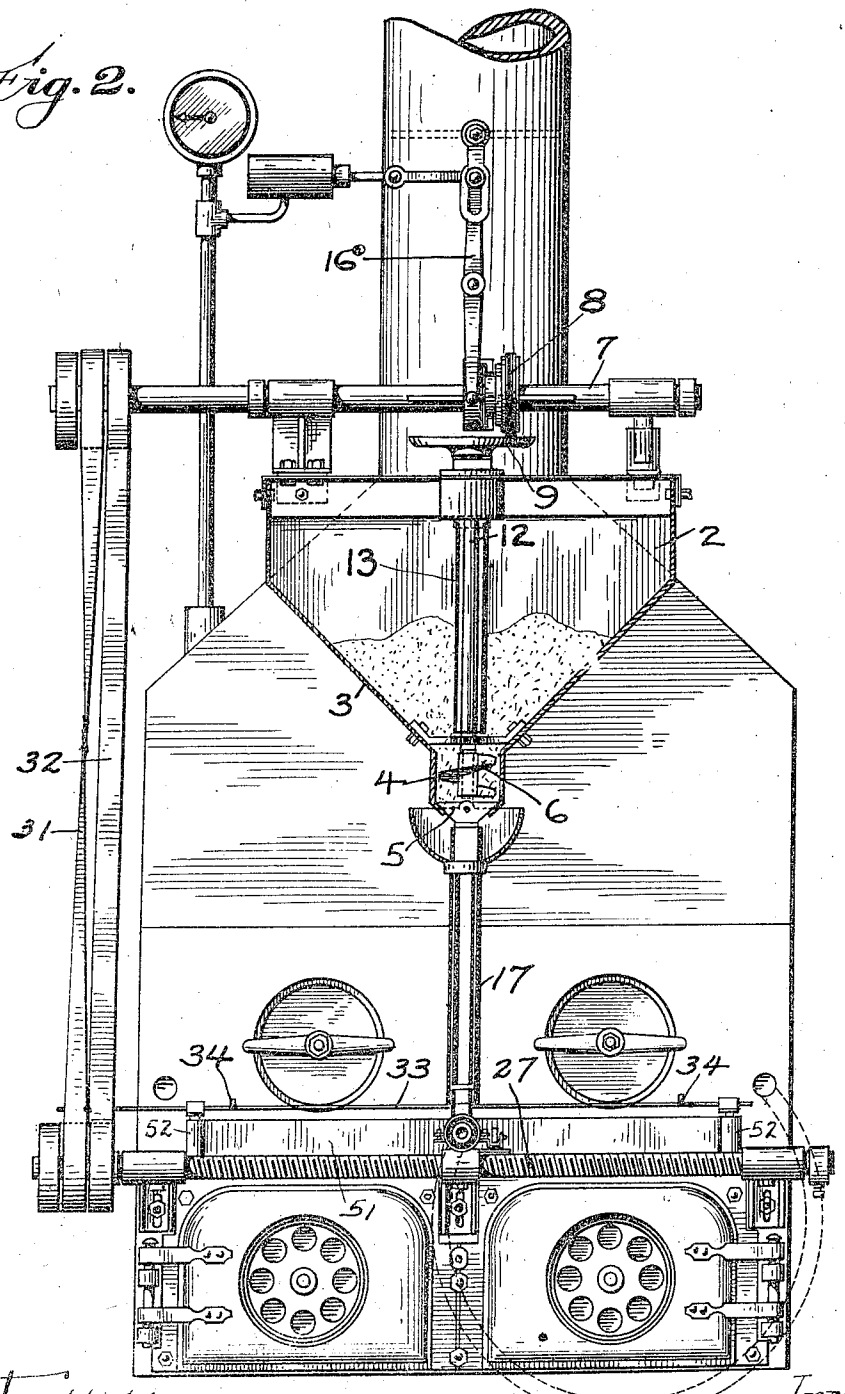
5 SHEETS—SHEET 2.

Fig. 2.



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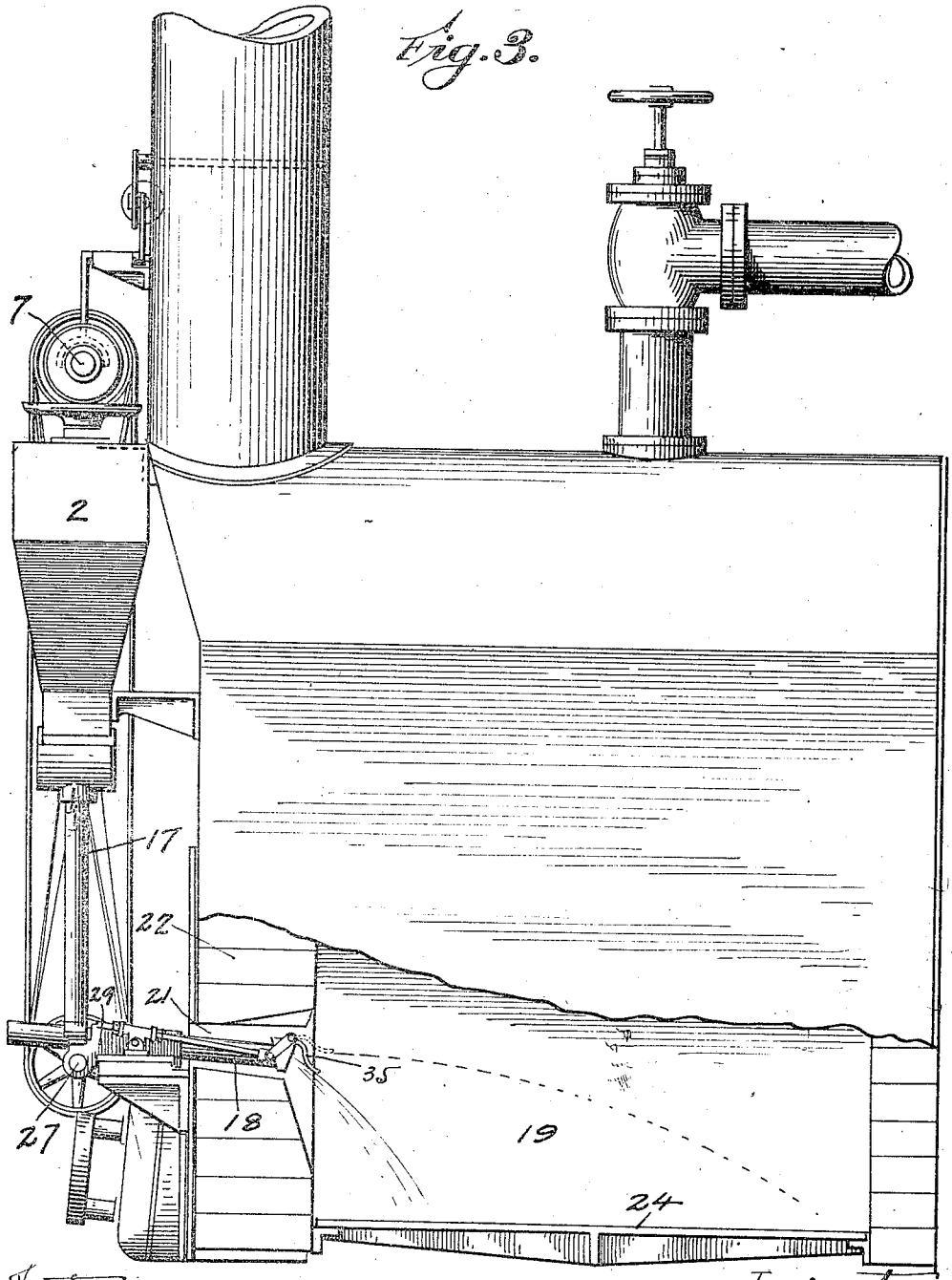
5 SHEETS—SHEET 3.

Fig. 3.



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5 SHEETS—SHEET 4.

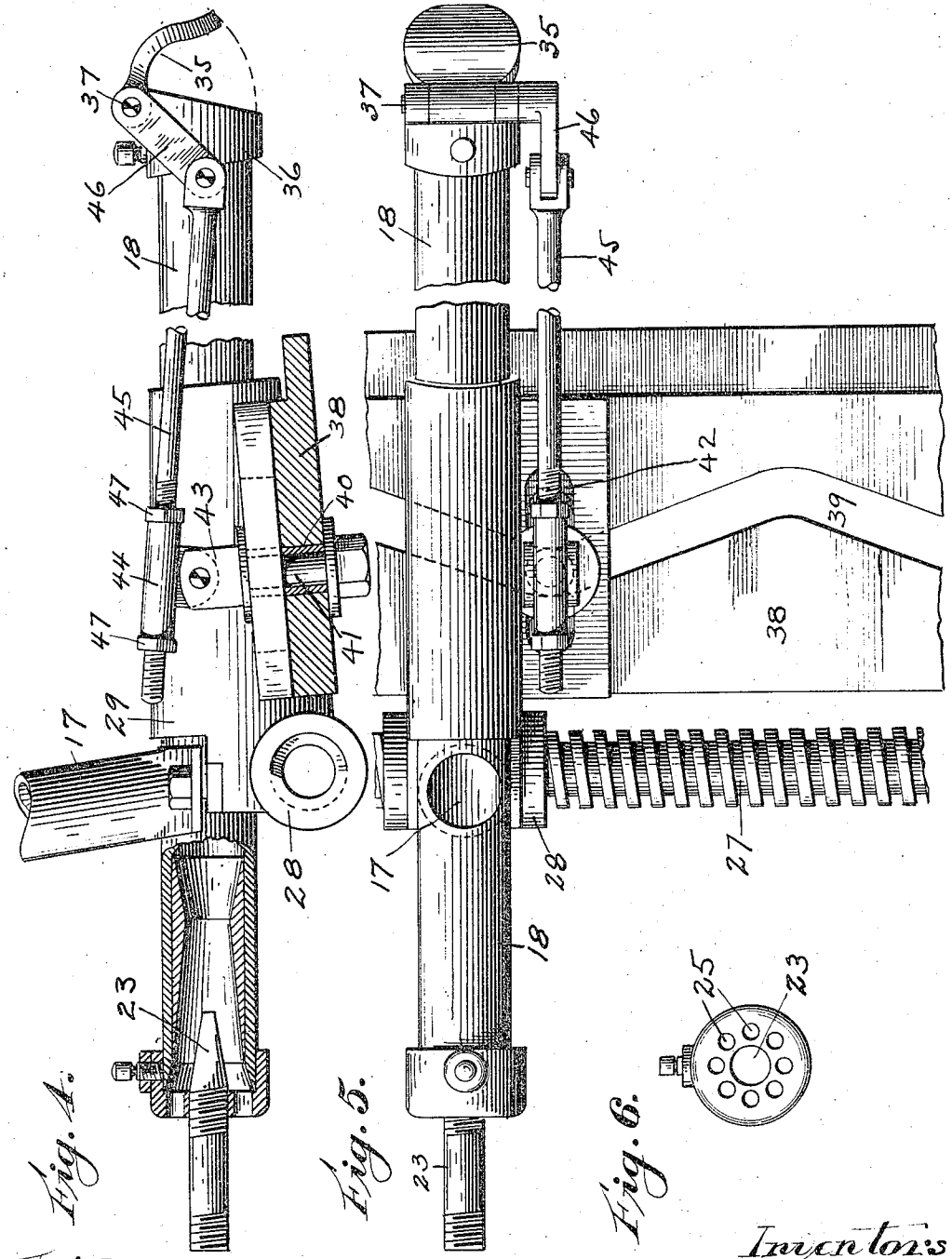

Fig. 4.

Fig. 5.

Fig. 6.

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5 SHEETS—SHEET 5.

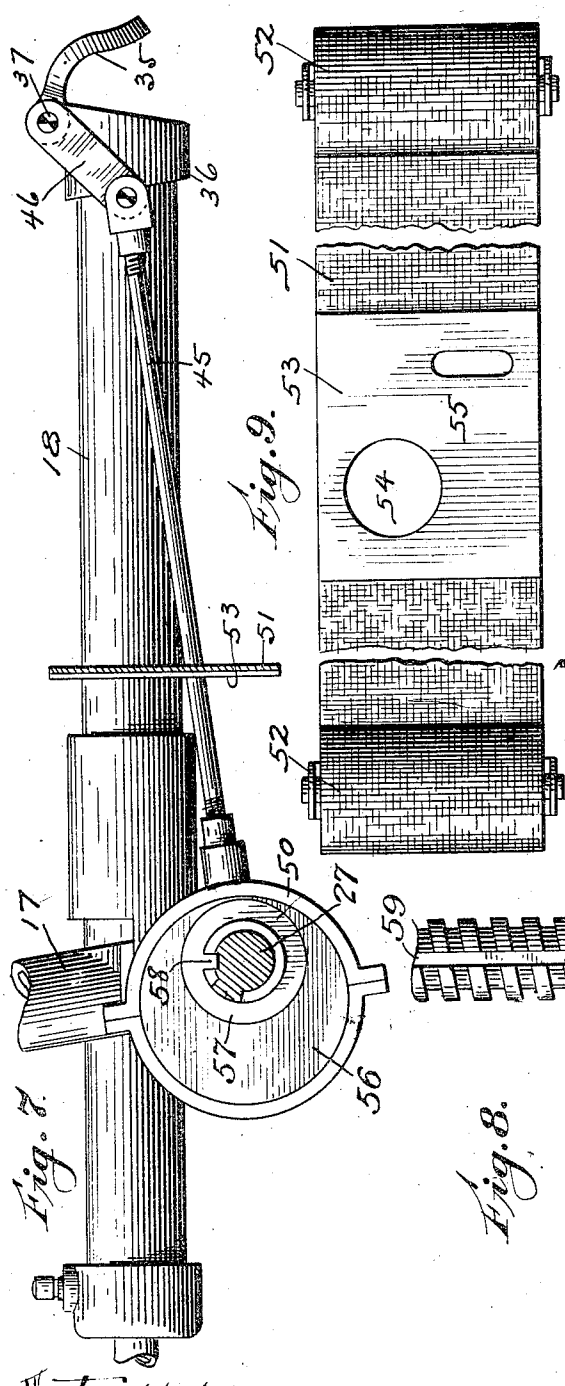

Fig. 9.

Fig. 7.

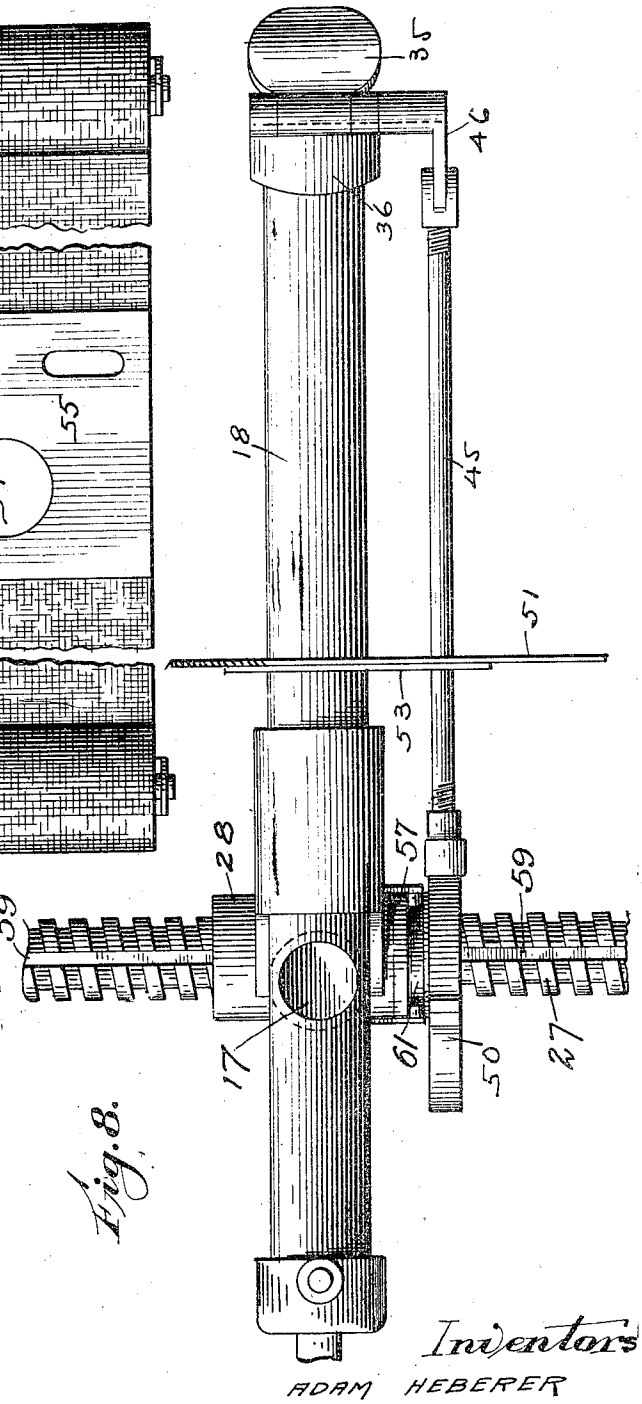

Fig. 8.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR FEEDING FUEL TO FURNACES.

1,022,550. Specification of Letters Patent. Patented Apr. 9, 1912.

Application filed April 19, 1910. Serial No. 556,329.

To all whom it may concern:

Be it known that we, ADAM HEBERER, a citizen of the United States, and a resident of Alameda, county of Alameda, and State of California, and HENRY A. HYNE, a subject of the King of Great Britain, residing at Belmont, county of San Mateo, and State of California, have invented new and useful Improvements in an Apparatus for Feeding Fuel to Furnaces, of which the following is a specification.

The invention relates to improvements in apparatus for introducing and distributing fuel in furnaces under steam generators, and in other situations in the arts and manufactures where heat is to be generated and applied for various purposes and relates more particularly to an apparatus for distributing solid fuel, such as pea coal or screenings over the entire area of the grate and to means for controlling and regulating the supply to the distributing apparatus.

The object of the invention is to provide an apparatus which acts automatically to vary the supply of fuel to the furnace depending on the amount of heat necessary to be generated.

A further object of the invention is to provide an apparatus which will distribute the fuel evenly and continuously over the grate surface.

Another object of the invention is to provide a fuel feeding apparatus which will operate as a smoke consumer to greatly decrease the amount of smoke generated in the combustion of the fuel.

To these objects the invention consists in novel means or apparatus for regulating the supply of fuel to the furnace and for distributing such supply equally over the surface of the grate with the effect of producing the same intensity of heat at all points.

The apparatus possesses other advantageous features, which, with the foregoing will be set forth at length in the following description, where we shall outline in full that form or embodiment of the invention which we have selected for illustration in the drawings accompanying and forming part of the present specification. From this it will be apparent that we do not restrict ourselves to the showing made by such drawings and description as many changes could be made without varying from the scope or spirit of the invention.

Figure 1 is a front elevation of a double boiler, or steam generator, showing the application of the apparatus of our invention. Fig. 2 is a front elevation of a boiler showing the apparatus of our invention in section. Fig. 3 is a side elevation of a boiler, part of the side being broken away to show the operation of the apparatus. Fig. 4 is a side elevation on a larger scale showing a portion of the feeding and distributing mechanism. Fig. 5 is a plan or top view of the mechanism shown in Fig. 4. Fig. 6 is an end view of the same apparatus showing the air ports. Fig. 7 is a side elevation of a modification of the fuel distributing mechanism. Fig. 8 is a plan or top-view of the mechanism shown in Fig. 7. Fig. 9 is a detail of an asbestos or other fire-proof curtain used in connection with the apparatus.

The apparatus may be arranged in connection with any furnace, whether such furnace is combined with a steam generator, or any other apparatus designed to be subjected to heat. In the present drawings the device is shown attached to a steam generator and the description will apply to such application, although it is to be understood that the use or construction of the apparatus is not to be restricted by such description.

The coal to be fed to the furnace is placed in the hopper 2, which may be of any suitable construction and held suspended in front of the furnace by any desirable means, either by attaching it directly to the front of the boiler, or by suspending it from any suitable frame-work. The hopper 2 is preferably provided with sloping sides 3 to settle the coal to the center at the bottom.

The central bottom portion of the hopper 2 is preferably formed into a cylindrical casing 4, having a partially restricted opening 5 in the bottom. A helical conveyer screw 6, arranged for rotation in the casing 4 regulates and controls the feed of the coal from the hopper 2, the amount of coal passing depending on the rate of rotation of the screw 6. Variable rotary motion is applied to the screw from the shaft 7, which is driven at a constant speed from any suitable source of power, by means of a friction roller 8 operating in contact with the disk 9 on the shaft 12 carrying the screw. By shifting the position of the roller 8, so that the point of contact with the disk 9 is changed, the rate of rotation of the screw is varied. A stationary casing 13 is preferably arranged around the shaft 12 in the hopper 2 to pre-

vent the coal from coming in contact with the shaft.

The movement of the friction roller 8 longitudinally of the shaft may be effected by hand, whenever it is desirable to vary the amount of fuel being fed, or it may be arranged to operate automatically. In the present instance, in the application of the feeding mechanism to a steam generator the feeding apparatus has been arranged to operate automatically under the variations of the steam pressure in the generator. In the drawings is indicated a regulator 15 such as is used at the present time for regulating the position of the damper in the flue and we have modified such mechanism and connected it to the roller 8 by the lever 16, so that an increase in pressure in the generator will move the roller 8 toward the edge of the disk 9 and thereby cause a decrease in the amount of fuel fed. In the application of the device to other fuel consuming apparatus, various other forms of regulators may be employed to accomplish the same result and maintain the fire at any desired temperature. The coal being of a fine composition or texture, it is evident that it will readily move under the action of gravity and tend to flow out of the orifice 5, and the office of the screw 6 is to retard and regulate such motion, so that only the desired quantity of coal may be fed to the furnace.

From the chamber 4 the coal passes through the conductor 17 to the spout 18 from whence it is discharged into the furnace. The conductor 17 may be made of a flexible material, such as is used in the manufacture of rubber hose, or may be made of a metal casing with slip joints to provide for extensions. The spout 18 moves across the front of the furnace and the distance from the chamber 4 to the spout 18 varies with such motion, causing an extension and contraction of the conductor 17.

The spout 18 projects into the furnace chamber 19 through a slot or opening 21 in the front wall 22 thereof, said slot 21 preferably extending across the entire width of the furnace. An injector 23 in the end of the spout 18, furnishes the power for discharging the coal into the furnace and onto the grate surface 24. The injector 23 is preferably operated by steam taken directly from the boiler, although this may be varied according to conditions. When steam is used, a number of air ports 25 are provided in the outer end of the spout behind the injector, so that a quantity of air will be drawn in and discharged over the bed of burning fuel, thereby greatly increasing the combustion of the gases and decreasing the amount of smoke generated.

It has been found advisable to use superheated steam in some cases and for this purpose the steam conductor tubes 26 on Fig. 1 are arranged to be connected to the superheater pipes, within the furnace.

For the purpose of spreading and distributing the coal over the width of the furnace and thereby obtaining a more even combustion, the discharge spout 18 is arranged to travel back and forth across the front of the furnace. Any suitable means may be employed for causing such travel, and in the embodiment herein illustrated, a feed screw 27 is employed, extending across the furnace. Where it is found desirable on larger boilers or furnaces to employ more than one spout on the furnace, several may be arranged, each adapted to travel across a portion of the entire width.

The feed screw 27 engages in the bearing 28 having a screw-threaded inner surface which is preferably formed integral with the head 29 in which the spout 18 is fastened. As the feed-screw revolves the spout is therefore moved across the width of the furnace. To provide for reversing the direction of rotation of the feed-screw 27 the belts 31 and 32 have been provided, running on pulleys on the shaft 7 and on the extension of the feed-screw 27. This method of reversing the direction of rotation by means of crossed belts and tight and loose pulleys is old and well known and requires no further explanation. It is however, generally advisable to provide means for automatically shifting the belts as the spout nears the side of the furnace. This may be accomplished in many ways, and in this instance a belt shipper rod 33 extending across the front of the furnace is provided with projections 34, lying in the path of the spout, so that the belts will be automatically shipped by the spout 18 at the end of the travel in either direction.

For the purpose of spreading and distributing the coal over the depth of the furnace as the spout 18 moves laterally, the deflecting plate 35 has been arranged over the discharge end thereof. The deflecting plate 35 in the present instance is hinged to a collar 36, attached to the end of the spout 18 and is adapted to be partially rotated about the pivot 37 to deflect the coal as it issues from the spout. It is evident that when the plate is raised the path of the coal is not obstructed and it will be projected to the rear of the furnace, but as the plate 37 moves downward partially closing the opening the coal is deflected from its path and moves in another path depending upon the position of the plate. In Fig. 3 the path of the coal for two positions of the deflector plate is shown. In this manner by slowly raising and lowering the deflector plate, the coal is projected for a greater or less distance into the furnace thereby equally distributing the coal over the entire surface. The shape of the plate which is

shown in the drawings possesses some advantages, but the plate may be made of any desired shape.

Means are provided for automatically operating the deflector-plate as the spout 18 is moved across the furnace, so that the distribution of the fuel will be even over the entire area of the grate. In Figs. 4 and 5 is set forth a method for accomplishing this result. Extending across the face of the furnace is the plate 38, provided with a zigzag or cam-shaped groove 39. A roller 40 on the rod 41 engaging in the groove 39 is restrained from longitudinal motion by the slot 42 in the casting 29. Therefore, as the casting and the spout move across the furnace, under the influence of the screw 27, the rod 41 carrying the saddle 43 reciprocates in the slot 42. This reciprocating motion is transferred to the plate 35 through the sleeve 44 on the saddle 43 and the connecting rod 45 and lever 46. The arc of rotation of the plate 35 may be varied by varying the length of the connecting arm 45, by means of the lock nuts 47 on opposite sides of the sleeve 44.

In Figs. 7 and 8 is shown a modification of the means for operating the deflector plate. The rod 45 which operates the deflector plate 35 is connected to a collar or band 50 lying around the eccentric 56 so that as the eccentric is revolved the rod 45 is reciprocated to operate the deflector plate. The eccentric plate 56 is attached to the hub 57 which is provided with a projection 58 which fits loosely in a slot 59 in the feed screw 27. The hub 57 is thereby constrained to rotate as the feed screw rotates and thereby operates the rod 45 through the eccentric 56. Longitudinal motion of the hub 57 is obtained by connecting it to the bearing 28, which moves longitudinally under the action of the feed screw 27. The connection between the hub and the bearing is generally formed by causing projections on the bearings to engage in a groove 61 in the hub, thereby allowing the hub to be rotated by the rotation of the feed screw.

For the purpose of closing the slot 21 through which the spout moves, and preventing an excess of air from entering the furnace and reducing its efficiency, a curtain 51, of a fireproof material has been provided. The curtain is preferably mounted on spring controlled rollers 52 at opposite sides of the furnace, so that it can wind or unwind readily as the spout travels. The plate 53 to which the curtain is attached is provided with openings 54 and 55 for the reception of the spout 18 and the connecting rod 45 respectively.

From the foregoing it will be evident that a continuous feed of fuel may be obtained, which may be regulated according to conditions, and that said fuel will be evenly distributed over the grate surface and a uniform fire maintained. It is evident also, that changes may be made in the design of the various elements without varying from the spirit of the invention, and therefore we do not desire to restrict ourselves to the exact construction shown.

We claim:—

1. In an apparatus for feeding fuel to furnaces, the combination with a furnace having a slot in the front wall thereof, of a spout extending into the furnace through said slot and adapted to be moved parallel to its original position across the full width of the furnace, a supply tube for conveying the fuel to the spout and an injector for projecting the fuel into the furnace.

2. In an apparatus for feeding fuel to furnaces, the combination with a furnace having a slot in the front wall thereof, of a spout extending into the furnace through said slot, means for moving the spout parallel to its original position for the full width of the furnace, means for supplying fuel to the spout and means for projecting the fuel into the furnace.

3. In an apparatus for feeding coal to furnaces, a furnace, a spout adapted to be moved parallel to its original position for the full width of the furnace extending into the furnace, means for varying the supply of coal to the spout and means for projecting the coal into the furnace.

4. In an apparatus for feeding coal to furnaces, the combination of a furnace, a coal supply, a spout, means for regulating the supply of coal to the spout, means for projecting the coal from the spout, means for moving the spout laterally parallel to its original position across the furnace, a deflector plate mounted on the end of the spout and means for oscillating the deflector plate to continuously vary the angle between the plate and the spout.

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