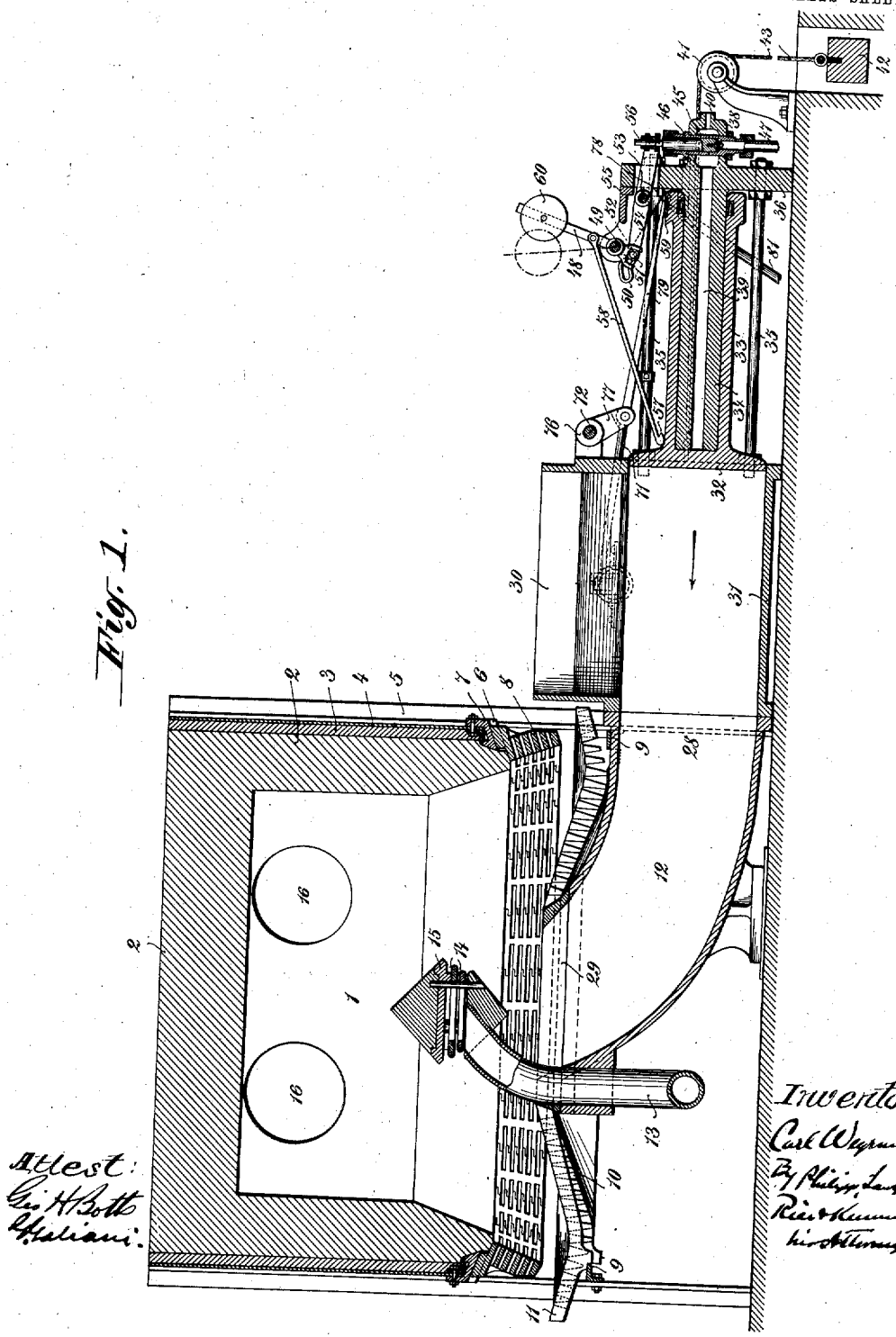


986,881.

C. WEGENER.
FURNACE.
APPLICATION FILED MAY 5, 1902.

Patented Mar. 14, 1911.
5 SHEETS—SHEET 1.

Fig. 1.



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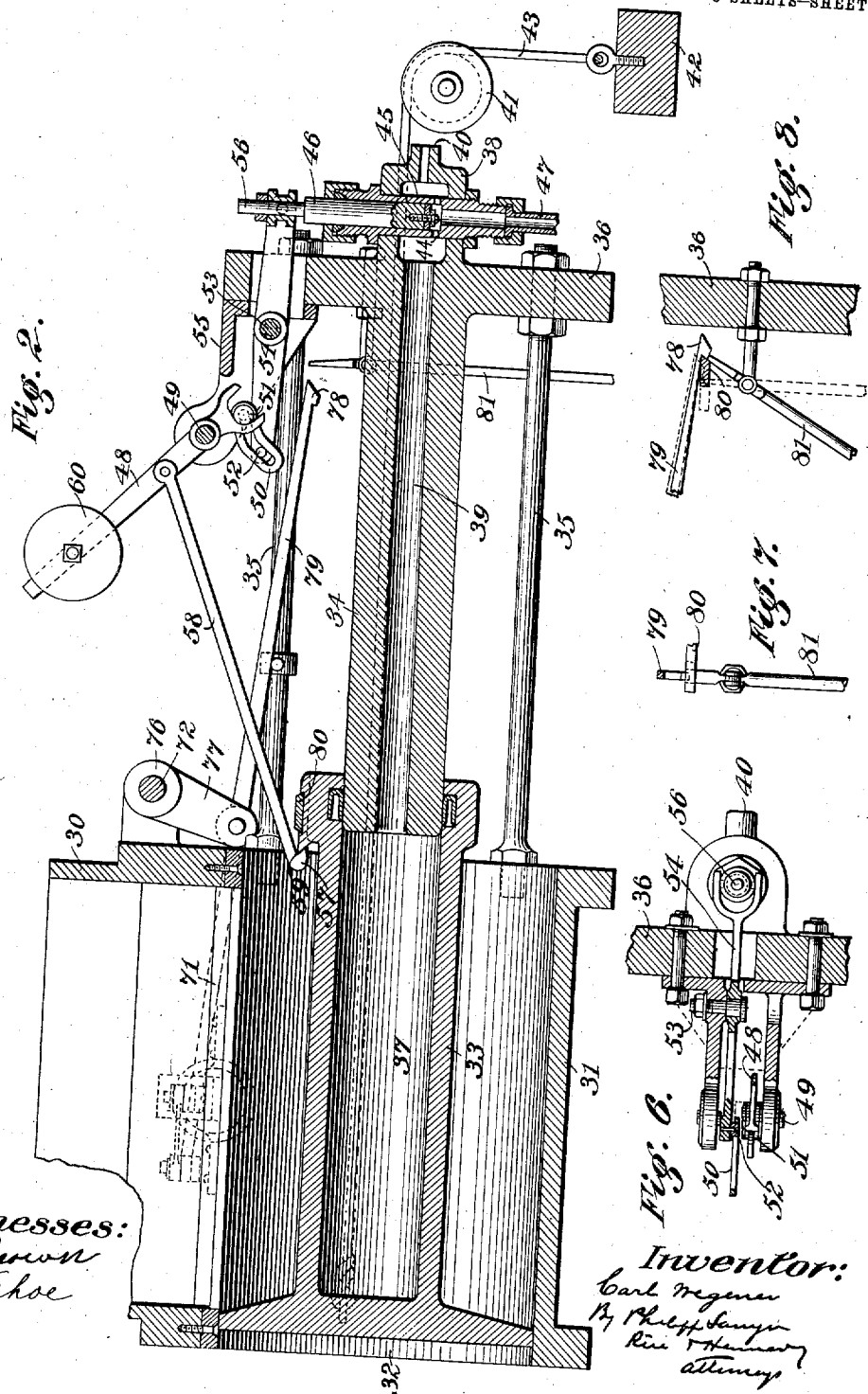
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Patented Mar. 14, 1911.

5 SHEETS—SHEET 2.

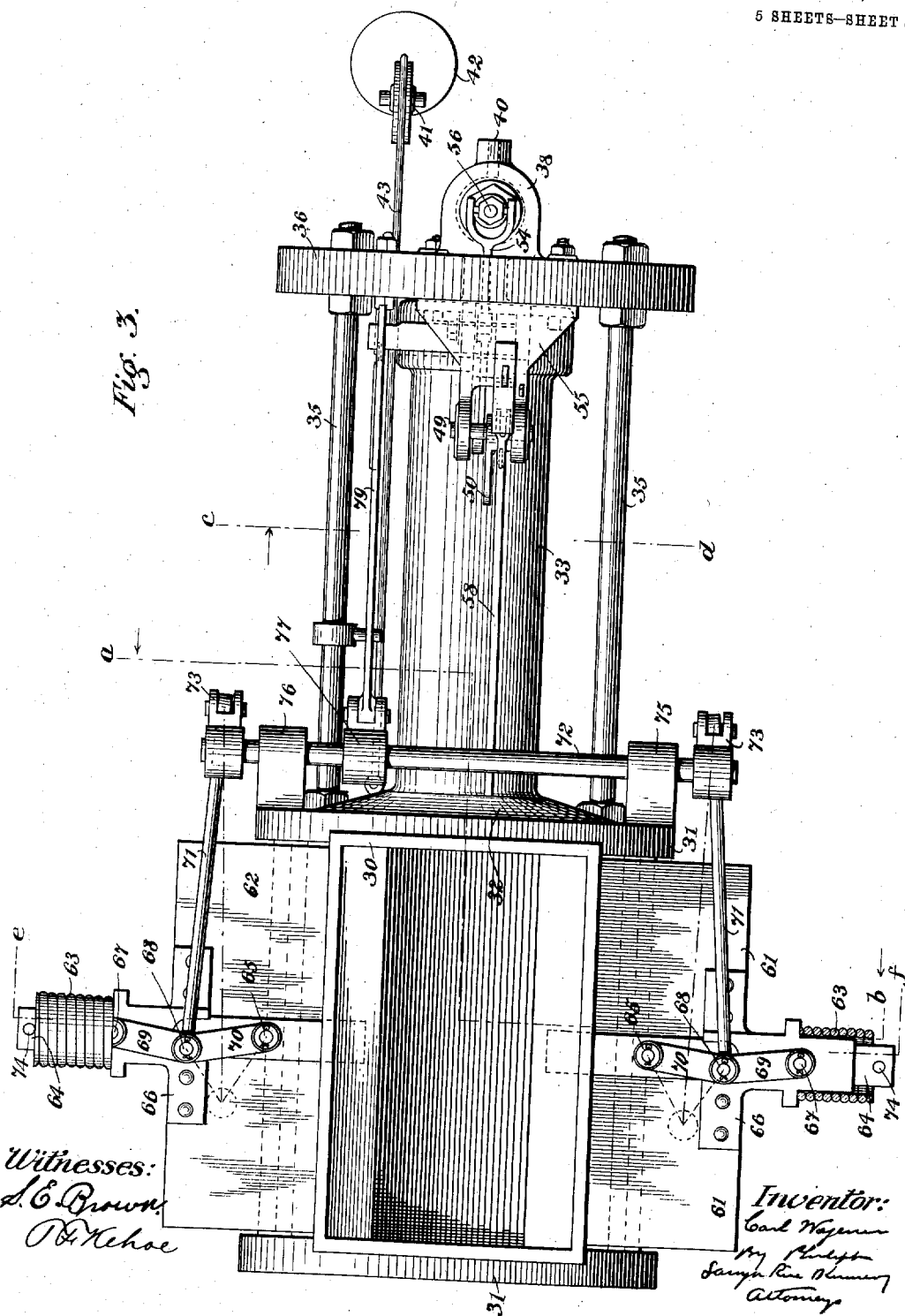


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5 SHEETS—SHEET 3.

Fig. 3.



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5 SHEETS—SHEET 4.

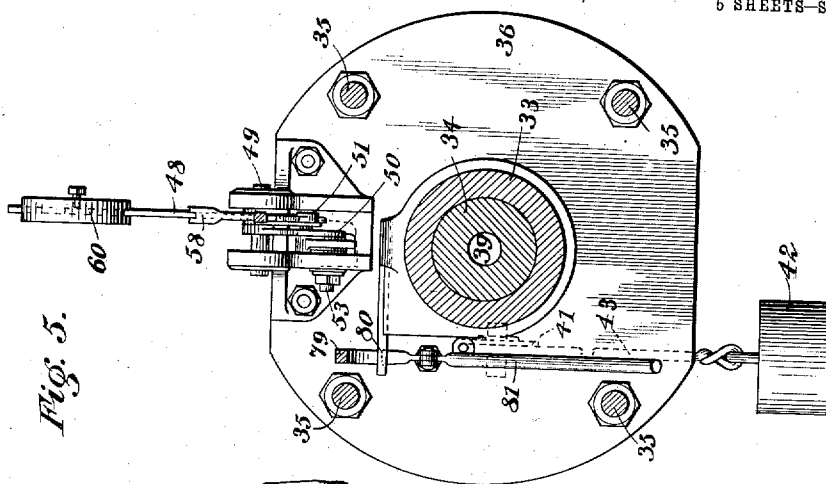


Fig. 5.

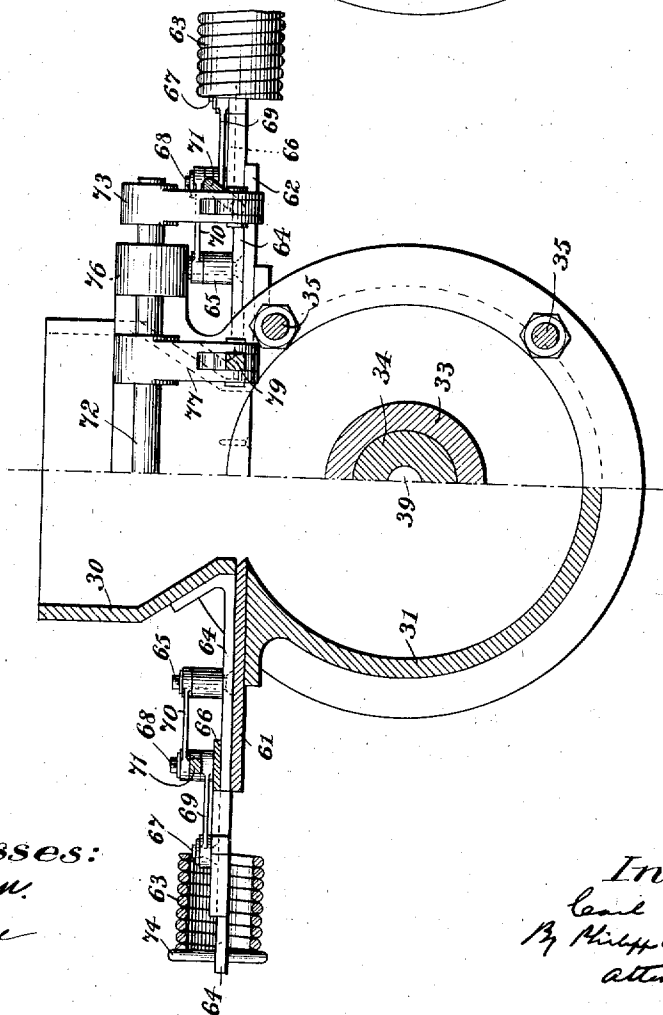


Fig. 4.

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5 SHEETS—SHEET 5.

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Fig. 10.

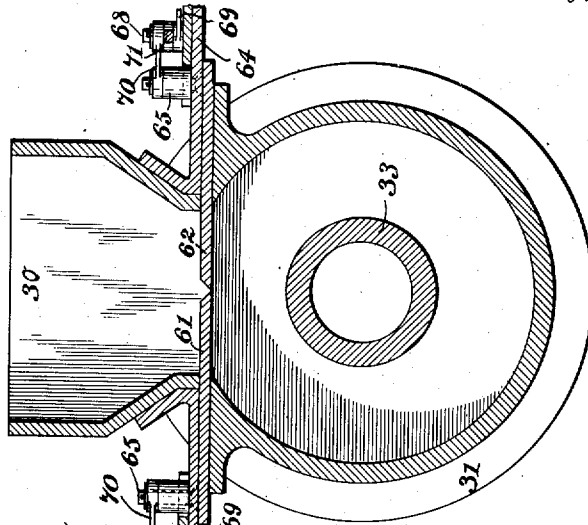
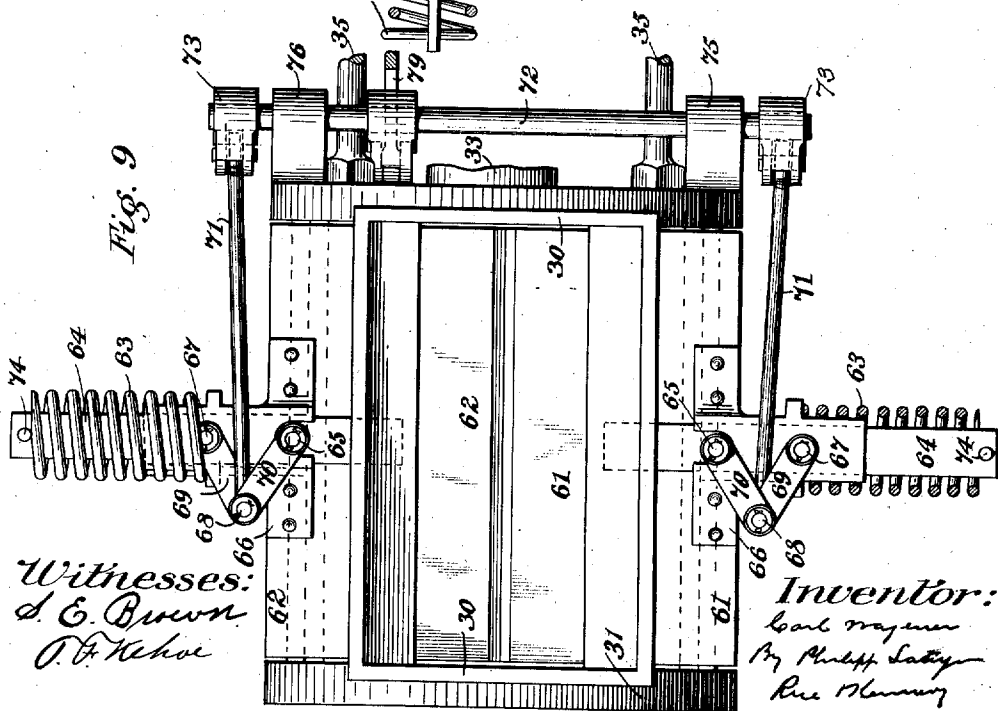


Fig. 9.



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UNITED STATES PATENT OFFICE.

CARL WEGENER, OF BERLIN, GERMANY.

FURNACE.

986,881.

Specification of Letters Patent.

Patented Mar. 14, 1911.

Application filed May 5, 1902. Serial No. 106,033.

To all whom it may concern:

Be it known that I, CARL WEGENER, a subject of the King of Prussia, and whose post-office address is No. 14 Gitschinerstrasse, Berlin, Prussia, German Empire, have invented new and useful Improvements in and Connected with Furnaces, of which the following is a specification.

The present invention relates to an automatically operating smokeless coal furnace (especially for lump coal) in which the fresh fuel is supplied to the combustion chamber in the known manner from below, underneath the burning layer of fuel.

The present invention comprises means for shutting off the combustion chamber underneath by a fire grate and in arranging the lower part of the side wall also as a grate, and automatically operating means for supplying the fuel to the combustion chamber.

The invention is illustrated in the accompanying drawings in which—

Figure 1 is a vertical section of a complete apparatus of the preferred form. Fig. 2 is a vertical section of the hydraulic fuel feeding mechanism showing the parts in a different position from that shown in Fig. 1. Fig. 3 is a plan view of the fuel feeding mechanism. Figs. 4 and 5 are sections on lines *a-b* and *c-d* respectively of Fig. 3. Figs. 6, 7 and 8 are detail views of parts of the fuel feeding mechanism. Fig. 9 is a partial plan view showing the parts in a different position from that shown in Fig. 3. Fig. 10 is a section on the line *e-f* of Fig. 3.

As will be seen from Fig. 1 of the drawings, 1 indicates the combustion chamber and 2 the furnace wall consisting of fire-proof material provided with outlet apertures 16. This wall is surrounded by an insulating layer 3 and a casing 4 of iron plate fixed to the supports 5. On the supports 5, or on a ring placed thereon and consisting of angle irons, are placed the angle pieces 7 provided with a guiding slot 6 and in these slots 6 are guided the ribbed pieces 8 serving as grate bars.

An angle iron 9 is fixed to the supports 5 in such a manner that the grate bars 10 are supported with their inner ends against the feed pipe 12 for introducing the fresh fuel into the combustion chamber and rest with their outer ends on this ring 9. Between the separate grate bars 10 lie flat

cleaning bars 11 which with their outer ends project beyond the grate bars 10 and can be moved vertically up and down as desired in order to clean the lower grate and remove the clinkers which form. A pipe 13 for admitting air is placed in this feed pipe 12, on the upper end of which pipe 13 is set a cap 15 covered at top and bottom with fire-proof material and provided with slits 14 so that the air issuing from the pipe 13 can escape on all sides.

The operation of the above described furnace is briefly as follows: On the circular grate formed by the bars 10, wood or other material adapted for lighting the fire is placed and ignited, whereupon the special fuel (for instance lumps of coal) is introduced through the feed pipe 12 into the combustion chamber by means of an automatically operating hydraulic feed apparatus to be more particularly described later on, and kindled. The combustion chamber gradually fills with burning coal and air is supplied to the combustion chamber through the lower fire grate and the lateral ribbed pieces 8, and through the pipe 13 and slits 14 of the cap 15. The ribbed pieces 8 prevent the coal from falling out while permitting the removal of the clinkers. Where clinkers are to be removed from the grate, a ribbed piece 8 is taken out and the clinkers removed through the aperture without interrupting or interfering with the process of combustion. By moving up and down the flat cleaning bars 11 the clinkers are prevented from adhering to the grate and at the same time they are conveyed forward, that is, toward the outer ends of the bars 10, from whence they can be removed in the aforesaid manner. The cap 15, pointed top and bottom which is set on the air pipe 13 rests in such a manner above the inlet aperture of the pipe 12 that the fuel issuing from the latter is forced by the cap 15 to spread out on all sides which prevents the formation of a pyramid of coal.

As will be seen from Figs. 2-10 the automatic hydraulic feed apparatus consists of a cylinder 31 provided with a hopper 30 (which cylinder is joined on to the special feed pipe 12 of the above described furnace) and of a reciprocating hydraulic cylinder piston 32. The latter is movable with its cylindrical part 33 provided with a suitable boring 37 on the piston itself 34 which is

fixed to the plate 36 attached to the cylinder 31 by means of bars 35. The piston 34, and also the plate 36 bearing a valve box 38, is provided with a boring 39 and to the tubular joint 40 of the valve box is joined a pipe for pressure water so that the cylinder piston 32 is driven forward by the pressure water into the cylinder 31 and the fuel falling into the cylinder 31 out of the funnel 30 is driven into the feed pipe 12 joined thereto and thence into the combustion chamber of the furnace. In order to draw back the cylinder piston 32 in the cylinder 31, a cord 43 bearing a weight 42 and guided over a roller 41 is attached to the cylinder piston (Figs. 1, 2 and 3) and a valve seat 45 provided with apertures 44 is placed in the valve box 38, the valve piston 46 automatically operated during the movement of the cylinder piston 32 being guided in this valve seat. The valve piston 46, when the cylinder piston 32 has arrived at the end of its forward stroke is moved up in such a manner that the apertures 44 are free and the pressure water can flow out of the valve box through the pipe 47, so that the cylinder piston 32 is now drawn back by the weight 42.

For the purpose of raising and lowering the valve piston 46 (counter-balanced in any suitable manner preferred) according to the position of the cylinder piston 32 there are pivoted on the bolt 49 of a block 55 fixed to the plate 36, a weighted lever 48 (Figs. 1, 2, 5 and 6) and a slotted lever 50 and a pin 51 so attached to the latter that the forked ends of the lever 48 surround this pin 51. The slotted lever 50 is provided with a slot concentric to the pivot 49 and with an eccentric slot adjoining the first; in the eccentric slot is guided a pin 52 of the double lever 54 pivoted on the bolt 53 which lever is attached with its forked ends to the rod 56 of the valve piston 46. On the weighted lever 48 there is arranged a connecting bar 58 having a hook 57, and on the end of the cylindrical part 33 of the piston 32 a projection 59, so that during the forward stroke of the cylinder piston 32 and toward the end of this stroke, the hook 57 of the connecting bar 58 is engaged by the projection 59 of the cylinder piston 32 and thereby the bar 58 drawn along so that the weighted lever 48 comes out of the position shown in full lines in Fig. 1 into that shown in dotted lines from which it falls owing to the weight 60 into the position illustrated in Fig. 2. During the movement of the weighted lever 48, the slotted lever 50 (and thereby the double lever 54) is so moved that the valve piston 46 is raised and the waste pipe 47 for the pressure water is opened. Consequently the cylinder piston 32 is now drawn back by the weight 42.

For the purpose of introducing the fuel

into the cylinder 31, there are arranged between the latter and the hopper 30, two dampers 61, 62 (see Figs. 3, 4, 9 and 10) which are automatically opened by the motion of the cylinder piston 32 and then closed by springs 63. In order to open automatically the dampers, a bolt 65 is fixed to a guide piece 64 arranged on the funnel 30, and a bolt 67 is fixed to a guide piece 66 placed on each damper. On these bolts 65, 67 are pivotally placed two links 69, 70 articulately connected with one another by means of a bolt 68; and to the bolt 68 is fixed a bar 71 which is arranged with play on an arm 73 keyed on a shaft 72 in such a manner that the links 69, 70, when the shaft 72 is compulsorily rotated, are brought out of the angular position shown in Fig. 9 and in dotted lines in Fig. 3 in which they are held by means of springs, into the almost straight position shown in full lines in Fig. 3, whereby the dampers 61, 62 are opened. The springs 63 are pushed up on the guide piece 64 and rest against a pin 74 placed in the latter and against the dampers 61, 62 in such a manner that when the shaft 72 is released the dampers are closed by the springs 63, as the links 69, 70 are easily moved back by the springs 63 out of the position shown in Fig. 3 into the angular position shown in Fig. 9. The rotation of the shaft 72 placed in bearings 75, 76 of the cylinder 31 is likewise derived from the cylinder piston 32 (see Figs. 1 and 2). For this purpose another arm 77 is attached to the shaft 72 on which is placed a connecting bar 79 provided with a projection 78. To the end of the cylindrical part 33 of the cylinder piston 32 is attached a catch 80 in such a way that during the backward movement of the cylinder piston, the projection 78 of the connecting bar 79 is taken along by the catch 80 so that the shaft 72 is revolved and thereby the bars 71 are moved in the direction of the arrow (Fig. 3) whereby the links 69, 70 are brought out of the angular position into the almost straight position and the dampers are opened.

During the forward stroke of the cylinder piston 32 the connecting bar 79 is kept in contact with the catch 80 by the action of the spring 63, so that the dampers would only open gradually. In order to close them quickly, a disengaging device is provided for the connecting bar 79. This device consists of a pivotally arranged disengaging bar 81, which is so placed that its upper end lies in the same plane with the catch 80.

The method of operation of this mechanism is briefly as follows: During the backward stroke of the cylinder piston 32, the disengaging bar 81 rests against the catch 80 and in such a manner that it comes under-

neath the projection 78 of the bar 79 whereby the bar 81 is brought into the position shown in dotted lines (Fig. 1). The projection 78 of the bar 79 is so formed that during the forward stroke of the cylinder piston 32 the disengaging bar is prevented from moving backward, so that consequently, during this forward stroke of the cylinder piston the bar 79 is lifted off the catch 80 by means of the disengaging bar 81 and released, whereupon the dampers 61, 62 can be quickly closed by the springs 63.

The method of operation of the above described hydraulic feed apparatus is shortly as follows: When the cylinder piston 32 is in the rearward position and the two dampers 61, 62 are opened, the cylinder 31 is filled with coal from the hopper 30. As during the backward movement of the cylinder piston, by the bar 58 pushing against it, the weighted lever 48 is brought into the position shown in Fig. 1 and thereby the valve piston 46 into the lower position in which the outer apertures 44 and the outlet pipe 47 are closed, the cylinder piston 32 will now be driven forward by the pressure water entering. At the commencement of this forward stroke the connecting bar 79 remains in contact with the catch 80, so that the dampers 61, 62 are in the first place kept open and the fuel which may have become stuck, can be pushed into the cylinder 31 by the operator. After a small part of the stroke has been carried out, the connecting rod 79 is automatically released from the catch by the disengaging bar 81, so that the dampers 61, 62 are now automatically closed by the springs 63.

By regulating the quantity of pressure water introduced into the cylinder piston the movement of the latter can be regulated, that is, accelerated or retarded. When the cylinder piston 32 approaches the end of its forward stroke the projection 57 of the connecting rod 58 on the weighted lever is engaged by the projection 59 on the cylindrical part 33 of the piston 32 and the weighted lever 48 is brought into the position illustrated in dotted lines in Fig. 1, out of which it falls into the position shown in Fig. 2 owing to the weight 60, and is consequently completely reversed. Owing to this reversal of the weighted lever the valve piston 46 is moved up, the outlet apertures freed and the outlet pipe opened, so that the pressure water entering into the valve box 38 can flow off direct. The cylinder piston 32 is consequently drawn back by the weight 42, and during the backward stroke pushes the connecting rod 58 against the cylinder piston 32 so that the weighted lever 48 is brought into its original position, the valve piston 46 moved down and the outlets 44 and outlet pipe 47 are closed. During the backward stroke of the cylinder piston the projection

78 of the connecting rod 79 is engaged by the catch 80 and taken along with it so that the shaft 72 is rotated and by means of the bar 71 the links 69, 70 are brought out of their angular position shown in Fig. 9, into the position shown in Fig. 3 and the dampers 61, 62 are thereby opened. The dampers are now open and the outlet pipe 47 closed so that the operation and the forward stroke of the cylinder piston can recommence.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In a smokeless combustion furnace, the combination of a combustion chamber the bottom and lower part of the side wall of which is formed as a grate, a pipe leading to an opening in the bottom of the combustion chamber for introducing fresh fuel into the combustion chamber from underneath below the layer of live fuel, a deflecting device located in the combustion chamber above the fuel supply opening for spreading out the fuel as it enters the combustion chamber, a feeding cylinder from which the fuel is fed to said pipe, a hopper from which the fuel is supplied to the feeding cylinder, dampers arranged between the feeding cylinder and the hopper, means for opening and closing the dampers, a feeding piston for reciprocating in said feeding cylinder, and a hydraulic piston and connections for operating said feeding piston, substantially as described.

2. In a smokeless combustion furnace, the combination of a combustion chamber the bottom and lower part of the side wall of which is formed as a grate, a fuel supply pipe leading to an opening to the combustion chamber located to supply the fresh fuel from underneath below the layer of live fuel, a feeding cylinder from which the fuel is fed to said pipe, a hopper from which the fuel is supplied to the feeding cylinder, dampers between the feeding cylinder and hopper, means for opening and closing the dampers, a reciprocating piston provided with an extension forming a hydraulic cylinder, a hydraulic piston on which the hydraulic cylinder moves, and means for supplying and discharging the pressure water, substantially as described.

3. In a smokeless combustion furnace, the combination with the combustion chamber, of a fuel supply pipe leading to an opening to the combustion chamber located to supply the fresh fuel from underneath below the layer of live fuel, a feeding cylinder from which the fuel is fed to said pipe, a hopper from which the fuel is supplied to the feeding cylinder, dampers arranged between the feeding cylinder and the hopper, means for opening and closing the dampers, a reciprocating piston provided with an extension

forming a hydraulic cylinder, a hydraulic piston on which the hydraulic cylinder moves, a valve controlling the inlet and outlet of the fresh water, and a lever mechanism connected with the valve and operated by the reciprocating hydraulic cylinder, substantially as described.

4. In a smokeless combustion furnace in which the fresh fuel is fed underneath the layer of live fuel, the combination with the combustion chamber, of a pipe for introducing the fresh fuel into said chamber, a feeding cylinder from which the fuel is fed to said pipe, a hopper from which the fuel is supplied to the feeding cylinder, dampers arranged between the feeding cylinder and the hopper, means for opening and closing the dampers, a piston mounted to reciprocate in the feeding cylinder provided with an extension forming a hydraulic cylinder, a hydraulic piston on which the hydraulic cylinder moves, a valve controlling the outlet and inlet of the pressure water, and means controlled by the movement of the hydraulic cylinder for operating said valve, substantially as described.

5. In a smokeless combustion furnace in which the fresh fuel is fed underneath the layer of live fuel, the combination with the combustion chamber, of a pipe for introducing the fresh fuel into the combustion chamber, a feeding cylinder from which the fuel is fed to said pipe, a hopper from which the fuel is supplied to the feeding cylinder, a piston reciprocating in the feeding cylinder, means for reciprocating the piston, dampers arranged between the feeding cylinder and the hopper, springs for closing the dampers, and means for opening the dampers comprising two pivotally connected links for each damper, a part moving with the piston, a member adapted to be moved during the backward movement of the piston by said part moving with the piston, connections between said member and said links for causing the dampers to be opened by the movement of said member, and means for disengaging said member from the part moving with the piston to permit the dampers to be closed for the forward movement of the piston, substantially as described.

6. In a smokeless combustion furnace in which the fresh fuel is fed underneath the layer of live fuel, the combination with the combustion chamber, of a pipe for introducing the fresh fuel into said chamber, a feeding cylinder from which the fuel is fed to said pipe, a feeding piston reciprocating in the feeding cylinder, a hydraulic cylinder and piston for operating the feeding piston, a valve for controlling the outlet and inlet of the pressure water, a weighted lever 48, abutments moving with the feeding cylinder, a hooked rod 58 adapted to be engaged by said abutments moving with the feeding

cylinder to throw the weighted lever as the feeding piston approaches the end of its movement in either direction, a slotted lever 50 actuated by the weighted lever through a lost motion-connection, and a lever 54 for actuating the valve having a pin projecting into the slot of the slotted lever 50 whereby the lever 54 is oscillated by the movement of the lever 50, substantially as described.

7. In a smokeless combustion furnace in which the fresh fuel is fed underneath the layer of live fuel, the combination with the combustion chamber, of a pipe for introducing the fresh fuel into said chamber, a feeding cylinder from which the fuel is fed to said pipe, a reciprocating piston provided with an extension forming a hydraulic cylinder, a hydraulic piston on which the hydraulic cylinder moves, a valve controlling the outlet and inlet of the pressure water, a weighted lever, a bar for operating said lever having a hook adapted to engage a projection on the hydraulic cylinder, a slotted lever actuated by the weighted lever, and a double lever actuated by said slotted lever for actuating the valve, substantially as described.

8. In a smokeless combustion furnace in which the fresh fuel is fed underneath the layer of live fuel, the combination with the combustion chamber, of a pipe for introducing the fresh fuel into the combustion chamber, a feeding cylinder from which the fuel is fed to said pipe, a hopper from which the fuel is supplied to the feeding cylinder, a piston reciprocating in the feeding cylinder, dampers arranged between the feeding cylinder and the hopper, means for reciprocating the piston, springs for closing the dampers, and means for opening the dampers comprising two pivotally connected links for each damper, a part moving with the piston, a member adapted to be moved during the backward movement of the piston by said part moving with the piston, connections between said member and said links for causing the dampers to be opened by the movement of said member, and means for disengaging said member from the part moving with the piston to permit the dampers to be closed for the forward movement of the piston, substantially as described.

9. In a smokeless combustion furnace in which the fresh fuel is fed from underneath below the layer of live fuel, the combination with a combustion chamber the bottom and lower part of which is formed as a grate, of a pipe for introducing the fresh fuel into the combustion chamber, a feeding cylinder from which the fuel is fed to the pipe, a hopper from which the fuel is supplied to the feeding cylinder, dampers arranged between the feeding cylinder and the hopper, means for opening and closing the dampers, a reciprocating piston provided with an ex-

tension forming a hydraulic cylinder, a hydraulic piston on which the hydraulic cylinder moves, a valve controlling the inlet and outlet of the pressure water, and operating mechanism for the valve controlled by the movement of the hydraulic cylinder, substantially as described.

10. In a smokeless combustion furnace in which the fresh fuel is fed from underneath below the layer of live fuel, the combination with a combustion chamber the bottom and lower part of which is formed as a grate, of a pipe for introducing the fresh fuel into the combustion chamber, a feeding cylinder from which the fuel is fed to the pipe, a hopper from which the fuel is supplied to the feeding cylinder, a reciprocating piston provided with an extension forming a hydraulic cylinder, a hydraulic piston on which the hydraulic cylinder moves, a valve controlling the inlet and outlet of the pressure water, mechanism for actuating the valve controlled by the movement of the hydraulic cylinder, dampers arranged between

the feeding cylinder and the hopper, springs for closing the dampers, and means for opening the dampers comprising two pivotally connected links for each damper, a part moving with the reciprocating piston, a member adapted to be moved during the backward movement of the reciprocating piston by said part moving with the reciprocating piston, connections between said member and said links for causing the dampers to be opened by the movement of said member, and means for disengaging said member from the part moving with the reciprocating piston to permit the dampers to be closed for the forward movement of the reciprocating piston, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CARL WEGENER.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.

It is hereby certified that in Letters Patent No. 986,881, granted March 14, 1911, upon the application of Carl Wegener, of Berlin, Germany, for an improvement in "Furnaces," an error appears in the printed specification requiring correction as follows: Page 2, line 119, the word "open" should read *close*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of April, A. D., 1911.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.