G. S. GALLAGHER.

STEAM BOILER FURNACE.

APPLICATION FILED NOV. 6, 1909.

984,205.

Patented Feb. 14, 1911.

2 SHEETS—SHEET 1.

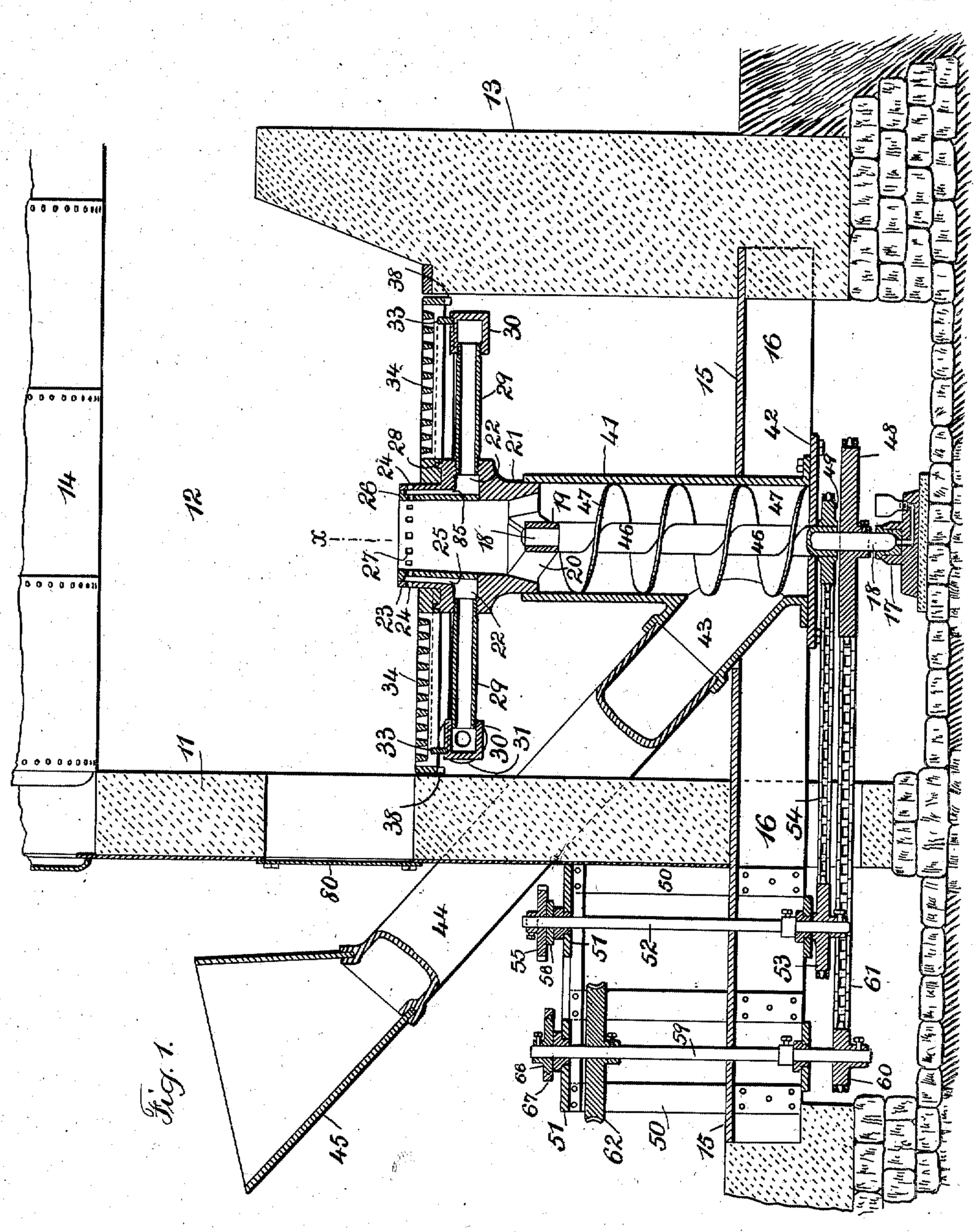

Fig. 1.

Witnesses.

Chas. F. Smith

A. D. Serrell

Inventor

George S. Gallagher

by Harold Serrell

his Atty

G. S. GALLAGHER.

STEAM BOILER FURNACE.

APPLICATION FILED NOV. 6, 1909.

984,205.

Patented Feb. 14, 1911.

2 SHEETS—SHEET 2.

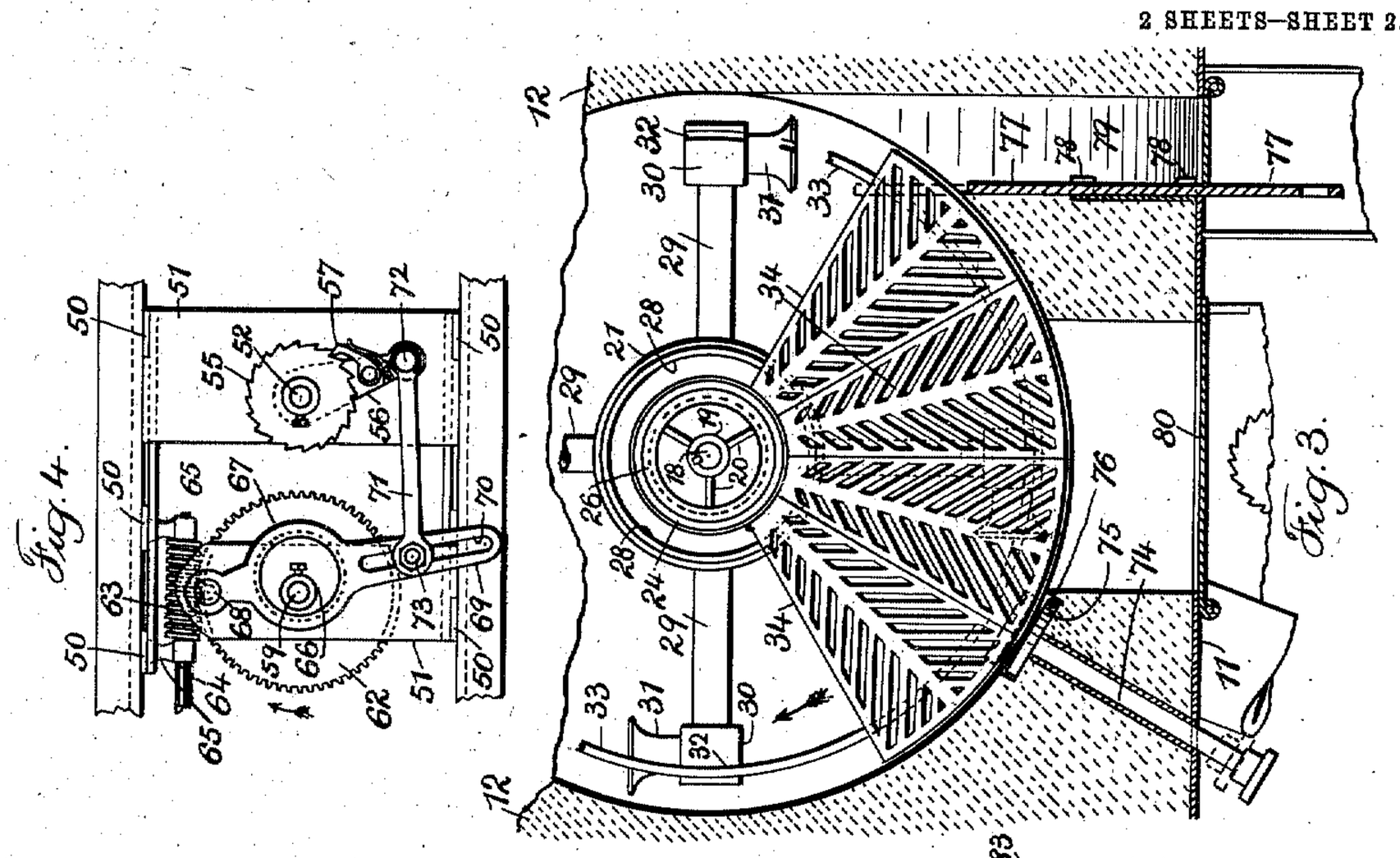

Fig. 3.

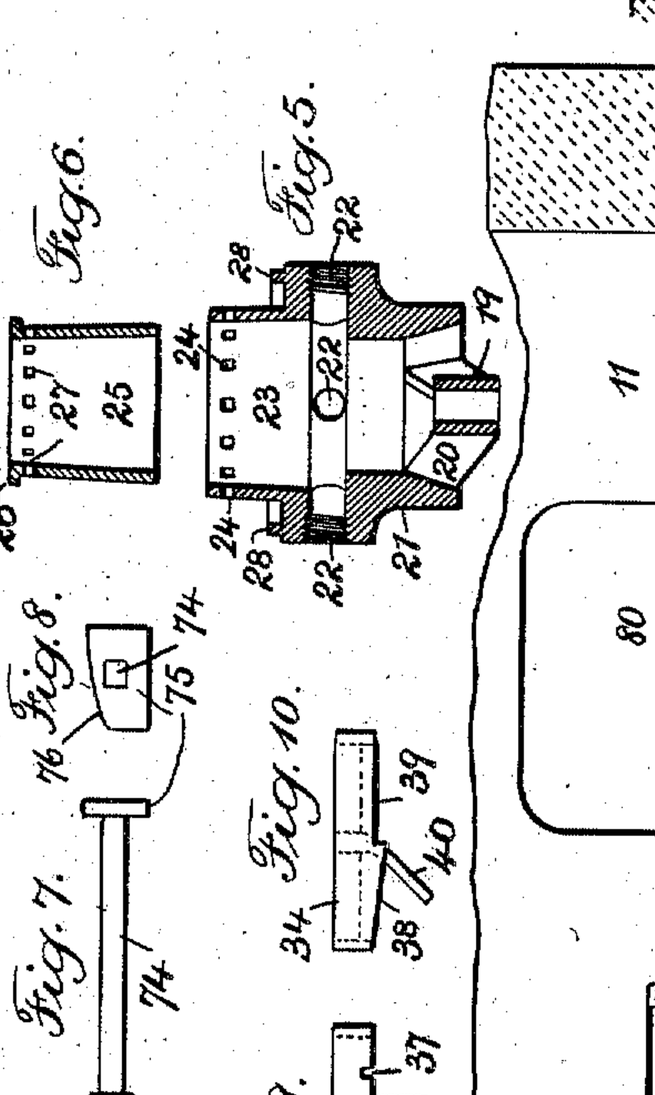

Fig. 4.

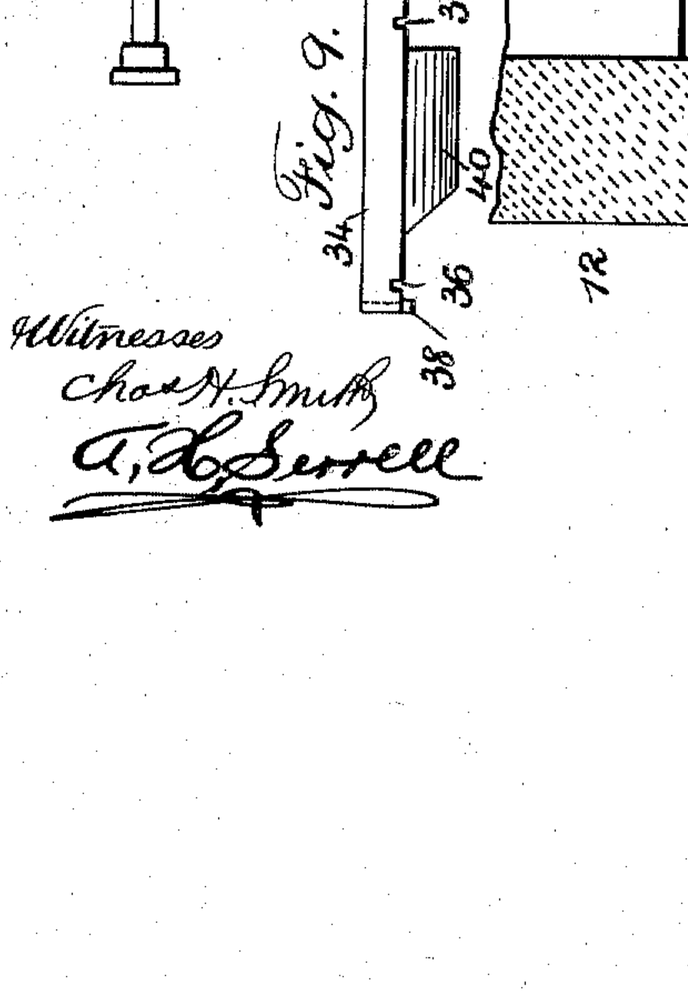

Fig. 2.

Witnesses
Chas. N. Smith
A. L. Serrell

Inventor
George S. Gallagher
by Harold Serrell
his Atty

UNITED STATES PATENT OFFICE.

GEORGE S. GALLAGHER, OF NEW YORK, N. Y., ASSIGNOR TO HENRY GALLAGHER AND EMMA G. GALLAGHER, OF NEW YORK, N. Y.

STEAM-BOILER FURNACE.

984,205. Specification of Letters Patent. **Patented Feb. 14, 1911.**

Application filed November 6, 1909. Serial No. 526,509.

To all whom it may concern:

Be it known that I, GEORGE S. GALLAGHER, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented an Improvement in Steam-Boiler Furnaces, of which the following is a specification.

My present invention relates to a steam boiler furnace and particularly to the construction of the grate employed, the means for actuating the grate and the manner and means employed for feeding the fuel to the conveyer box above the grate.

In carrying out my invention, I preferably employ together with the inclosing walls and the drum of the steam boiler furnace, a grate member which is preferably circular, means for revolving the grate, means whereby the grate or parts thereof may be raised and dropped to shake the fire, means for conveying the fuel from a point below the grate to the fire-box above the same, means for scraping the grate and means whereby in the turning of the grate currents of air are created and conveyed from the space beneath the grate to the fire-box immediately above the grate and preferably at the central portion thereof, all of which will be hereinafter more particularly described.

In the drawing, Figure 1 is a central vertical section illustrating my present improvement in steam boiler furnaces. Fig. 2 is a sectional elevation approximately on the line *x*, Fig. 1. Fig. 3 is a sectional plan taken above the grate members. Fig. 4 is a plan view of the parts employed to drive the moving members. Fig. 5 is a central longitudinal section of the hub for the grate members. Fig. 6 is a similar view illustrating the ring employed with this hub. Fig. 7 is a side elevation of the member employed to coact with the grate members in shaking the fire. Fig. 8 is an end elevation of the same. Fig. 9 is a side elevation of one of the grate bars showing a modified form thereof and Fig. 10 is an end elevation of the same.

Referring particularly to the drawings, the steam boiler furnace comprising my present invention may be inclosed in any suitable form of housing as for instance the front wall 11 and side walls 12; the rear wall not being shown, and in a suitable position may be provided with a customary bridge wall indicated at 13 and the boiler drum indicated at 14, which latter as will be understood may be mounted in any suitable manner on the walls of the furnace.

15 designates the flooring preferably on a level with the boiler house floor and extending entirely across the space between the front wall 11, bridge wall 13 and the intermediate portions of the side walls 12. Beneath this flooring 15 and suitably fixed in the foundation walls in such a position as to abut against the under surface of the flooring, there are spaced apart channel members indicated at 16, which as will be understood assist in supporting the flooring. Also beneath the flooring 15 and in a suitable pit provided therefor there is a bearing 17 mounted on a suitable base. One end of the vertical shaft 18 is journaled in this bearing 17 and secured at the other and upper end of this shaft 18 is a hub 19 which is fixed thereto in any desired manner. Extending radially from the hub 19 are arms 20 and these arms are connected with and made integrally a part of a head 21 which is preferably cylindrical and in suitable spaced apart positions is provided with screw-threaded apertures 22. The upper portion of the head 21 or the extension thereof indicated at 23 is preferably of greater interior diameter and of less exterior diameter than the lower or main portion of this head 21 and adjacent to the upper edge of this extension portion 23 the same is provided with a series of spaced apertures indicated at 24.

25 designates a ring member which is also approximately cylindrical, is provided at its upper end with a flange 26 and beneath this flange with series of spaced apertures indicated at 27. This ring 25 is adapted to fit into and be secured within the head 21 plainly indicated in Fig. 1 in such a position as to provide an annular chamber between the same and the inner surface of the extension 23 when the apertures 27 in the ring 25 will register approximately with the apertures 24 in the extension 23.

The upper surface of the head 21 is provided with a circular rib 28 and secured in each one of the screw-threaded apertures 22 and extending therefrom is a tubular arm 29. At its outer extremity each tubular arm 29 is provided with a box-like head 30 and each box-like head 30 is provided with an air inlet nozzle indicated at 31. On their

upper surfaces each box-like head 30 is provided with a recess 32 and into these recesses 32 a ring 33 is fitted; this ring 33 being of such a width that when in position its upper edge is on substantially the same level as the upper edge of the rib 28.

The grate employed in this furnace is preferably made up of a plurality of sector-shaped sections as is indicated in Fig. 3 and one of which is illustrated in Figs. 9 and 10. Each one of these sector-shaped grate sections 34 comprises a surface member provided with series of apertures which are preferably of varying lengths and surrounding depending side and end members. As is indicated in Fig. 9, the side members of each grate section in the lower edges thereof are provided with recesses 36 and 37, which respectively when the grate section is placed in position are adapted to receive portions of the ring 33 and the circular rib 28, not only to secure each grate section in position but also to support the same; the head member 21 acting as a hub and the ring 33 as a rim upon and with which the grate sections are revolved as hereinafter described. As indicated in Fig. 10, the front side of each grate section is provided with an inclined lower edge 38 extending approximately one-half the width of the front side of the grate section, the other half of which at its lower edge is approximately parallel with the top surface of the section as indicated at 39, and as is also indicated in Figs. 9 and 10, each one of these grate sections may be provided with a wing 40 depending preferably centrally and at an angle from its under surface.

41 designates a casing which is also cylindrical and passes through an opening provided therefor in the flooring 15 and is supported upon the cross-piece 42 connected to the channel members 16. The upper end of this casing 41 receives the lower portion of the head 21 and the latter is adapted to be revolved in the former. The casing 41 is also provided with a branch connection 43 to which is connected a chute 44 provided at its outer end with a hopper 45 adapted to receive the fuel to be burned in the boiler. Within the casing 41 is a conveyer shaft 46. This conveyer shaft 46 is hollow and fits over and turns upon the shaft 18 and furthermore is provided with a screw conveyer indicated at 47 which latter extends from a point immediately above the cross-piece 42 to a point immediately below the hub 19. A sprocket or gear wheel 48 is fixed on the lower end of the shaft 18 adjacent to the bearing 17 and above the sprocket wheel 48 and on the lower end of the conveyer shaft 46 a sprocket or gear wheel 49 is fixed.

Exteriorly of the front wall of the boiler and suitably arranged there are upright members 50 and cross-pieces 51 forming a suitable frame and provided with bearings in which shafts 52 and 59 are journaled. The shaft 52 passes through the flooring 15 and adjacent to its lower end is provided with a sprocket or gear wheel 53 and a chain 54 passes around and extends between the sprocket 53 and sprocket 49. At its upper end the shaft 52 is provided with a ratchet wheel 55 and beneath the ratchet 55 there is loosely mounted on the shaft 52 a crank 56, which carries the pawl 57 adapted to engage the teeth of the ratchet 55, and at its upper extremity the shaft 52 is provided with a collar 58 to maintain the parts in their respective positions thereon, and as will be understood, this collar may be made integral with the sprocket 55. The shaft 59 also passes through the flooring 15 and a sprocket 60 is secured thereto adjacent to its lower end. A chain 61 extends between and passes around the sprocket 60 and the sprocket 48. In any suitable position above the flooring 15 a gear 62 is fixed on the shaft 59 and this gear 62 meshes with a worm 63 on a shaft 64, which latter is journaled in suitable brackets 65 which are secured in the upright members 50. It will be understood that this shaft 64 may be driven at any desired speed from and by any suitable source of power. On its upper end the shaft 59 has fixed thereto an eccentric 66 provided with which there is an eccentric strap 67 pivotally connected at 68 with one of the cross-pieces 51, and at the opposite side provided with an extension 69 in which there is a slot 70 as indicated in Fig. 4.

71 designates a link which at one end is pivotally connected to the free end of the crank 56 as indicated at 72 and at the opposite end is adjustably secured in the slot 70 by means of the nut 73 or otherwise.

74 designates a rod adapted to be passed through a portion of the front wall of the furnace in which an aperture is provided therefor and at its inner end this rod 74 is provided with a plate head 75, the upper edge of which is inclined as indicated at 76. When in the position shown in full lines Fig. 3, the plate head 75 of this rod 74 fits within a recess provided therefor in the front wall 11. This rod 74 however, may be pushed inwardly to such an extent that the plate head 75 will assume such a position as to come immediately below the front depending side of each of the sector-shaped grate sections for the purpose hereinafter described.

77 designates a plate of metal slidably mounted in brackets 78 in a passageway 79 made in the front wall of the boiler, and this plate 77 is so placed that the same may be inserted or moved inwardly to extend across a portion of the surface of the grate bars so as to scrape the same and also to cause clinkers and any other matter which

will not pass through the apertures in the grate sections to be forced outwardly into the passageway 79, from which these foreign substances may be readily removed by any suitable tool.

I may also provide in the front wall of the boiler indicated at 80 a door which is adapted to cover an opening in this wall providing access to the fire-box or space above the grate, and I may also provide a door 83 in one of the side walls, or other suitable position, covering an opening 84 leading into the ash pit 82, or the space beneath the grate bars and above the flooring 15, and this ash pit door may also be provided with apertures and means for closing or regulating the extent to which the same may be opened in order to provide for the necessary draft.

Now in the operation of the hereinbefore described apparatus, the coal or other fuel is supplied to the hopper 45 and passes by way of the chute 44 to the interior of the casing 41. The shaft 59 and gear 62 thereon are preferably turned in the direction of the arrow Fig. 4 by means of the worm 63 and through the eccentric 66 and eccentric strap 67, the arm 69, the link 71 and crank 56 and the shaft 52 is given a partial revolution by means of the ratchet 55 in the pawl 56 for every revolution of the shaft 59. The conveyer shaft 46 is revolved by the turning of the shaft 52 by means of the sprockets 53, 49, and the chain 54, and the fuel is fed by the screw-conveyer upwardly and preferably vertically through the casing 41, through the head 21 and out onto the surface of the grate sections; the fuel thereby being supplied centrally to the grate. The shaft 18 is revolved by the shaft 59 by means of the sprockets 60, 48, and the chain 61. The turning of the shaft 18 causes the head 21 and its associated parts to revolve, carrying therewith the grate sections 34. Now it will be apparent that as the hub or head 21 revolves, air is admitted at the nozzles 31 and passes therefrom into the box-shaped heads 30 through the tubular arms 29 into the annular space 85 between the ring 25 and the extension 23 and through the apertures 24 outwardly and through the apertures 27 inwardly. It will also be apparent that the wings 40 depending from the grate sections will also tend to cause the air beneath the grate to pass upwardly through the apertures therein. When the rod 74 is pushed inwardly as the grate revolves, each grate section by the inclined edge 38 on its front side is raised from its normal position at its outer edge and this condition exists until after the inclined edge 38 has passed over the inclined edge 76 of the head 75 on the rod 74, when as will be understood the grate section which has been raised will drop back into position and by the impact from falling in place will cause the fire to be shaken automatically. It will also be understood, as hereinbefore indicated, that when the plate 77 is pushed inwardly so that its inner end extends over a portion of the grate surface, the grate will not only be scraped, but clinkers and other foreign substances which will not pass through grates may be forced into the passageway 79 and so removed from the fire-box.

I claim as my invention:

1. In a steam boiler furnace, a revoluble grate, means for supporting the same, means for continuously turning the said grate while in use and means connected to and moving with the said grate, whereby in its revolution, currents of air are created and continuously conveyed from the space beneath the grate to approximately central points above the same.

2. In a steam boiler furnace, a revoluble sectional grate, means for supporting the same, means for continuously turning the said grate while in use, means connected to and moving with the said grate whereby in its revolution, currents of air are created and continuously conveyed from the space beneath the grate to approximately central points above the same, and means operative during the revolution of the grate for shaking successively the sections of the grate.

3. In a steam boiler furnace, a revoluble grate, means for supporting the same, means for continuously turning the said grate while in use, means connected to and moving with the said grate, whereby in its revolution, currents of air are created and continuously conveyed from the space beneath the grate to approximately central points above the same, and means operative during the revolution of the grate for scraping the upper surface thereof and forcing out such matter as will not pass therethrough.

4. In a steam boiler furnace, a revoluble grate composed of a plurality of sections, means for supporting each grate section, means for turning the said grate and its support, and means connected to and moving with the grate, whereby in its revolution, currents of air are created and continuously conveyed from the space beneath the grate to approximately central points above the same.

5. In a steam boiler furnace, a revoluble grate composed of a plurality of sections, means for supporting each grate section, means for turning the said grate and its support, means moving with the grate, whereby in its revolution, currents of air are created and continuously conveyed from the space beneath the grate to approximately central points above the same, and means operative during the revolution of the grate for shaking successively the sections of the grate.

6. In a steam boiler furnace, a grate com-

prising a plurality of sector-shaped sections, a frame upon which said grate sections are supported, a shaft to which said frame is connected, means whereby said shaft is turned to revolve the grate, and means moving with and connected to the grate whereby in its revolution, currents of air are created and continuously conveyed from the space beneath the grate to approximately central points above the same.

7. In a steam boiler furnace, a grate comprising a plurality of sector-shaped sections, a frame upon which said grate sections are supported, a shaft to which said frame is connected, means whereby said shaft is turned to revolve the grate, means moving with and connected to the grate, whereby in its revolution, currents of air are created and continuously conveyed from the space beneath the grate to approximately central points above the same, and means whereby in the revolution of the grate, each section thereof may be separately and automatically shaken.

8. In a steam boiler furnace, a grate comprising a plurality of sections, a frame for supporting the same, a shaft to which the said frame is secured, means for turning the said shaft to revolve the grate, the said frame including means connected to the grate whereby through the revolution of its parts, currents of air are created and continuously conveyed from the space beneath the grate to approximately central points above the same, and means whereby in the revolution of the grate, each section thereof may be separately and automatically shaken.

9. In a steam boiler furnace, a grate comprising a plurality of sections, a support for the same having a central aperture therein, the said grate support including means whereby in the revolution of its parts with the grate, air currents are created and continuously conveyed from the space beneath the grate to points approximately central above the same, means for turning the said support and thereby revolving the grate, a conveyer for feeding the fuel to the said grate through the said central aperture in the said support, and means whereby the said conveyer is actuated by the said means for revolving the grate.

10. In a steam boiler furnace, a shaft, a hollow head secured to said shaft and provided with an annular chamber surrounding the same with apertures providing communication from said annular chamber to both the interior and exterior of the said hollow head, tubular arms secured at one end to the said head and communicating with the said annular chamber, nozzles connected to the other and outer of the said arms and communicating with the interiors thereof, a grate comprising a plurality of sections, each of which is supported by the said head and the said tubular arms, and means for turning the said shaft to revolve the said head, tubular arms and grate sections.

11. In a steam boiler furnace, a shaft, a head secured to said shaft, provided with a central longitudinal opening and an interior annular air passage, tubular arms connected to the said head and communicating with said annular air passage and being also provided with apertures in the walls of the said head leading both inwardly and outwardly from the said annular air passage, nozzles connected to the said tubular arms, a ring supported by the said tubular arms, a rib integral with the said head, a grate comprising a plurality of sections each of which is provided with recesses adapted respectively to receive portions of the said ring and rib, and means for turning said shaft to revolve the said head, arms and grate sections.

12. In a steam boiler furnace, a shaft, a head secured to said shaft, provided with a central longitudinal opening and an interior annular air passage, tubular arms connected to the said head and communicating with said annular air passage and being also provided with apertures in the walls of the said head leading both inwardly and outwardly from the said annular air passage, nozzles connected to the said tubular arms, a ring supported by the said tubular arms, a rib integral with the said head, a grate comprising a plurality of sections each of which is provided with recesses adapted respectively to receive portions of the said ring and rib, means for turning said shaft to revolve the said head, arms and grate sections, a conveyer shell placed vertically beneath said grate and at its upper end adapted to receive the said head, a conveyer shaft surrounding the aforesaid shaft, a conveyer screw on the said conveyer shaft operating within the said conveyer shell and regulatable means for turning the said conveyer shaft through and by the aforesaid means for turning the first aforesaid shaft, head and grate sections.

13. In a steam boiler furnace, a grate, a support for the same having a central longitudinal opening therein, a shaft to which the said grate support is connected, a conveyer shaft surrounding the said grate frame shaft, a conveyer screw on the said conveyer shaft, a casing for the said conveyer screw, means for feeding fuel to the interior of the said casing, a counter-shaft, means for turning the said grate frame shaft from the said counter-shaft and means actuated by the said counter-shaft for driving the said feed screw shaft and regulating the speed thereof.

14. In a steam boiler furnace, a grate comprising a plurality of sections, a frame upon which the said grate sections are supported, the frame being provided with a central longitudinal opening, a shaft connected to the

said grate support, a conveyer shaft, a screw on the said conveyer shaft, a casing surrounding the said conveyer screw, a counter-shaft, means for turning the said support ring shaft from the said counter-shaft and means actuated by the said counter-shaft for driving said screw and conveyer shaft and regulating the speed thereof.

15. In a steam boiler furnace, a grate comprising a plurality of sections, a frame upon which the said grate sections are supported, the frame being provided with a central longitudinal opening, a shaft connected to the said grate support, a conveyer shaft, a screw on the said conveyer shaft, a casing surrounding the said conveyer screw, a counter-shaft, means for turning the said support ring shaft from the said counter-shaft, an auxiliary counter-shaft from the said counter-shaft and regulating the speed thereof and means for driving the said feed screw and its shaft from said auxiliary counter-shaft.

Signed by me this 30th day of October 1909.

GEORGE S. GALLAGHER.

Witnesses:
GEO. T. PINCKNEY,
E. ZACHARIASEN.