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PATENTED MAR. 6, 1906.

J. COLLIS.

BOILER FURNACE.

APPLICATION FILED MAR. 2, 1905.

2 SHEETS—SHEET 1.

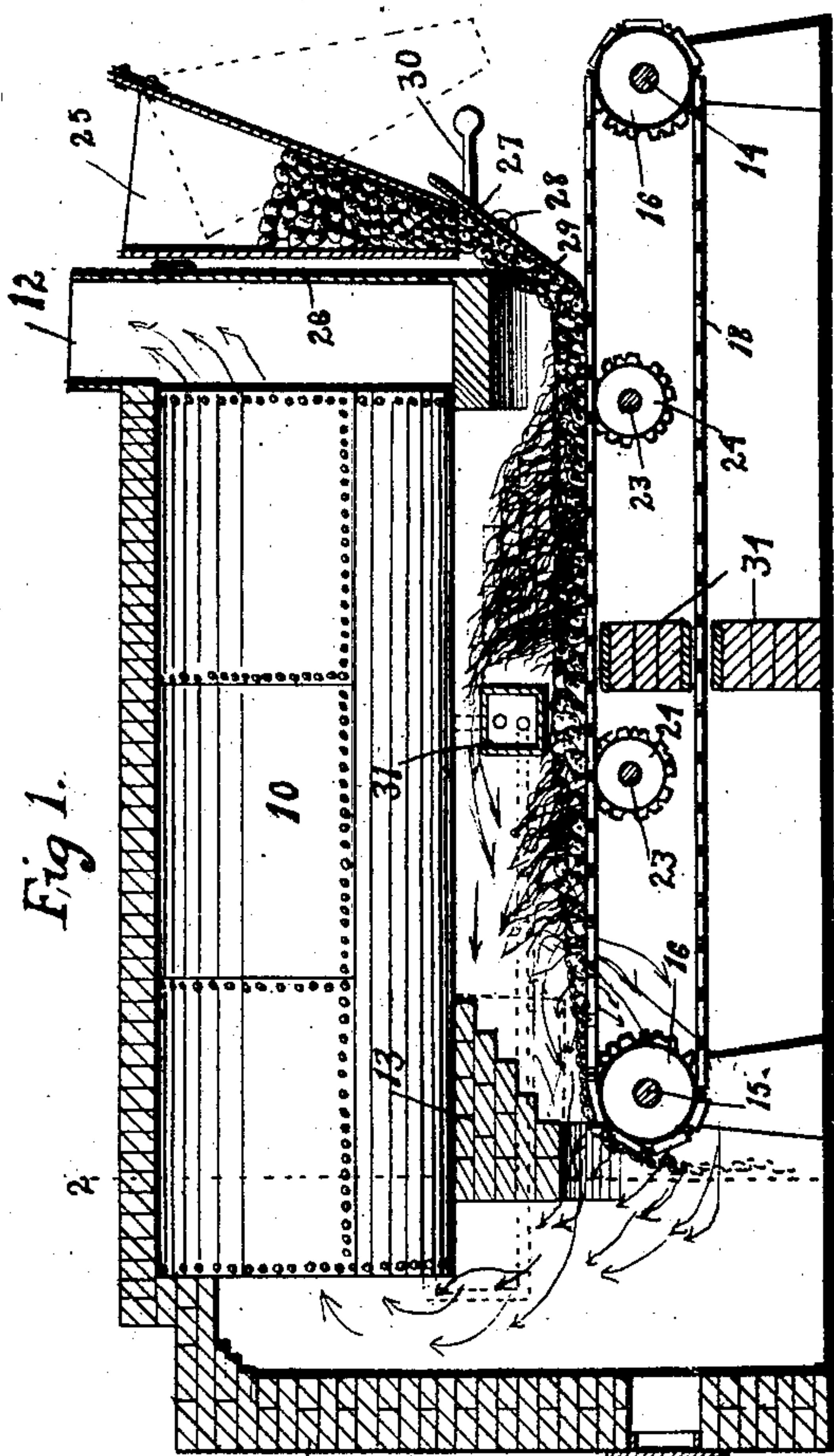


Fig 1.

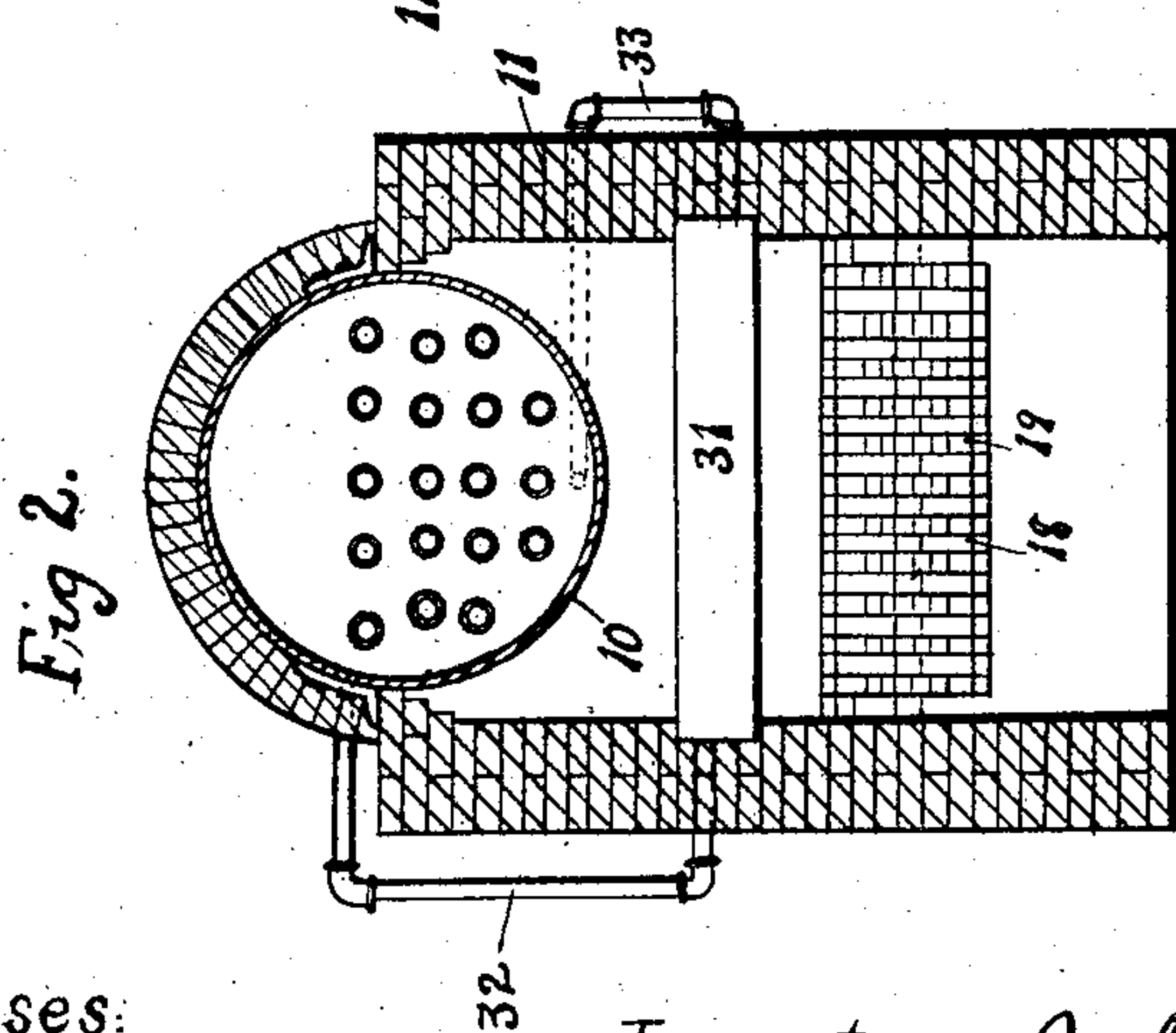


Fig 2.

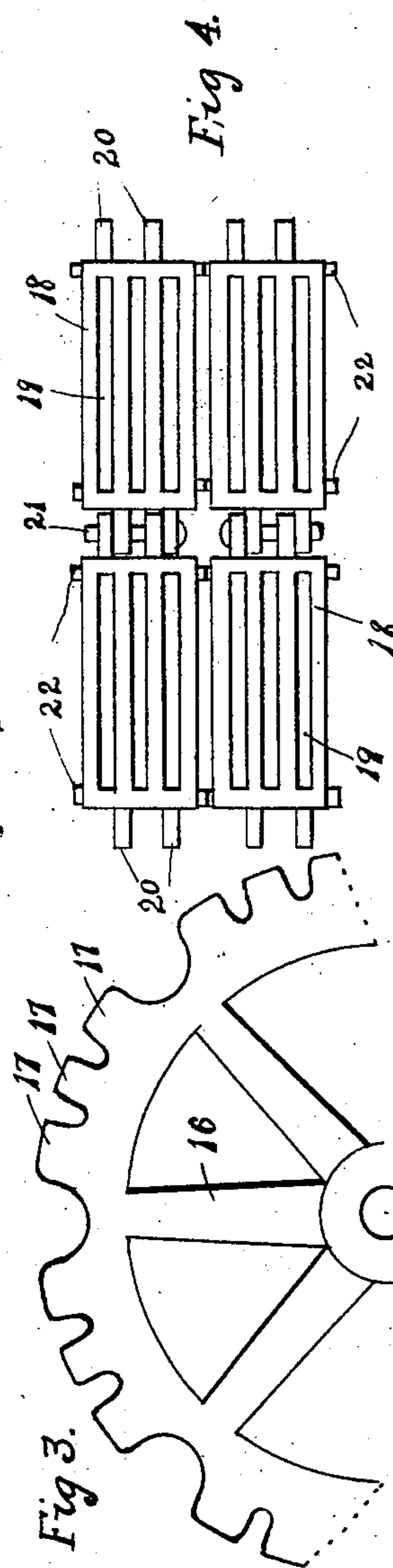


Fig 4.

Fig 3.

Witnesses:

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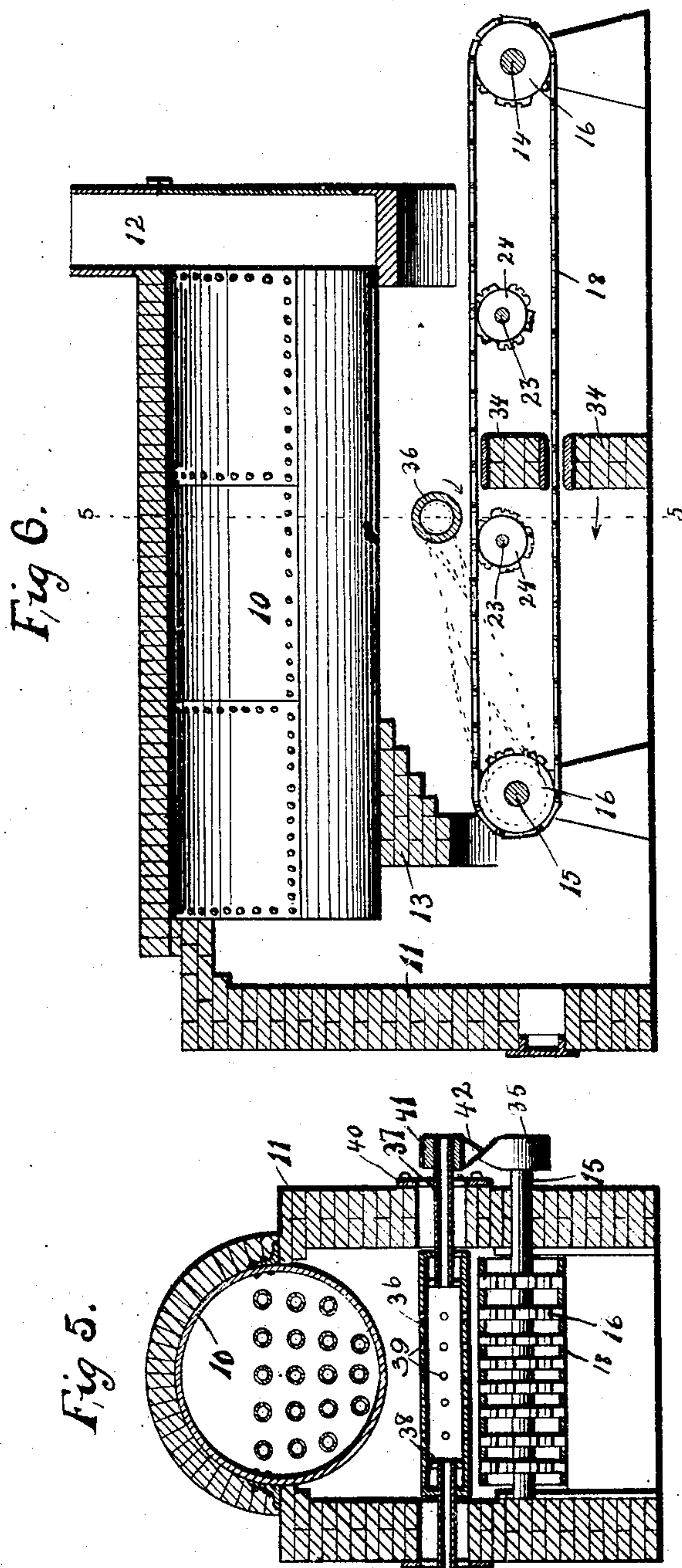
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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BOILER-FURNACE.

No. 814,840

Specification of Letters Patent.

Patented March 6, 1906.

Application filed March 2, 1905. Serial No. 248,037.

To all whom it may concern:

Be it known that I, JOHN COLLIS, a citizen of the United States, residing at Des Moines, in the county of Polk and State of Iowa, have
5 invented a certain new and useful Boiler-Furnace, of which the following is a specification.

My object is to provide a boiler-furnace with a bridge-wall located beneath the furnace-body and midway between the ends of
10 a traveling grate moving with the burning coals from front to rear beneath the said bridge-wall, so that the smoke, gases, and other volatile products of combustion arising from the fire on the grate in front of the
15 bridge-wall are effective in heating the boiler to the same extent as in the ordinary fire-box of a boiler-furnace and after said products of combustion have passed over the bridge-wall they will be forced downwardly by a brick
20 arch into contact with glowing coals upon the traveling grate in the rear of the bridge-wall, where the smoke and gases will be consumed, thereby tending to keep alive said glowing coals and to give off heat to the rear portion
25 of the boiler, thus obtaining the effect as regards smoke consumption of two independent fires, without the necessity of separately feeding and maintaining said fires.

A further object is to provide a rotatable
30 bridge-wall and a boiler-furnace having a traveling grate, said bridge-wall capable of slight vertical movement to accommodate itself to the thickness of the layer of fuel on the grate, so that the said bridge-wall will
35 present new surfaces to the action of the fire, and thus avoid being burned out at the hottest points and also to provide for cutting off draft under the bridge-wall relative to the amount of fuel on the grate.

40 A further object is to provide improved means for feeding fuel to the traveling grate.

Referring to the accompanying drawings, Figure 1 shows a vertical central sectional view of a complete boiler-furnace embodying
45 my invention. Fig. 2 shows a vertical transverse sectional view on the indicated line 2 2 of Fig. 1 with the partition-wall below the grate omitted. Fig. 3 shows a side elevation of part of one of the sprocket-wheels for supporting the traveling grate. Fig. 4 shows a detail plan view of a number of the traveling-grate links. Fig. 5 shows a transverse sectional view on the line 5 5 of Fig. 6, showing a modified form of bridge-wall and means for
55 rotating same, with the grate-supporting sprockets omitted. Fig. 6 shows a vertical

central longitudinal sectional view of same. Fig. 7 shows a transverse section of the rotary bridge-wall. Fig. 8 shows a side elevation, partly in section, of same; and Fig. 9
60 shows an end elevation of the rotary bridge-wall and the slotted bracket for supporting its end.

In the accompanying drawings, the reference-numeral 10 is used to indicate the boiler
65 of the class known as the "return-flue" type. This boiler is supported in the furnace-walls 11 in the ordinary way, and at its front is the smoke-stack 12, communicating with the return-flues. Beneath the rear end portion of
70 the boiler is the brick arch 13 to deflect products of combustion downwardly, for purposes hereinafter made clear. Beneath the boiler is a traveling grate supported by shafts 14 and 15, on which are mounted sprocket-
75 wheels 16, each sprocket-wheel having its teeth divided into a number of projections 17. The traveling grate is composed of a number of links which may be cast and each of which comprises a body portion 18, formed
80 with longitudinal slots 19, each of which is of a size to receive the projections 17 of the teeth of the sprocket-wheels. On each end of each link are the lugs 20, and two adjacent end-to-end links are connected by a bolt 21,
85 passing through said lugs. At each side of each link are the laterally-projecting lugs 22 to hold the side-by-side links spaced apart. Throughout the length of the upper portion of the traveling grate I have provided for
90 supporting it by means of the shafts 23, carrying the sprocket-wheels 24, constructed similar to the sprocket-wheels 16. The forward end of the traveling grate projects in front of the boiler, so that, if desired, fuel
95 may be fed to it by hand.

I have provided for supplying the traveling grate with fuel as follows: The numeral 25 indicates a hopper hinged at its upper forward corner to swing forwardly and up-
100 wardly, so that access may be had to the door 26 of the flue 12 by swinging said hopper forwardly and upwardly. The lower end of the hopper discharges upon a furnace-door 27, which door is pivoted at 28. Below said piv-
105 otal point it is provided with perforations 29, and above the pivotal point it is solid. Fixed to the upper end of said door is a weighted arm 30, so arranged that it may be conveniently grasped by the operator and pulled downwardly to place the door 27 in a substantially horizontal position, thus opening

the door and permitting the traveling grate to be fed independently of the hopper. The distance between the door 27 and the adjacent portion of the door 26 is such as to limit the quantity of fuel delivered from the hopper to the traveling grate, so that the fuel upon the grate will be of uniform depth.

Located midway between the arch 13 and the front of the boiler is a hollow metal bridge-wall 31, extending from one side of the furnace to the other with its lower surface at such an elevation from the top of the traveling grate as to permit the bed of coals on the traveling grate to pass under it and yet prevent the passage under it of any considerable quantity of the products of combustion arising from the grate. This bridge-wall limits the dimension of the fire-box of the furnace, and in use the grate is advanced at such speed that the fuel will be substantially consumed before it passes under the said bridge-wall. I have provided for utilizing the bridge-wall to assist in heating the water in the boiler as follows: One end of the bridge-wall 31 is provided with a pipe 32, communicating between the upper portion of the bridge-wall and the upper portion of the boiler, and at the other end of the bridge-wall is a pipe 33, communicating between the lower portion of the bridge-wall and the lower rear end of the boiler. In this way a circulation of water within the bridge-wall is provided for when a fire is burning on the grate, and the heated water is discharged into the boiler. This prevents the bridge-wall from burning out and materially assists the boiler in heating water. After the products of combustion arising from the grate in front of the bridge-wall have passed over the bridge-wall they will pass under the boiler and will give off their heat in the ordinary way. When the currents in which these products of combustion are carried strike the arch 13, they will be deflected downwardly to the glowing coals upon that portion of the grate that has traveled under the bridge-wall, and some of this current will pass downwardly through the grate and some along the top of the grate under the arch. It is well known that by bringing a current of air and smoke and volatile gas close to or through glowing coals these products will be ignited and the gases will give off their heat and the smoke be wholly consumed. Hence in practice the furnace will consume the smoke and all volatile products of combustion, and these will be utilized in maintaining the glowing coals in their heated condition, thus supplying heat to the rear end portion of the boiler. Beneath the bridge-wall is a solid wall 34, extending across the furnace and dividing the space between the upper and lower portions of the traveling grate into front and rear compartments and preventing draft from passing upwardly through the grate in the rear

of said wall. It is intended that the draft passing through the grate to produce combustion shall pass through in front of said wall, so that the portion in front of the wall constitutes the equivalent of the fire-box of the ordinary furnace, while that portion in the rear of the bridge-wall constitutes a second fire-box for the purpose of consuming the products of combustion arising from the fire in front of the bridge-wall.

In the modified form shown on Sheet 2 the shaft 15 is extended through the adjacent side wall of the furnace and provided with a pulley 35. The bridge-wall is of cylindrical form and is indicated by the numeral 36, and fixed to its ends are the open-ended hollow shafts 37, communicating with the interior of the bridge-wall and extended through the adjacent side walls of the furnace. On the interior of the bridge-wall 36 near its end are the integral arms 38 to brace the inner ends of the shafts 37, and the central portion of the bridge-wall is perforated at 39. Fixed to the outer surfaces of the furnace-walls are the slotted brackets 40, through which the shafts 37 are passed and by which they are guided in their up-and-down movements. On one of the shafts 37 is a pulley 41, connected by the cross-belt 42 with the pulley 35. By this arrangement the under surface of the cylindrical bridge-wall 36 is made to move in the direction of the travel of the fuel on the grate. Hence the said bridge-wall constantly presents new surfaces to the hottest portions of the fire to prevent it from becoming burned out, and the bridge-wall will ride upon the fuel on the grate and prevent the passage of draft under it, thus positively dividing the fire-box at the front from the one at the rear except that the smoke and flames that passed over the bridge-wall may enter the fire-box at the rear of the bridge-wall and be brought into contact with the heated coals thereon. By providing the open-ended shafts 37, communicating with the outside atmosphere and with the interior of the cylindrical bridge-walls, it is obvious that air will be drawn into the bridge-wall and heated and then discharged through the openings 39 of the bridge-wall and caused to commingle with the gases and smoke under the boiler, and thus aid combustion.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States therefor, is—

1. In a furnace, the combination with a traveling grate, of a bridge-wall arranged above and between the ends of the fuel-supporting portion of the traveling grate, spaced apart from the top of the traveling grate to permit the fuel to pass under it, means for advancing the traveling grate so that fuel on it may pass under the bridge-wall and continue to burn in the compartment in the rear of the bridge-wall and means for directing

the products of combustion arising from the chamber in front of the bridge-wall over the bridge-wall and over the portion of the grate in the rear of the bridge-wall.

- 5 2. In a furnace, the combination with a traveling grate, of a bridge-wall arranged above and between the ends of the fuel-supporting portion of the traveling grate and spaced apart from the top of the traveling grate to permit the fuel to pass under it, means for advancing the traveling grate so that fuel on it may pass under the bridge-wall and continue to burn in the compartment in the rear of the bridge-wall and means for directing the products of combustion arising from the chamber in front of the bridge-wall, over the bridge-wall and then downwardly over the portion of the grate in the rear of the bridge-wall.
- 20 3. In a furnace the combination of a traveling grate, a partition below the central portion of the traveling grate to direct draft upwardly through the portion of the grate in front of the partition, a bridge-wall above the central portion of the traveling grate and above the said partition, said bridge-wall spaced apart from the grate to permit fuel to pass under it and means for directing the products of combustion from one side of the grate over the bridge-wall and over the portion of the grate on the opposite side of the bridge-wall.
- 30 4. In a furnace the combination of a traveling grate, a partition below the central portion of the traveling grate to direct draft upwardly through the portion of the grate in front of the partition, a bridge-wall above the central portion of the traveling grate and above the said partition, said bridge-wall spaced apart from the grate to permit fuel to pass under it, and means for directing the products of combustion from one side of the grate over the bridge-wall and over the portion of the grate on the opposite side of the bridge-wall, and a deflecting-arch above the rear portion of the grate to direct products of combustion passing over the bridge-wall,

downward toward the rear portion of the grate.

- 5 5. In a boiler-furnace, the combination of furnace-walls, a boiler, a traveling grate, a partition beneath the central portion of the traveling grate, a bridge-wall above and spaced apart from the central portion of the traveling grate, and a deflecting-arch beneath the rear end of the boiler.

- 6 6. In a furnace, the combination of a traveling grate, a rotatable bridge-wall above the grate and spaced apart from it to permit fuel to pass under the bridge-wall, said bridge-wall shaped to remain in contact with the fuel while its under surface is moving in the same direction as the fuel upon the grate.

- 7 7. The combination with a furnace, of a rotatable bridge-wall, said bridge-wall provided with discharge-openings and means for introducing air into the bridge-wall.

- 8 8. The combination with a furnace and a traveling grate, of a rotary bridge-wall connected with the traveling grate to be rotated thereby.

- 9 9. The combination with a furnace and a traveling grate, of a rotatable bridge-wall capable of limited up-and-down movement and normally resting on the fuel on the grate.

- 10 10. In a furnace, the combination of a traveling grate a bridge-wall normally resting upon the fuel on the grate and capable of being moved up and down by the variations in the thickness of the layer of fuel on the traveling grate passing over the bridge-wall.

- 11 11. The combination of a boiler-furnace and a traveling grate, of a cylindrical, perforated bridge-wall, open-ended shafts communicating with the interior of the bridge-wall and rotatably and slidingly supported in the side walls of the furnace and means for connecting the bridge-wall with the traveling grate so that its under surface is advanced in the same direction as the grate

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Witnesses:

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