

Dec. 9, 1924.

W. M. DUNCAN

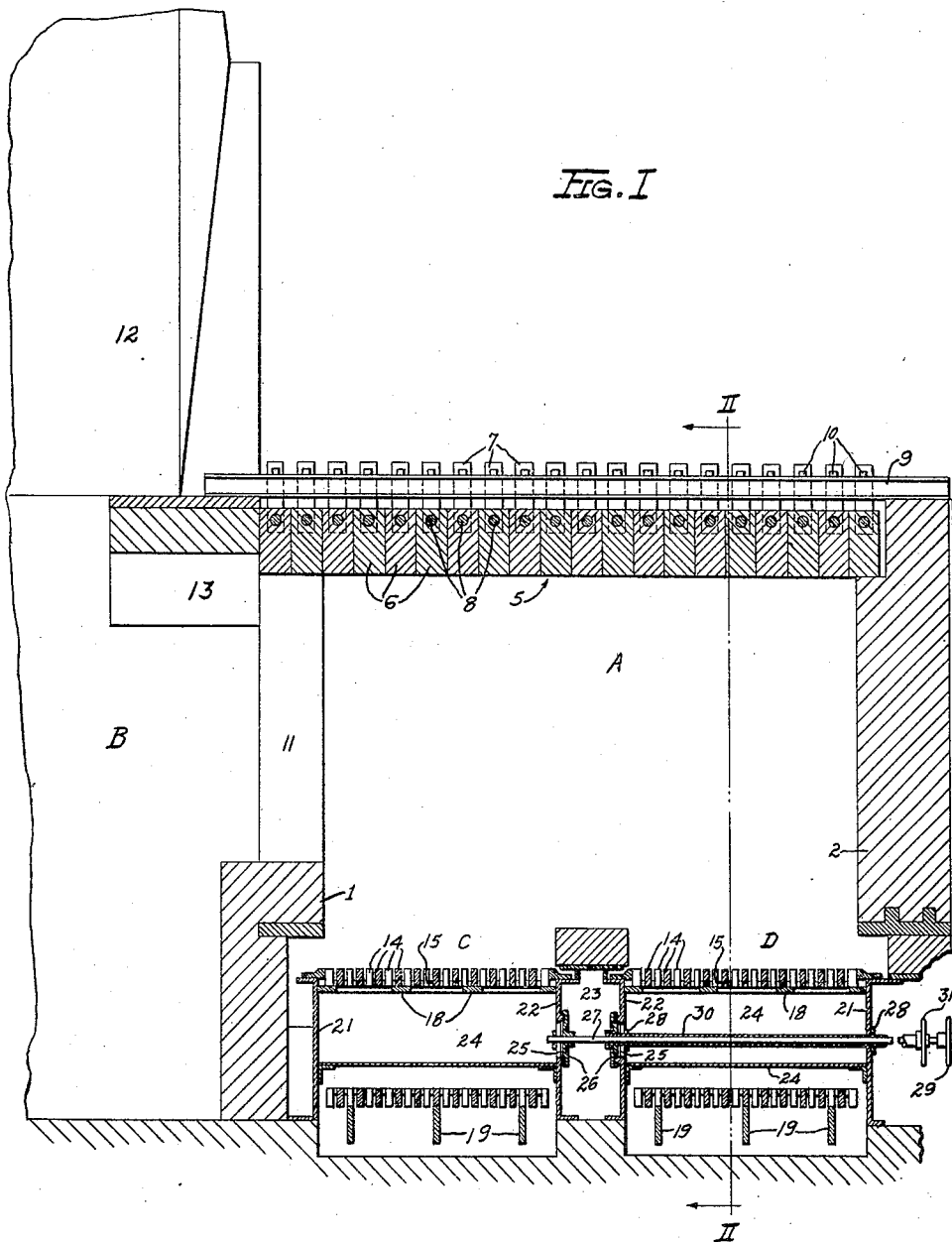
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FURNACE

Filed June 9, 1923

2 Sheets-Sheet 1

FIG. I



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FIG. II

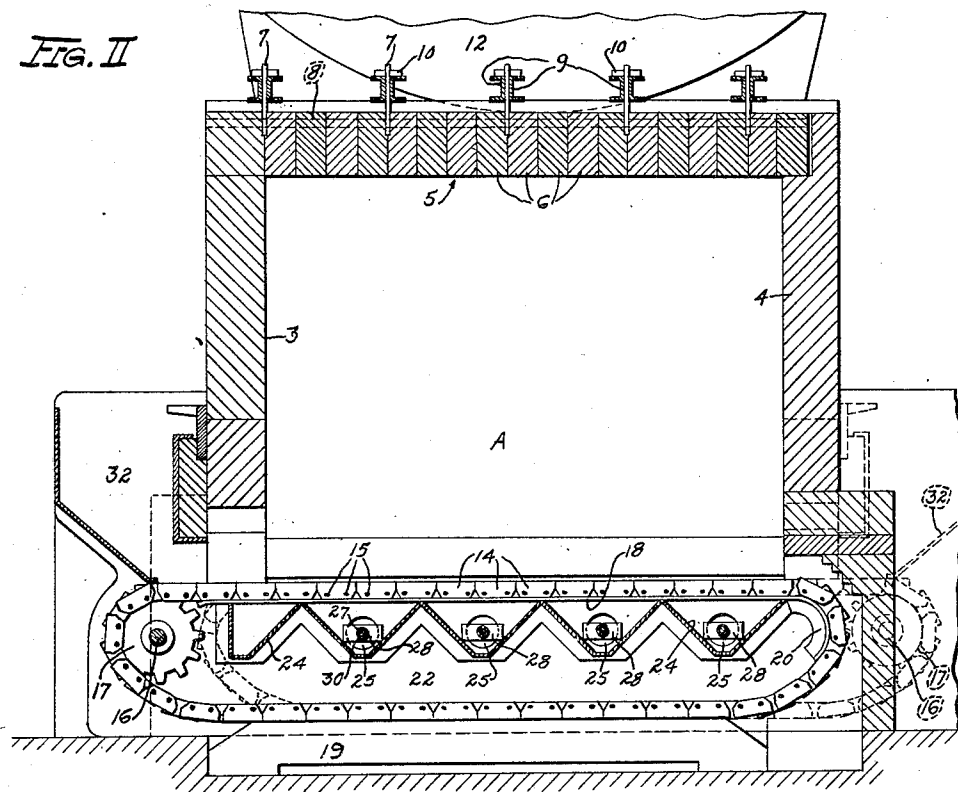
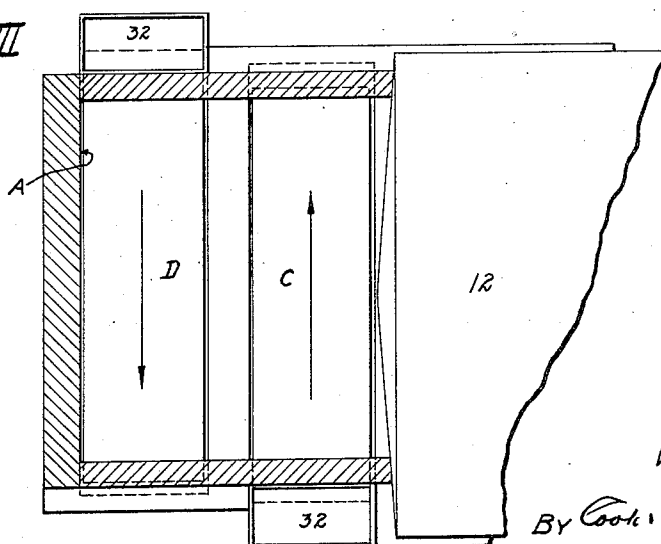


FIG. III



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UNITED STATES PATENT OFFICE.

WILLIAM M. DUNCAN, OF ALTON, ILLINOIS.

FURNACE.

Application filed June 9, 1923. Serial No. 644,342.

To all whom it may concern:

Be it known that I, WILLIAM M. DUNCAN, a citizen of the United States of America, a resident of Alton, in the county of Madison, State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to improvements in furnaces, and more particularly to a furnace equipped with traveling chain grates from which heat is transmitted to a boiler or the like. The main object is to provide a furnace with a traveling grate structure which will insure an approximately even distribution of heat throughout the width of the heating chamber of the furnace, whereby better results will be obtained during the operation of said furnace.

Prior to this invention, many furnaces having traveling chain grates were each provided with but a single grate, which grate was provided with a fuel hopper at one of its ends. Fuel was fed to the traveling grate from the hopper, and this fuel was burned as it was carried from the hopper end of the grate to the opposite end thereof. It is apparent that in the operation of a furnace of the type mentioned, the heat transmitted to the heating chamber would not be uniform, for it is plain that as the fuel traveled toward the discharge end of the grate said fuel would be gradually consumed, and the intensity of the heat rising from said fuel would be proportionately lessened.

In the furnace disclosed in the present application I employ a pair of traveling chain grates arranged side by side, each of said traveling grates being adapted to travel in a direction opposite to the direction of travel of the adjacent traveling grate. By this arrangement that portion of one grate which supports fuel which is practically consumed and is consequently not producing a great amount of heat is immediately adjacent to the portion of the associated grate which supports fuel which is producing the maximum amount of heat. Thus it is apparent that the pair of grates functioning as a unit transmit to the heating chamber of the furnace a body of heat which is practically uniform throughout the lengths of the grates, thereby greatly

improving the results obtained from the furnace.

With the foregoing and other objects in view, the invention comprises the novel construction, combination and arrangement of parts hereinafter more specifically described and illustrated in the accompanying drawings wherein is shown the preferred embodiment of the invention. However, it is to be understood that the invention comprehends changes, variations and modifications which come within the scope of the claims hereunto appended.

Fig. I is a fragmentary side elevation of one end of a boiler or still equipped with a heating plant embodying the features of this invention, said heating plant being shown in section.

Fig. II is a vertical section on line II—II of Fig. I.

Fig. III is a fragmentary diagrammatical plan view of a boiler or still equipped with my invention.

In the drawings, A designates a combustion chamber having a rear wall 1, a front wall 2, side walls 3 and 4 and a top wall 5, the latter being formed by blocks 6 suspended from hanger bars 7. 8 designates supporting rods, each passing through a row of blocks 6 and also through some of the hanger bars 7. The hanger bars 7 are supported by channels 9 to which they are secured by means of pins 10, as shown in Figs. I and II. The rear wall 1 of the combustion chamber A forms the front wall of a heating chamber B, and a flame outlet 11 is formed in the upper portion of the wall 1 to provide for the transmission of heat from the combustion chamber A to the heating chamber B. 12 designates a boiler or still forming the top wall of the heating chamber B and adapted to be heated by the flame passing through the flame outlet 11. An arch 13 is located adjacent to the top of the flame outlet 11 and directly below one end of the boiler. The boiler and heating chamber lie at approximately right angles to the combustion chamber A.

C and D designate a pair of traveling chain grates arranged within the combustion chamber A, said grates being located side by side as illustrated in Fig. I of the drawings and being adapted to travel in courses approximately at right angles to the boiler or still 12. The grates C and D are arranged below the flame outlet 11 in

the wall 1 to provide for the passage of flame from said grates through said flame outlet and into the heating chamber B. As an illustration of a suitable traveling grate structure I employ endless rows of grate links 14 pivoted together at 15, and provided with a rotary drive shaft 16 to which a suitable number of drive wheels 17 are secured. The fuel-supporting upper portions of the endless grates travel on tracks 18 and the lower portions of said grates travel on tracks 19. To support the rear portions of the grates each track 18 may be provided with a curved portion 20.

15 The chain grates C and D are each mounted between side walls 21 and 22, the walls 22 of said chain grates forming the side walls of a draft passageway 23 which is interposed between said chain grates C and D, and into which passageway air may be forced by means of a suitable blower. Located between the side walls 21 and 22 and below the upper fuel-supporting portion of each traveling grate is a plurality of draft boxes 24, 25 said draft boxes being arranged transversely of the grates and being provided with open upper ends to provide for the delivery of draft through the beds of fuel on the upper portions of the grates. The walls 22 are each provided with a plurality of draft openings 25 which permit the passage of draft from the draft passageway 23 to the draft boxes 24, one of said openings being arranged in a wall of each draft box. Associated with each of the draft openings 25 is a rotary draft regulator 26 which may be of any suitable design. The rotary draft regulators 26 are capable of independent operation whereby the flow of draft into each draft box may be regulated, and the means for operating the draft regulators associated with the grate C independently of the draft regulators associated with the grate D comprises rods 27 on each of which one of the draft regulators associated with the grate C is mounted. The rods 27 pass through bearings supported by the side walls 21 and 22 of the grate D and are each provided at its outer end with a hand wheel 29 whereby said regulators may be rotated to permit or retard the passage of draft through the associated openings 25. Surrounding each of the rods 27 and rotatably arranged thereon is a tube 30, said tube having fixed to it at one of its ends a draft regulator 26 which is associated with one of the draft openings 25 of the grate D. The tubes 30 are supported in the bearings 28 and each of said tubes is provided at its outer end with an operating wheel 31 similar to the operating wheels 29 on the rods 27. From the foregoing it is plain that by rotating the handwheels 29 the draft regulators associated with the grate C may be operated 65 independently of the draft regulators asso-

ciated with the grate D, and it is also apparent that by rotating the hand wheels 31 the draft regulators associated with the grate D may be operated without affecting the draft regulators associated with the grate C. 70

Each traveling grate C and D is provided with a fuel hopper 32 which is located outside of the combustion chamber A, the hopper 32 associated with the grate C being at one side of the furnace and the hopper 32 75 associated with the grate D being at the opposite side of the furnace and each of said traveling grates is adapted to travel in a direction opposite to the direction of travel of the adjacent grate. 80

In the operation of a furnace constructed in accordance with my invention, the fuel passing from the fuel hopper 32 onto the traveling grate C will be slowly consumed as it moves longitudinally of the combustion chamber A, so that the intensity of the heat rising from said grate will gradually diminish as said fuel approaches the discharge end of the grate. By using a single grate this would result in an uneven heat 90 being transmitted to the heating chamber. However, by employing a pair of grates traveling in opposite directions, the portions of the grate D which are transmitting the maximum amount of heat will always be immediately adjacent to the portions of the grate C which are transmitting the minimum amount of heat, whereby a body of heat of comparatively uniform intensity 95 throughout its width will pass from the combustion chamber to the heating chamber B, thus providing for an approximately equal distribution of heat below the boiler. 100

I claim:

1. A furnace provided with a plurality of traveling fuel-supporting grates, means associated with said traveling fuel-supporting grates whereby adjacent grates are caused to travel in opposite directions, means at one side of the furnace for delivering fuel to one of a pair of adjacent grates, and means at the other side of the furnace for delivering fuel to the other of said pair of adjacent grates. 110

2. A furnace provided with a combustion chamber, a heating chamber at one side of said combustion chamber, said combustion chamber having a flame outlet to provide for delivery of flame to said heating chamber, a plurality of traveling fuel-supporting grates within said combustion chamber, means associated with said traveling fuel-supporting grates whereby adjacent grates are caused to travel in opposite directions, means at one side of the furnace for delivering fuel to one grate of a pair of adjacent grates, and means at the other side of the furnace for delivering fuel to the other grate of said pair of adjacent grates. 120 125

3. A furnace provided with a combustion 130

chamber, a heating chamber at one side of said combustion chamber, said combustion chamber having a flame outlet to provide for the delivery of flame to said heating chamber, a boiler arranged directly above said heating chamber, a pair of endless traveling chain grates arranged in said combustion chamber, means associated with said traveling chain grates whereby they are caused to travel in opposite directions, means at one side of the furnace for delivering fuel to one of said grates, and means at the other side of the furnace for delivering fuel to the other of said grates.

4. A furnace provided with a plurality of traveling fuel-supporting grates arranged side by side, means whereby adjacent fuel-supporting grates are caused to travel in opposite directions, means at one side of the furnace for delivering fuel to one of a pair of adjacent fuel-supporting grates, means at the other side of the furnace for delivering fuel to the other of said pair of adjacent fuel-supporting grates, and means interposed between adjacent grates whereby draft is supplied to said grates.

5. A furnace provided with a plurality of traveling fuel-supporting grates arranged side by side, means whereby adjacent fuel-supporting grates are caused to travel in opposite directions, means at one side of the furnace for delivering fuel to one of a pair of adjacent grates, means at the other side of the furnace for delivering fuel to the other of said pair of adjacent grates, and means comprising a draft conductor interposed between adjacent grates whereby draft is supplied to said grates.

6. A furnace provided with a combustion chamber, a heating chamber at one side of said combustion chamber, said combustion chamber having a flame outlet to provide for the delivery of flame to said heating chamber, a boiler arranged directly above said heating chamber, a pair of endless traveling chain grates arranged side by side in said combustion chamber, means whereby said traveling chain grates are caused to travel in opposite directions, means at one side of the furnace for delivering fuel to one of said traveling chain grates, means at the other side of the furnace for delivering fuel to the other of said traveling chain grates, and a draft conductor interposed between said pair of chain grates whereby draft may be supplied thereto.

7. A furnace provided with a plurality of

traveling fuel-supporting grates arranged side by side, means whereby adjacent fuel-supporting grates are caused to travel in opposite directions, means at one side of the furnace for delivering fuel to one of a pair of adjacent grates, means at the other side of the furnace for delivering fuel to the other of said pair of adjacent grates, means interposed between adjacent grates whereby draft is supplied thereto, and means for separately controlling the passage of draft to the individual grates.

8. A furnace provided with a combustion chamber, a heating chamber at one side of said combustion chamber, said combustion chamber having a flame outlet to provide for the delivery of flame to said heating chamber, a boiler arranged directly above said heating chamber, a pair of endless traveling chain grates arranged side by side in said combustion chamber, means whereby said traveling chain grates are caused to travel in opposite directions, means at one side of the furnace for delivering fuel to one of said grates, means at the other side of the furnace for delivering fuel to the other of said grates, a draft conductor interposed between said pair of chain grates whereby draft may be supplied thereto, and means for separately controlling the passage of draft to the individual grates.

9. A furnace provided with a combustion chamber, a heating chamber at one side of said combustion chamber, said combustion chamber having a flame outlet to provide for the delivery of flame to said heating chamber, a pair of endless traveling chain grates arranged side by side in said combustion chamber, means whereby said traveling chain grates are caused to travel in opposite directions, means at one side of the furnace for delivering fuel to one of said grates, means at the other side of the furnace for delivering fuel to the other of said grates, a draft conductor interposed between said chain grates, a plurality of draft boxes arranged below the fuel-supporting portion of each of said traveling grates, said draft boxes and said draft conductor being in communication with each other, and means for separately controlling the flow of draft from said draft conductor to the individual draft boxes.

In testimony that I claim the foregoing I hereunto affix my signature.

WILLIAM M. DUNCAN.