

Dec. 8, 1931.

J. KEMNAL

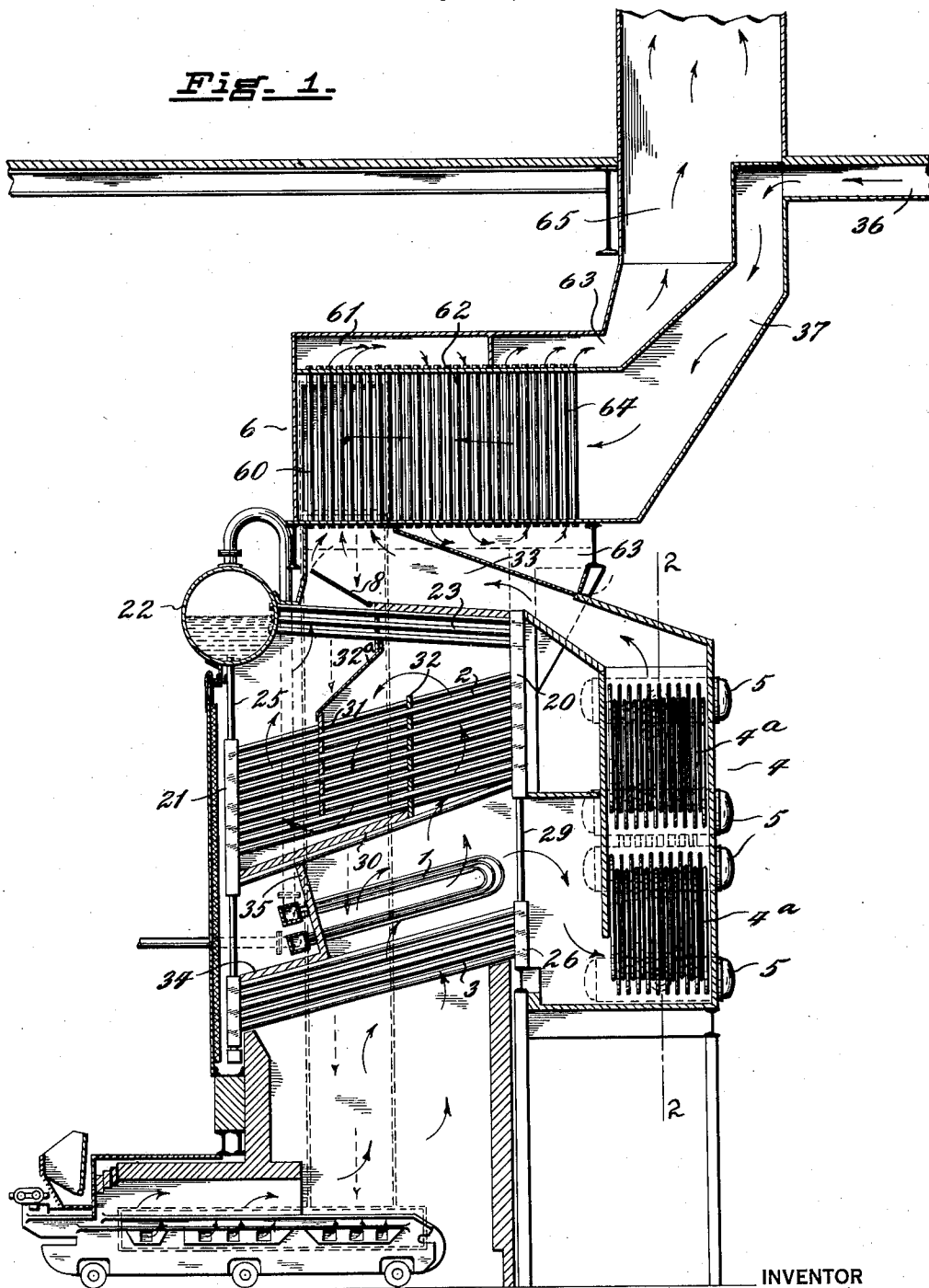
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STEAM BOILER INSTALLATION AND METHOD OF OPERATING THE SAME

Filed April 9, 1924

2 Sheets-Sheet 1

Fig. 1.



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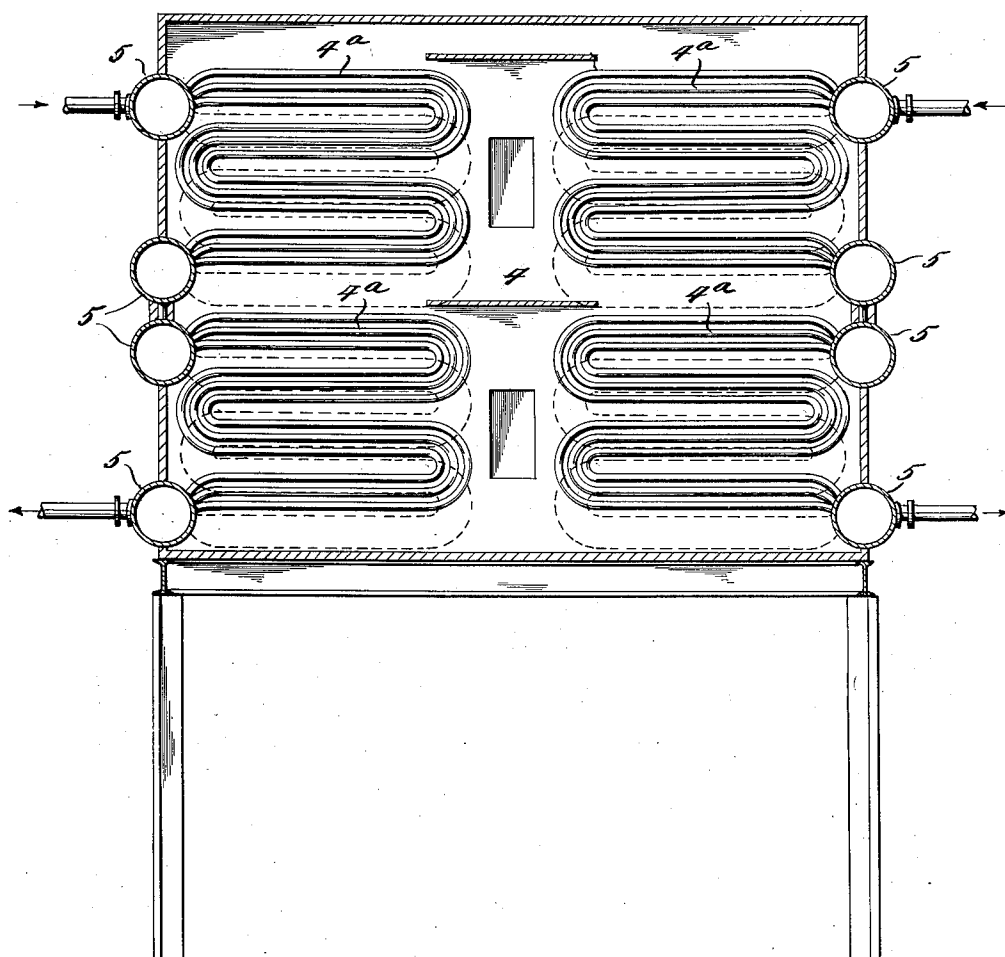
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2 Sheets-Sheet 2

Fig. 2.



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STEAM BOILER INSTALLATION AND METHOD OF OPERATING THE SAME

Application filed April 9, 1924, Serial No. 705,211, and in Great Britain April 27, 1923.

My invention more particularly relates to a steam boiler installation comprising a steam reheater and the method of operating the same. My invention will best be understood by reference to the accompanying drawings in which Fig. 1 is a sectional elevation illustrating a steam boiler installation embodying my invention, Fig. 2 is an end view, with parts in section, of the steam reheater and Fig. 3 is a side view illustrating the operating parts for the damper.

Like reference characters indicate like parts throughout the drawings.

Referring to the drawings, 1 designates a steam superheater which, as shown, is disposed between the upper bank 2 and the lower bank 3 of horizontally inclined boiler tubes, the two banks being spaced.

At the rear of the boiler is located the steam reheater, indicated generally at 4, and comprising tubes 4^a connected to drums or headers 5, the tubes preferably being bent back upon themselves, and shown in Fig. 2, the tubes, the ends of which are connected to two drums 5, being bent to form two U's in the illustrated embodiment.

The ends of the tubes of the upper bank 2 are connected to uptake and downtake headers 20 and 21, the former being connected to the steam and water drum 22 by substantially horizontal tubes 23, while the downtake header 21 is connected to the steam and water drum by nipples 25. The uptake headers 20 of the upper bank are connected to headers 26 of the lower bank by nipples 29.

The gases are directed across the upper bank of tubes by baffles comprising, in the illustrated embodiment, a horizontally inclined baffle 30 located above the lowermost row of tubes of the upper bank, and transverse baffles 31 and 32 which direct the gases across the tubes in the manner indicated by the arrows, the baffle 31 being provided with an extension 32^a, which projects up across the tubes 23 and directs the gases to a common flue 33 for the gases passing over the bank of tubes of the boiler and over the steam reheater.

Preferably, a horizontally inclined baffle 34 is located above the lower bank 3 of tubes

at the front thereof, and a vertically inclined baffle 35 extends from the inner end thereof across the space between the upper and lower banks of tubes to the baffle 30, the headers of the superheater preferably being located behind the baffles 34 and 35.

The gases after passing over the lower bank of tubes 3 and over the superheater 1, are directed in alternate paths between the nipples 29 to the steam reheater and to the flue 33, or over the upper bank of tubes of the boiler and to the flue 33, the relative amounts of gases passing over the steam reheater and over the upper bank of tubes of the boiler being controlled by a damper 8, pivoted as shown, and preferably actuated by power means (not shown), preferably operable in accordance with the load on the steam turbine or other steam engine from which the steam for the steam reheater is derived. In case of an emergency where the load is suddenly thrown off on account of a short circuit in the electrical equipment, or through any other cause, the control for the damper 8 will move it so as to prevent the hot gases from flowing over the reheater, thereby avoiding the overheating of the tubes of the reheater, which would overheat the steam flowing through it to an extent that might give trouble in the piping, fittings and turbine, or which might burn out the reheater tubes. When the damper occupies a substantially horizontal position, as shown in Fig. 1, practically all of the gases are directed over the steam reheater. On the other hand, when the damper is moved to a vertical or somewhat past the vertical position, then practically no gases pass over the steam reheater, and substantially all of the gases pass over the upper bank of tubes of the boiler. The damper 8 thus furnishes a means for regulating the amount of gases flowing over the reheater and over the upper bank of boiler tubes, while an unregulated amount of gases flows over the primary superheater 1; that is to say, all of the gases under all conditions flow over the primary superheater. Diverting more or less gases from the steam reheater in accordance with the load on the steam turbine or other steam engine from which the

steam for the steam reheater is derived, prevents the tubes of the steam reheater from being burned out.

A heat transfer device, preferably an air heater, indicated generally at 6, is located in the flue 33 above the boiler. The air heater as illustrated is of the tubular type, the gases from the steam reheater or from the boiler passing through a group of tubes 60 to a chamber 61, thence through a second group of tubes 62 of the air heater to a chamber 63, and thence through the last group of tubes 64 of the air heater to the outlet flue 65. Air is directed through a passage 36 in the direction indicated by the arrows over the tubes of the air heater to a flue 37, the air preferably passing over the tubes of the air heater in a generally reverse direction from the passage of the heated gases through the air heater, and thence preferably to the furnace.

As is understood, the function of the steam reheater is to effect reheating to a higher temperature than that due to its pressure of steam on its passage from one stage to another stage of a steam turbine, or from one cylinder to another cylinder of a reciprocating steam engine, or for any purpose for which reheated steam is desired.

I claim:

1. A water tube boiler having a superheater in the boiler setting, an outlet flue for waste gases, a plurality of channels leading from beyond the superheater to the outlet flue, a steam reheater located in one of said channels, and means for varying the relative amounts of gases flowing through said channels.

2. In combination, a steam boiler comprising two spaced banks of horizontally inclined water tubes, a superheater located in the space between said banks of tubes, a flue located beside said boiler, a steam reheater located in said flue, means for directing heated gases over the lower and upper banks of water tubes and over said superheater, means for controlling the relative amounts of gases flowing over said steam reheater and over the upper bank of water tubes, a common flue into which the gases from said reheater and from said upper bank of tubes are directed, and a heat transfer device located in said last named flue.

3. In combination, a steam boiler comprising two spaced banks of horizontally inclined water tubes, a flue located beside said boiler, a steam reheater located in said flue, means for directing heated gases over the lower bank of water tubes and over said superheater, means for directing the gases leaving said superheater from between the two spaced banks of tubes into said reheater flue or across the upper bank of water tubes, means for controlling the relative amounts of gases flowing over said steam reheater and over the said upper bank of tubes, a common flue into which

the gases from said steam reheater and from the upper bank of tubes discharge, and an air heater located in said flue.

4. In combination, boiler heating surface, a superheater, a steam reheater, and a heat exchanger, means for directing heated gases in succession over a portion of said boiler heating surface and said superheater, and in parallel paths over said reheater and the remaining boiler heating surface and thence over said heat exchanger, and means for controlling the relative amounts of gases flowing over said reheater and said remaining boiler heating surface.

5. In a steam boiler, spaced banks of boiler tubes, a primary superheater interposed between said banks, a reheater, means for directing all of the heated gases over said primary superheater, and means for directing a regulated amount of heated gases over said reheater.

6. In a steam boiler, spaced banks of horizontally extending water tubes, a primary superheater interposed between said banks, a reheater, means for directing all of the heated gases over said primary superheater, and means for directing a regulated amount of heated gases over said reheater.

7. In combination, a furnace having a single pass for gases terminating in two passes disposed in parallel, the gases passing first through said single pass and then into said parallel passes, a bank of water tubes extending across said single pass, a second bank of water tubes in one of said parallel passes, a reheater in the other of said parallel passes, and means for controlling the amount of gases flowing through said parallel passes.

8. In combination, a furnace having a single pass for gases terminating in two passes disposed in parallel, the gases passing first through said single pass and then into said parallel passes, a flue connected to said parallel passes, a bank of water tubes extending across said single pass, a second bank of water tubes in one of said parallel passes, a reheater in the other of said parallel passes, and means for controlling the amount of gases flowing through said parallel passes.

9. In combination, a furnace having a single pass for gases terminating in two passes disposed in parallel, the gases passing first through said single pass and then into said parallel passes, a flue connected to said parallel passes, a bank of water tubes and a superheater extending across said single pass, a second bank of water tubes in one of said parallel passes, a reheater in the other of said parallel passes, and means for controlling the amount of gases flowing through said parallel passes.

10. In combination, a furnace having an outlet flue for the gases generated therein, a bank of water tubes disposed in said furnace in the path of said gases, a plurality of passes

for said gases disposed between said bank and said flue, means for controlling the amount of gases flowing through said passes, a second bank of water tubes in one of said passes, and a reheater in the other of said passes.

5 11. In combination, a furnace having an outlet flue for the gases generated therein, a bank of water tubes and a superheater disposed in said furnace in the path of said gases,
10 a plurality of passes for said gases disposed between said bank and said flue, means for controlling the amount of gases flowing through said passes, a second bank of water tubes in one of said passes, and a reheater in
15 the other of said passes.

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