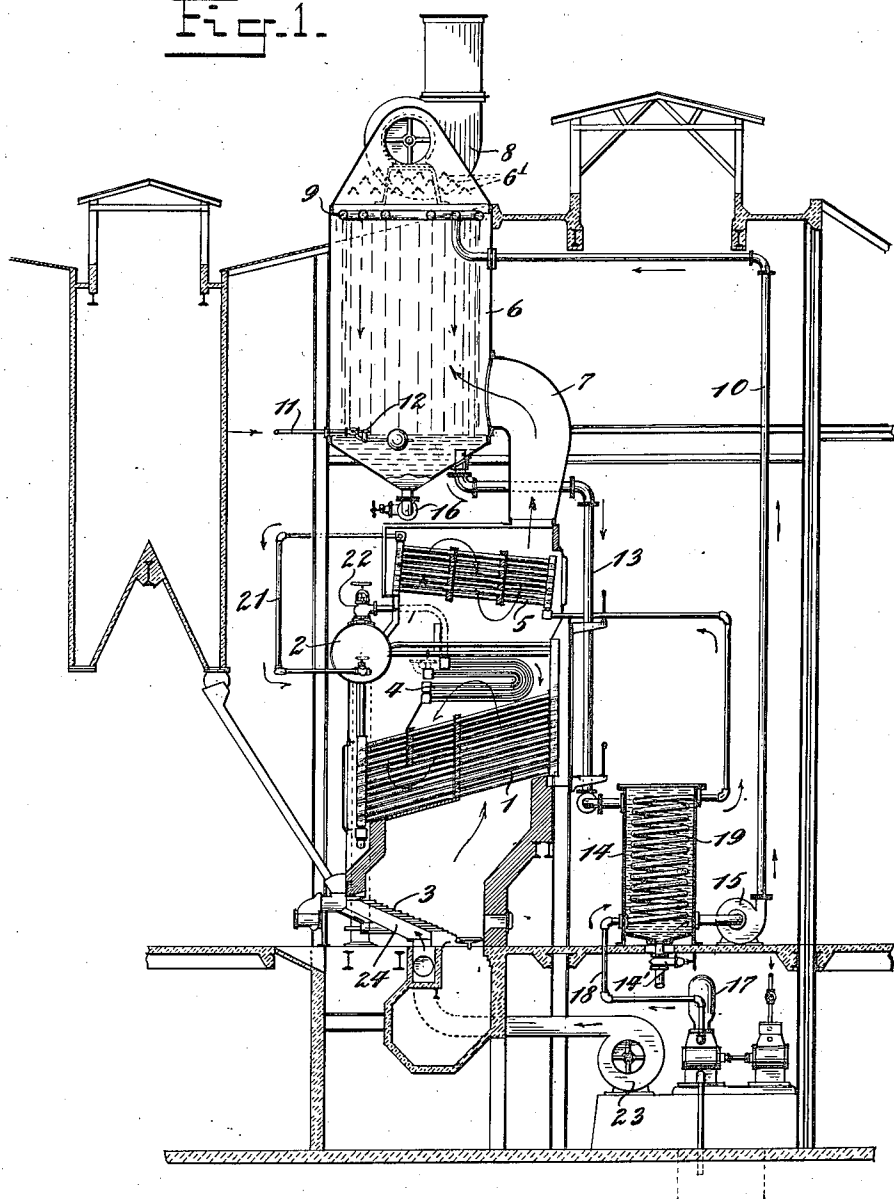


F. SARGENT & H. C. HEATON.
 APPARATUS FOR WASHING AND UTILIZING WASTE BOILER GASES.
 APPLICATION FILED APR. 24, 1916.

1,235,928.

Patented Aug. 7, 1917.
 3 SHEETS—SHEET 1.

Fig. 1.



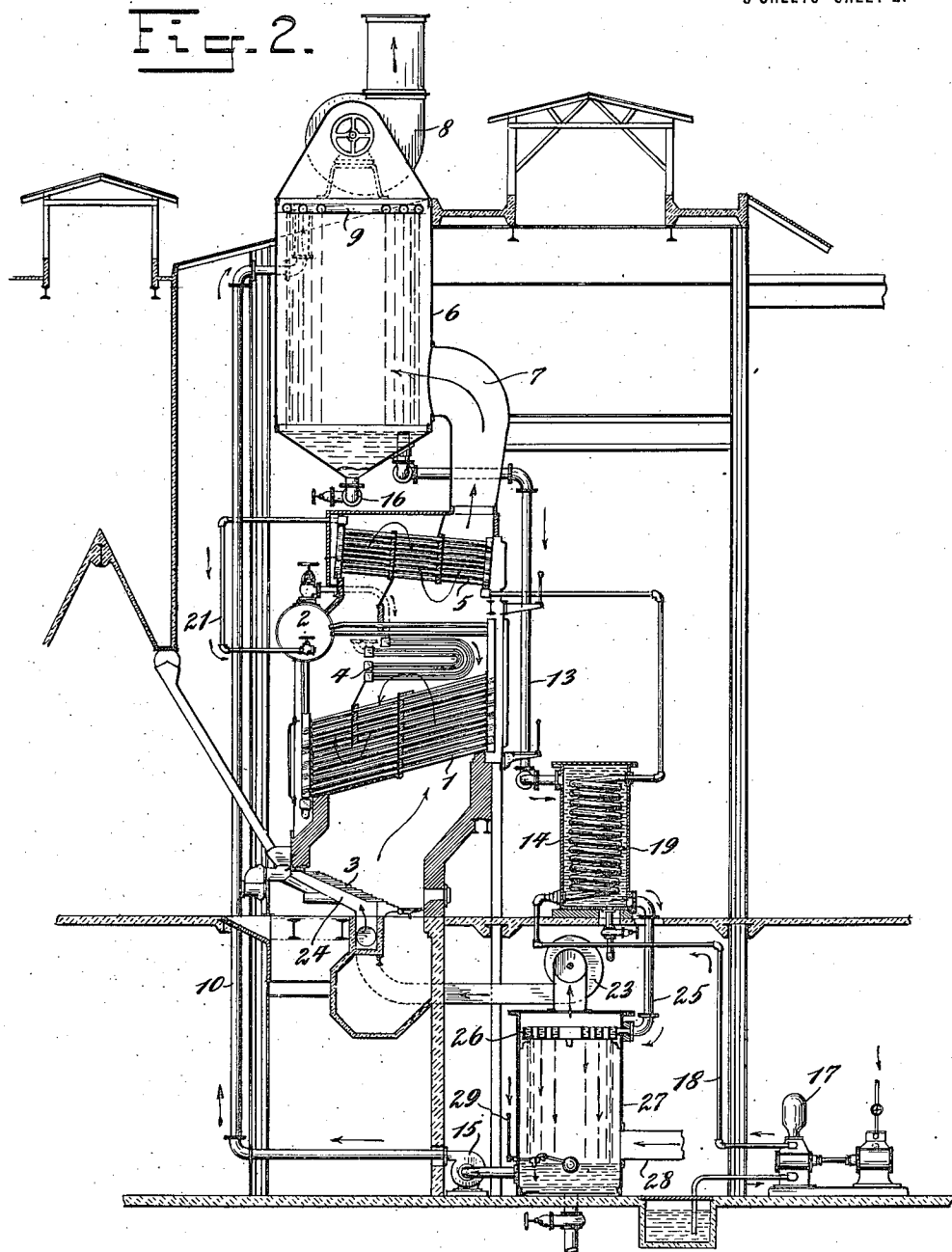
INVENTORS.
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Fig. 2.



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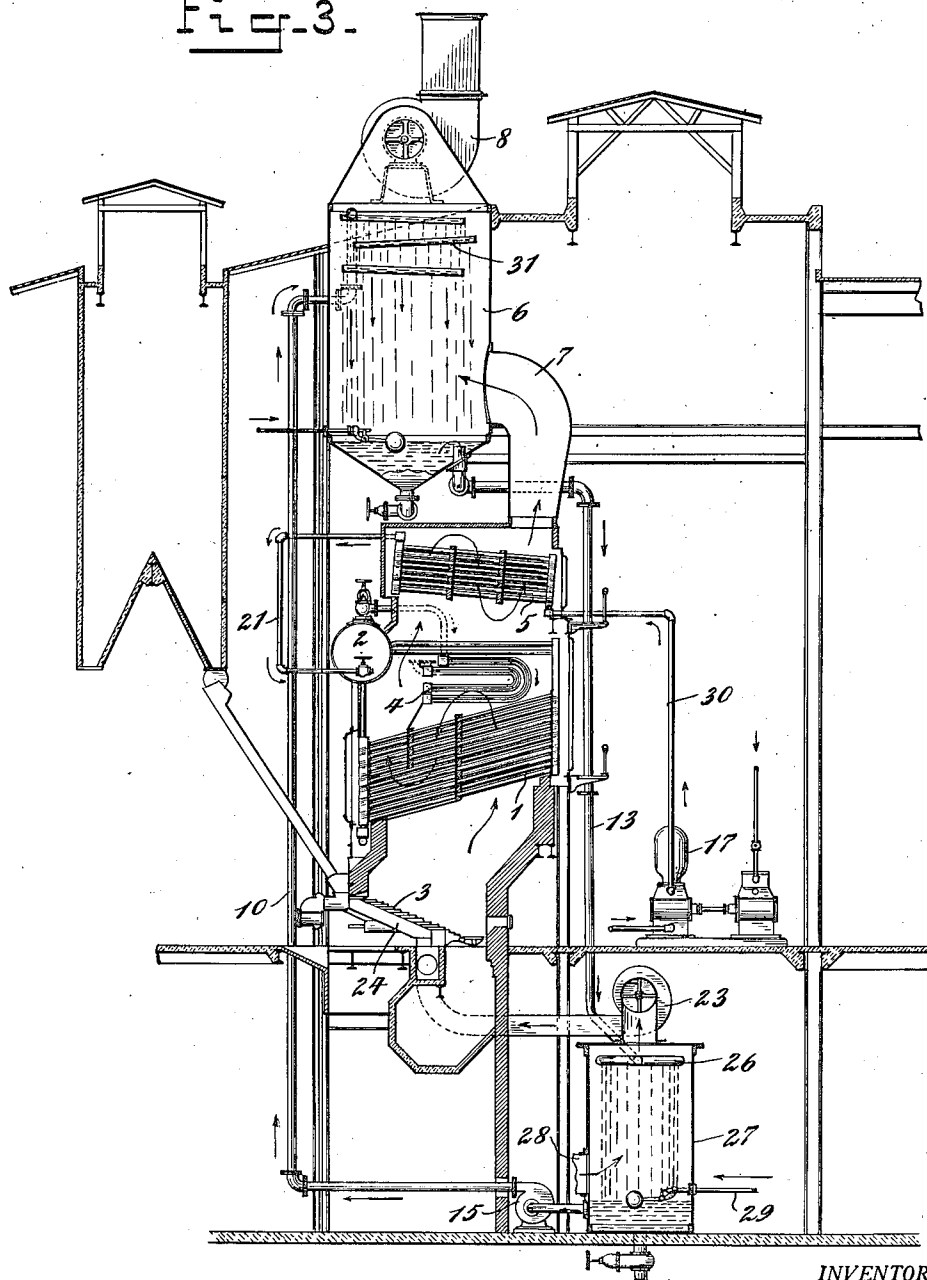
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3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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OF NEW JERSEY.

APPARATUS FOR WASHING AND UTILIZING WASTE BOILER-GASES.

1,235,928.

Specification of Letters Patent.

Patented Aug. 7, 1917.

Application filed April 24, 1916. Serial No. 93,109.

To all whom it may concern:

Be it known that we, FREDERICK SARGENT and HERMAN C. HEATON, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Washing and Utilizing Waste Boiler-Gases, of which the following is a specification.

Our invention relates to apparatus for washing and utilizing waste gases, and has been designed more particularly for use in connection with steam boilers. It will be understood by reference to the accompanying drawings in which Figure 1 is a vertical section through a steam boiler plant containing our special washing apparatus, and Figs. 2 and 3 are similar views showing modified arrangements. In all of the drawings the views are more or less diagrammatic.

Referring to Fig. 1, the numeral 1 designates a bank of inclined generating tubes expanded into front and rear headers, said headers being connected by pipes to a steam and water drum 2. The boiler is fired by a stoker 3, the bank of tubes being divided by baffles to direct the gases toward the uptake ends of the tubes. Above the bank of generating tubes is a superheater 4, and above the latter is an economizer 5. These parts may be of any usual and well-known design and connected in a known manner, as indicated in the drawings. The flow of the gases over the boiler tubes, superheater and economizer is indicated by arrows.

6 indicates the washing chamber which is preferably set above the economizer. This washer may be of any suitable or convenient form having an opening near the lower part thereof for the admission of smoke and gases from the flue 7, and an outlet at the top thereof into an induced draft fan 8 or other suction device, from which they are forced to the stack or uptake. The wash water is sprayed into the chamber through a suitable spraying device, such as a perforated coiled pipe 9, in the upper part of the chamber, connected to a water supply pipe 10.

In the particular arrangement shown, water is admitted to the chamber 6 through a pipe 11, the level of the water being controlled by a float valve 12. Leading from the lower part of the chamber 6 is a pipe 13

connected to a feed water heater 14, the water being drawn through said pipe and heater by a centrifugal pump 15, and then by the latter forced through the pipe 10 to the sprayer 9. The heater 14 may be cleaned of mud or other deposits through a blow-off valve 14'. The wash water is sprayed downward through the gases so as to obtain the benefit of the counter-flow principle, that is, the colder water comes in contact with the colder gases, and the hotter water with the hotter gases. The water, after spraying through the gases, collects in the lower part of chamber 6, the volume of the water being maintained substantially constant by means of the float valve 12. The dust or soot removed from the gases in chamber 6 is flushed out through a large valve 16.

The feed water, obtained from the hot well, or any other source, is forced by the pump 17 through the pipe 18 to the coil of pipe 19 in the heater 14, said coil being surrounded by the hot water delivered to the heater through pipe 13. The feed water is made to flow through coil 19 in a reverse direction to the flow of the water through the heater, and in this way the counter-flow principle is again made use of. The upper end of the coil of pipe 19 is connected by a pipe 20 leading to the economizer 5, from which it passes by a pipe 21 to the steam and water drum 2. 22 is the main steam valve through which the steam is discharged from the boiler, or to the superheater 4.

23 indicates a fan for delivering air to the stoker boxes 24.

In Fig. 2 we have shown a modified arrangement in which the water from the washing chamber 6, after flowing to the feed water heater 14, is delivered through a pipe 25, leading from the lower part of the heater, to a sprayer 26 in the upper part of a chamber 27. Above the level of the water in the chamber 27 is an air inlet pipe 28, and in the upper part thereof an air outlet leading to the fan 23, from which the air is delivered to the stoker boxes 24. The purpose of the spraying chamber 27 is to saturate the air with moisture before it is delivered to the stoker boxes. The saturation of the air entering the furnace is for the purpose of increasing the efficiency of an economizer in which moisture is con-

densed from the furnace gases, and is described more fully in an application for patent Serial No. 876,016, filed December 8, 1914. The water from the air-moistening chamber 27 is forced by pump 15 through pipe 10 to the sprayer 9 in the upper part of the gas washing chamber 6. In the arrangement shown in Fig. 2 the water to make up for evaporation or leakage is supplied to the air-moistening chamber 27 through the pipe 29, the level of the water being controlled by a float valve.

In Fig. 3 we have shown a further modification which consists essentially in omitting the feed water heater of Fig. 2, that is, the water from the gas-washing chamber 6, instead of being delivered to a feed water heater, is delivered directly through the pipe 13 to the sprayer 26 in the upper part of the air-moistening chamber 27. In this arrangement the feed water is drawn from the hot well and delivered by the pump 17 through the pipe 30 direct to the economizer 5.

A further modification is shown in the form of the sprayer used in the gas-washing chamber 6. Instead of a perforated pipe, we have shown, in Fig. 3, a series of inclined and perforated wooden shelves or gratings 31 similar to those used in cooling-towers, the water being broken up as it flows over the shelves and through the openings therein.

Among the advantages secured by our invention are that the gases leaving the boiler are washed free from soot and dust, and the annoyance from the deposition of soot and dust over surrounding property is avoided. Also some of the heat which would otherwise be wasted in the gases is returned to the feed water, or is utilized in heating and saturating the air for combustion, and in both cases additional economy is thereby secured.

Instead of using water in the chamber 6 we may use some other liquid, as for example, a heavy non-inflammable oil, with a higher vaporizing point than water.

What we claim and desire to secure by Letters Patent of the United States is:—

1. In a steam boiler plant, a conduit through which the waste gases pass, means for spraying the gases therein, a feed water heater, and a conduit arranged to conduct the heated spray liquid to the feed water heater, the heater being arranged to keep the feed water separated from the spray liquid while conducting heat from the latter to the feed water.

2. In a steam boiler plant, a conduit through which the waste gases pass, means for spraying the gases therein, a feed water heater, a conduit arranged to conduct the heated spray liquid to the feed water heater, and means for conducting the feed water through said heater in a direction opposite to the flow of the heated spray liquid therein.

3. In a steam boiler plant, a conduit through which the waste gases pass, means for spraying the gases therein, a feed water heater, and a conduit arranged to conduct the heated spray liquid to the feed water heater, the heater being arranged to keep the feed water separated from the spray liquid while conducting heat from the latter to the feed water, and a pump for returning the spray liquid from said heater to the gas washing chamber.

4. A steam boiler plant comprising a chamber to which the waste gases are delivered, means for spraying water into said chamber, a feed water heater, a chamber for moistening the air for combustion, and means for passing the hot wash water through said heater and for spraying it in said air-moistening chamber.

In testimony whereof we have hereunto signed our names in the presence of two subscribing witnesses.

FREDERICK SARGENT.
HERMAN C. HEATON.

Witnesses:

R. J. STRASSER,
M. W. LEDWARD.