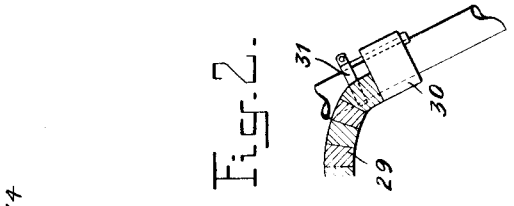
D. S. JACOBUS.

WATER TUBE BOILER.

APPLICATION FILED SEPT. 21, 1912.

1,051,890. Patented Feb. 4, 1913.

Fig. 2.



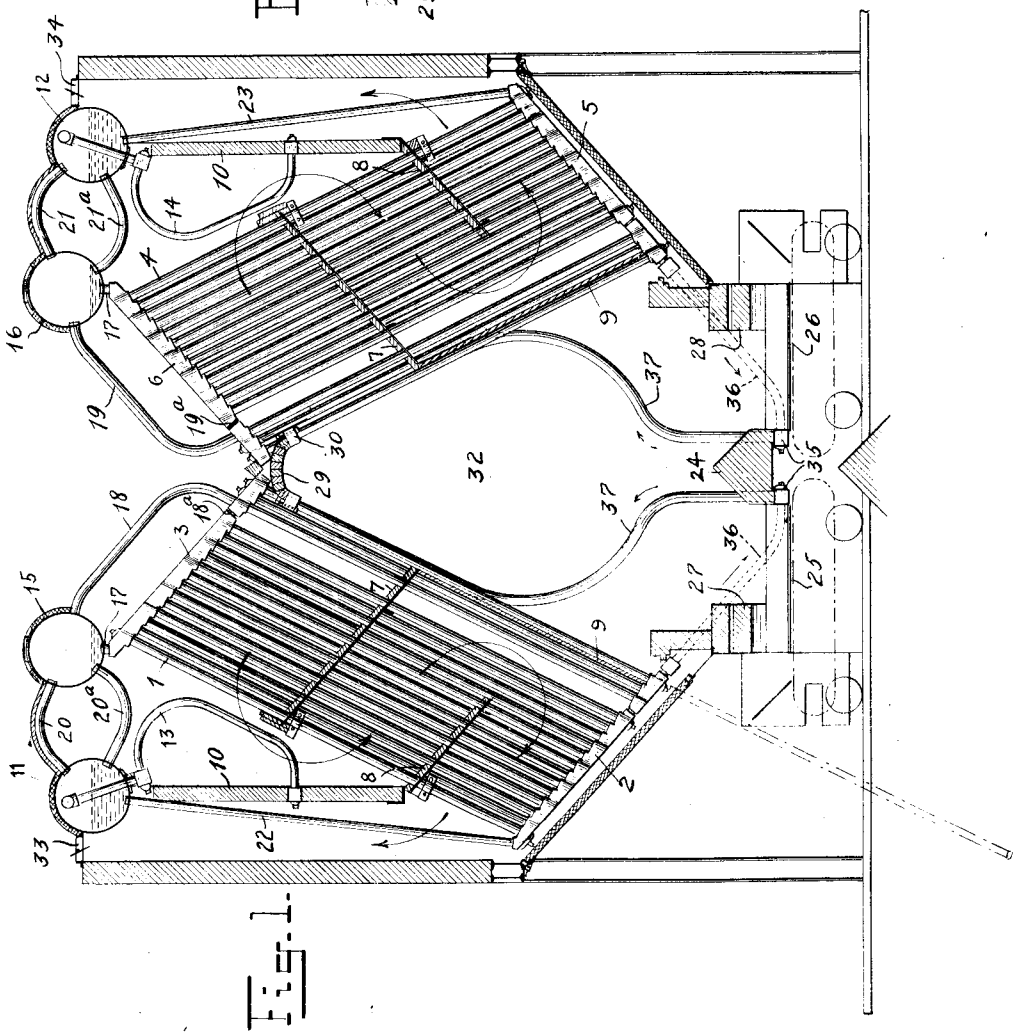


Fig. 1.

WITNESSES:

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WATER-TUBE BOILER.

1,051,890. Specification of Letters Patent. Patented Feb. 4, 1913.

Application filed September 21, 1912. Serial No. 721,531.

To all whom it may concern:

Be it known that I, DAVID S. JACOBUS, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Water-Tube Boilers, of which the following is a specification.

My invention relates to water tube boilers and has for its object an increase of efficiency and capacity in installations of large units. This object is accomplished by combining two units each comprising a bank of inclined water tubes arranged symmetrically above a common fuel and combustion chamber, the fuel chamber extending from one side of the boiler to the other to provide a large furnace volume, and the heating surfaces of the units disposed relative to each other so as to form an A-shaped combustion chamber which shall be open to the escape of the products of combustion, over the tubes of the heating surface, along the upper portions of the inclined sides of the combustion chamber, and by providing a special system for the circulation of the water in the boiler and for separating the steam from the water in the boiler.

The invention will be understood by reference to the accompanying drawings in which—

Figure 1 is a longitudinal section; and Fig. 2, a detail of a part of a fire brick arch.

In Fig. 1, I have shown two units each comprising a bank of inclined water tubes, the tubes 1 of the left hand unit being expanded into lower and upper headers 2 and 3, and the tubes 4 of the right hand unit being expanded into lower and upper headers 5 and 6. These headers extend transversely of the boiler from one side wall of the setting to the other side wall.

Each bank is divided by transverse baffles 7 and 8, the baffles 7 rising from baffles 9 extending from the lower headers and supported on one of the lower rows of tubes, thus providing a plurality of transverse passes for the products of combustion across and around the tubes as indicated by the arrows. Walls 10 extend from the transverse baffles 8 to the steam and water drums 11 and 12, and in the space above the banks of tubes, and above the first and second passes, are placed superheaters 13 and 14 of any approved type. The form shown comprises two transverse boxes connected by U-shaped tubes. The upper box of each superheater is connected to the steam space of the corresponding drum. In this design I provide two drums 15 and 16 and connect them by nipples 17 with the upper ends of the headers 3 and 6. Pipes 18 connect the lower parts of the upper headers 3 with drum 15, and similar pipes 19 connect the lower parts of upper headers 6 with drum 16. By the introduction of the pipes 18 and 19, the lower rows of tubes of the banks 1 and 4 which come nearest the fire may discharge the steam generated in them into the drums 15 and 16 so that it does not have to travel all the way through the upper headers, and may be discharged into the steam space above the water line if so desired.

If so desired the upper headers 3 and 6 may be divided into two sections at the points 18^a and 19^a and the steam and water in the lowermost tubes in the two banks will then have a separate circulation from that in the rest of the tubes. The drums 11 and 15 are connected by steam circulators and separating tubes 20 and water circulators 20^a, and the drums 12 and 16 are connected by steam circulators and separating tubes 21 and water circulators 21^a. In this design the circulation in the two units is independent, the steam and water passing upwardly through the inclined tubes to the upper headers and to drums 15 and 16 where the steam is separated from the water. From the drums 15 and 16 the steam passes through the circulators and separating tubes 20 and 21, where any moisture is further removed, to the outer drums 11 and 12. The water passes through the water circulators 20^a and 21^a to the outer drums 11 and 12. The water from the drum 11 passes downward through the downcomers 22 for the left hand unit, and from the drum 12 downward through the downcomers 23 for the right hand unit. The steam passes from the drums 11 and 12 through the superheaters 13 and 14 respectively. Suitable provision may be made for the delivery of saturated steam from the drums 11 and 12 if desired.

The boiler units above described are suspended over a common furnace extending

from the front to the rear of the boiler. In the design shown the furnace is divided along its center by a low wall 24 extending from one side wall to the other. This wall serves as a rear wall for the two fuel bed sections, in this instance two chain grate stokers 25 and 26 of any approved construction, and operated independently of each other, one from the front and the other from the rear of the setting. The mud drums of the boilers are connected to the lower headers, and are shown outside of the ignition arches 27 and 28, and the brick-work above the same where they are protected from the heat of the furnace.

The two boiler units are so disposed relative to each other that the upper headers 3 and 6 converge toward each other downwardly and their lower ends meet approximately at the transverse central vertical plane of the setting. To prevent the lower ends of the upper headers burning out on account of the accumulation of sediment inside them, I provide a protecting arch 29 of fire brick or tiling at the uppermost part of the furnace. The said arch is held in position by special tiles 30 secured by clamps 31 at the upper ends of the lowermost tubes of the banks 1 and 4. There is thus provided a large A-shaped combustion chamber 32 closed at the apex, and open to the escape of the products of combustion along the upper portions of the inclined sides, that is at the uptake ends of the inclined tubes. The gases from the combustion chamber divide and pass over the heating surfaces of the units, as indicated by the arrows, to the flue outlets 33 and 34 on the respective sides of the units. It may be desirable to connect the water boxes 35, below the wall 24, with the circulation. For such purpose I have shown them connected by pipes 36 and 37 with the lower and upper headers respectively.

The coal is fired at the front and rear of the boiler setting. With this arrangement, the character of the combustion may be maintained constant from one side of the boiler to the other, and the loss often experienced through a stream or lane of excess air or unconsumed combustible gases passing through the boiler and escaping to the stacks will be avoided. It is well-known among engineers that in ordinary boiler furnaces there is a great variation in analyses taken from different points in the path of the flue gases leaving the furnace, whereas with the present furnace arrangement this action is reduced to a minimum, as any irregularity from the front to the rear of the grates disappears before the gases pass from the upper part of the combustion chamber, and as the composition of the gases for uniform firing conditions will be uniform from one side of the boiler to the other, it follows that the composition of the entire volume of the gases leaving the furnace will be substantially uniform.

The angle of inclination of the tubes of the heating surfaces is approximately 45° or more to the horizontal, and the planes of the headers approximately at an angle of 90° to each other. I do not, however, restrict myself to these angles, the essential feature being the disposition of the units relative to each other over a common furnace and combustion chamber to provide an A-shaped combustion chamber of relatively large volume, and the other features herein described, which contribute to an increased efficiency and economy in operation.

What I claim is:—

1. In a water tube boiler, the combination of two units, each comprising a bank of inclined water tubes, upper and lower headers into which said tubes are expanded, said units being so disposed that the upper headers converge toward each other downwardly, whereby there is formed an A-shaped combustion chamber between the units, two steam and water drums above each unit, all of the steam passing into one of the drums of a unit and from thence to the other drum, steam circulators and separating tubes and water circulators connecting said drums, connections from the upper headers to one of the drums of each set, and a centrally disposed fuel chamber common to said units.

2. In a water tube boiler, the combination of two units each comprising a bank of inclined water tubes, upper and lower headers into which said tubes are expanded, said units being so disposed that there is formed an A-shaped combustion chamber between the units, two steam and water drums above each unit, all of the steam passing into one of the drums of a unit and from thence to the other drum, steam circulators and separating tubes and water circulators connecting said drums, one of the drums of each set being nippled to the upper ends of the upper headers of the corresponding unit and connected by means of tubes to the lower part of said headers, downcomers from the other of said drums to the lower headers, and a centrally disposed fuel chamber common to said units.

3. In a water tube boiler, the combination of two units each comprising a bank of inclined water tubes, upper and lower headers into which said tubes are expanded, said units being so disposed that there is formed an A-shaped combustion chamber between the units, two steam and water drums above each unit, all of the steam passing into one of the drums of a unit and from thence to the other drum, steam circulators and separating tubes and water circulators connecting said drums, connections from the upper

headers to one of the drums of each set, a centrally disposed fuel chamber common to said units, and a fire brick arch at the uppermost part of the combustion chamber to protect the lower ends of the upper headers.

4. In a water tube boiler, the combination of two units each comprising a bank of inclined water tubes, upper and lower headers into which said tubes are expanded, said units being so disposed that there is formed an A-shaped combustion chamber between the units, two steam and water drums above each unit, all of the steam passing into one of the drums of a unit and from thence to the other drum, steam circulators and separating tubes and water circulators connecting said drums, connections from the upper headers to one of the drums of each set, a stoker for each unit, water boxes at the rear of the stokers, and a circulating system for said boxes whereby water is taken from the lower headers and passed through the stoker boxes and discharged through pipes which lead upward to the upper headers.

5. In a water tube boiler, the combination of two units, each comprising a bank of inclined water tubes, upper and lower headers into which said tubes are expanded, said units being so disposed that there is formed an A-shaped combustion chamber between the units, two steam and water drums above each unit all of the steam passing into one of the drums of a unit and from thence to the other drum, the upper headers of each unit being divided into two sections and pipes or tubes connecting the separate sections of each unit to the upper steam and water drums so as to provide a separate circulation for the boiler tubes which come nearest the fire, steam circulators and separating tubes and water circulators connecting said drums, and a centrally disposed fuel chamber common to said units.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

DAVID S. JACOBUS.

Witnesses:
E. CAMP,
E. P. TERRY.