D. S. JACOBI

WATER TUBE BOILER.

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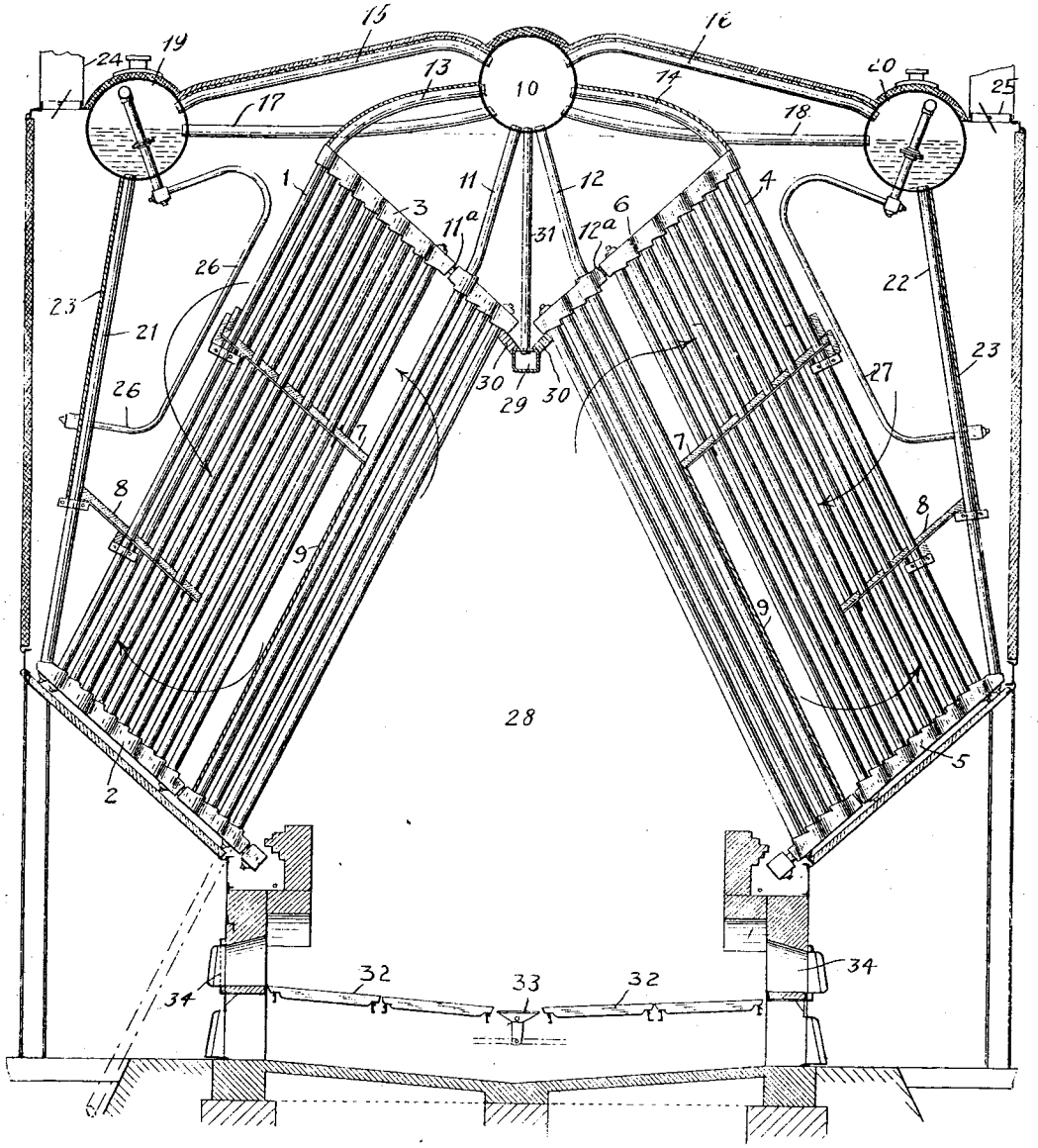
1,051,891. Patented Feb. 4, 1913.



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WATER-TUBE BOILER.

1,051,891. Specification of Letters Patent. Patented Feb. 4, 1913.

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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 arranging two banks of inclined water tubes 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 two banks 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 the employment of a central steam and water drum into which all of the steam generated by the boiler passes and where it is separated in part from the water, and of separator and circulating tubes from this drum to two outer steam and water drums from which dry steam is discharged. This arrangement is especially applicable to high rates of driving as a most efficient circulation is obtained and the water is thoroughly eliminated from the steam even under conditions where through impure feed water or the like there might be trouble with other boilers.

The invention will be understood by reference to the accompanying drawing, which is a longitudinal section.

In the drawing I have shown two banks of inclined water tubes, the tubes 1 of the left hand bank being expanded into lower and upper headers 2 and 3, and the tubes 4 of the right hand bank 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, thus providing a plurality of transverse passes for the products of combustion across and around the tubes as indicated by the arrows. In this design I use a single central drum 10 connected by pipes 11 and 12 with the lower part of the upper headers of the two banks of generating tubes so that the steam generated in the tubes which come in contact with the direct radiant heat from the fire, may discharge directly into the drum 10 and does not have to travel all the way through the upper headers. If so desired the upper headers of each bank may be made in two parts by omitting the nipple connections 11^a and 12^a, and the steam generated by the tubes which come in contact with the radiant heat will then all pass through the pipes or tubes 11 and 12 and an active circulation will be maintained thereby. I also connect, by pipes or tubes 13 and 14, the upper ends of headers 3 and 6 with the central drum, so that all of the steam generated by the boiler first passes to the central drum where it is separated in part from the water and from thence passes through the steam circulators and separating pipes or tubes 15 and 16 to the steam and water drums 19 and 20. The water circulators 17 and 18 connect drum 10 with two steam and water drums 19 and 20 and serve to conduct the water which circulates through the boiler from the central drum 10 to the outside drums 19 and 20. Downcomers 21 and 22 connect the drums 19 and 20 with the lower headers of the corresponding unit. The downcomers support fire brick walls 23 extending from the baffles 8 to the drums 19 and 20 to properly direct the gases to the outlet flues 24 and 25.

Superheaters 26 and 27, of any approved type, are placed above the first and second passes of each bank of tubes, and are connected with the steam space of the drums 19 and 20 respectively. A connection is provided to deliver saturated steam from said drums if desired.

The two banks of tubes above described are suspended over a common furnace extending from the front to the rear of the boiler, the banks being 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 protect the lower ends of the upper headers I provide a water box 29 at the top of the furnace which serves to support tiling 30 placed at each side of the box.

The water box discharges any steam generated in it through vertical pipes 31 leading from its top to the central drum 10. There is thus provided a large A-shaped combustion chamber 28 substantially closed at the apex and open to the products of combustion along the upper portions of the inclined sides, that is, at the uptake ends of the generating tubes. The gases divide and pass over the heating surfaces, as indicated by the arrows, to the outlet flues. In this design the water circulation is upwardly through the inclined tubes to the upper headers, pipes leading therefrom to the central drum 10, from the latter to the side drums 19 and 20 through the downcomers to the lower headers.

The furnace is provided with grate bars 32 and a central dumping plate 33 so that when this plate is covered with fuel there will be a continuous fuel bed beneath the entire boiler, the furnace being charged through doors 34 in both the front and rear walls. 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 hereindescribed, which contribute to an increased efficiency and economy in operation.

What I claim is:—

1. In a water tube boiler, the combination of two banks of inclined water tubes, upper and lower headers into which said tubes are expanded, said banks being so disposed that the upper headers converge toward each other downwardly, whereby an A-shaped combustion chamber is formed between the banks, a central steam and water drum into which all of the steam from the two banks of tubes is discharged through pipes or tubes connecting the banks of tubes with said central drum, circulating and separating pipes or tubes connecting said central drum with two outer steam and water drums, and a centrally disposed fuel chamber common to said banks of tubes.

2. In a water tube boiler, the combination of two banks of inclined water tubes, upper and lower headers into which said tubes are expanded, said banks being so disposed that an A-shaped combustion chamber is formed between the banks, a central drum above the banks of tubes into which all of the steam from the two banks of tubes is discharged, pipes or tubes connecting both the upper ends and the lower parts of the upper headers with said drum, two outer steam and water drums, and steam circulating and separating tubes and water circulators connecting the central drum with said outer drums.

3. In a water tube boiler, the combination of two banks of inclined water tubes, upper and lower headers into which said tubes are expanded, said banks being so disposed that an A-shaped combustion chamber is formed between the banks, a water box at the top of the combustion chamber, tiles supported on said box to protect the lower ends of the upper headers, and a centrally disposed fuel chamber common to said banks of tubes.

4. In a water tube boiler, the combination of two banks of inclined water tubes, upper and lower headers into which said tubes are expanded, said banks being so disposed that an A-shaped combustion chamber is formed between the banks, a water box at the top of the combustion chamber, tiles supported on said box to protect the lower ends of the upper headers, a central drum above the banks of tubes into which all of the steam from the two banks of tubes is discharged, pipes or tubes connecting said water box and the upper headers with said drum, and a centrally disposed fuel chamber common to said banks of tubes.

5. In a water tube boiler, the combination of two banks of inclined water tubes, upper and lower headers into which said tubes are expanded, said banks being so disposed that an A-shaped combustion chamber is formed between the banks, a centrally disposed fuel chamber common to said banks, a central steam and water drum above the banks of tubes into which all of the steam from the two banks of tubes is discharged, two outer drums, steam separating and circulating tubes and water circulators connecting said central and outer drums, and downcomers connecting said outer drums with the lower headers.

6. In a water tube boiler, the combination of two banks of inclined water tubes, upper and lower headers into which said tubes are expanded, said banks being so disposed that an A-shaped combustion chamber is formed between the banks, a central drum above the banks of tubes into which all of the steam generated in the two banks is discharged, pipes or tubes connecting the upper headers with said drum, two outer steam and water drums one for each bank of tubes, steam circulators and separating tubes and water circulators connecting the central drum with said outer drums, downcomers connecting the outer drums with the lower headers, baffles for directing the gases across and around the tubes, fire brick walls supported on said downcomers to direct the gases to the outlet flues, and a centrally disposed fuel chamber common to said banks of tubes.

7. In a water tube boiler, the combination of two banks of inclined water tubes, upper and lower headers into which said tubes are expanded, said banks being so disposed that an A-shaped combustion chamber is formed between the banks, a central drum above the banks of tubes into which all of the steam from the two banks of tubes is discharged, the upper headers being divided into two sections and pipes or tubes connecting the separate sections with said drum so as to provide a separate circulation for the tubes which come nearest the fire, two outer steam and water drums and steam and circulating tubes and water circulators connecting the central drum with said outer drums.

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.