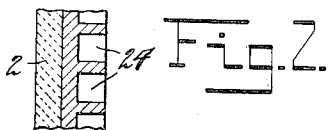
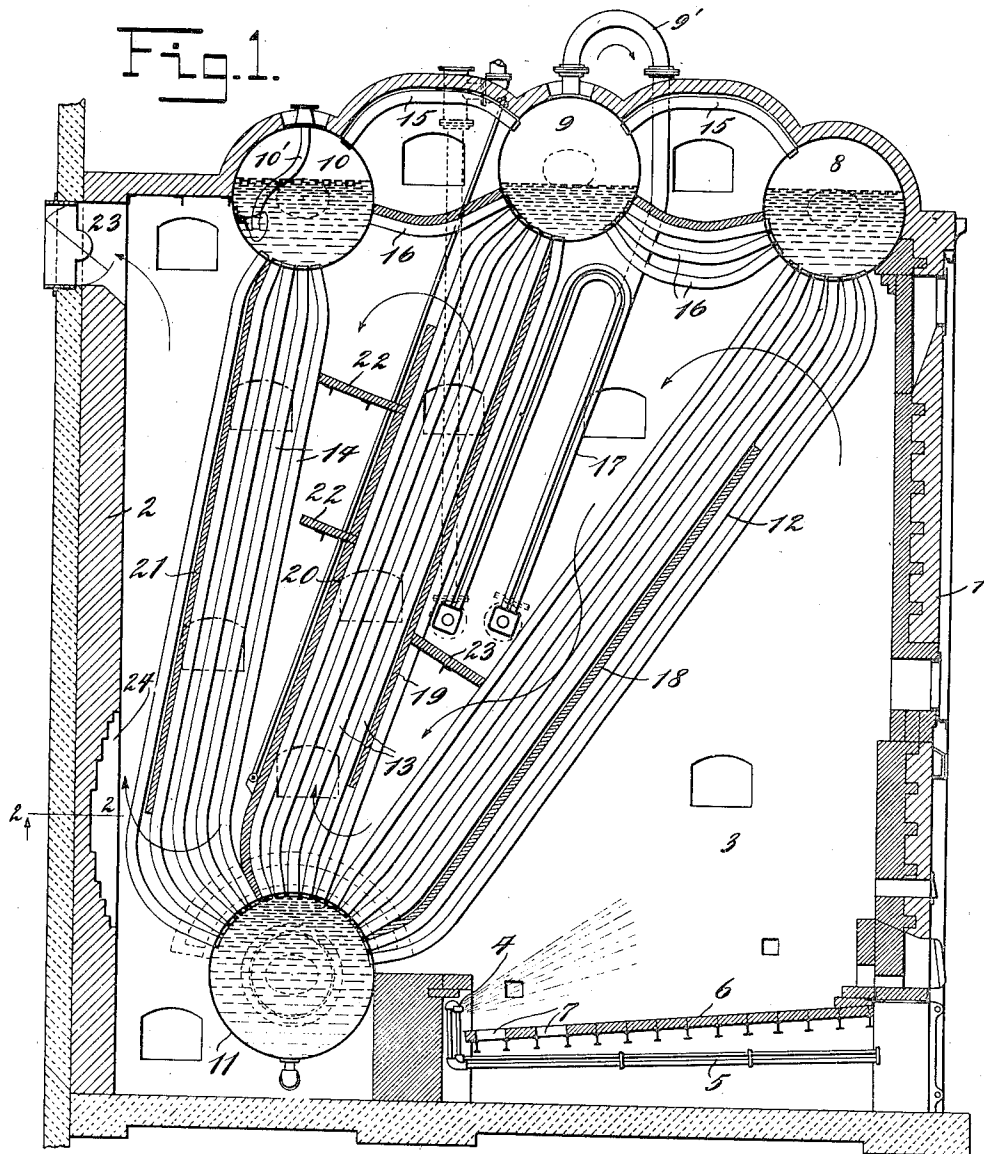


D. S. JACOBUS.
 BAFFLE SYSTEM FOR STIRLING BOILERS.
 APPLICATION FILED AUG. 12, 1913.

1,132,014.

Patented Mar. 16, 1915.



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UNITED STATES PATENT OFFICE.

DAVID S. JACOBUS, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO THE BABCOCK & WILCOX COMPANY, OF BAYONNE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

BAFFLE SYSTEM FOR STIRLING BOILERS.

1,132,014.

Specification of Letters Patent.

Patented Mar. 16, 1915.

Application filed August 12, 1913. Serial No. 784,313.

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 Baffle Systems for Stirling Boilers, of which the following is a specification.

My invention relates to a system of special baffles for Stirling boilers, and will be understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section, of one embodiment of my invention; and Fig. 2 a transverse section on the plane of the line 2—2 of Fig. 1.

The present invention is applicable to a Stirling boiler with two upper steam and water drums and one mud drum, as well as to one having three steam and water drums and one or two mud drums.

In the design shown the numeral 1 designates the front wall, and 2 the rear wall of the boiler setting; 3 the furnace, which, in this instance, shows an arrangement for oil burning, the burners 4 being placed at the rear of the furnace and projecting the flame forward. The oil for the burners is delivered through pipes 5 entering a space below the floor 6. Air for combustion is admitted through opening 7 in the floor. The invention, however, is not limited to the particular furnace shown, as it may be equipped for coal burning and with any suitable type of stoker.

The boiler shown consists of three transverse steam and water drums 8, 9 and 10, set parallel, and connected to a mud drum 11 by banks of water tubes 12, 13 and 14, the tubes being so curved as to enter the tube sheets readily. The steam space of the center drum is inter-connected to both the front and rear drums by a row of curved steam circulating tubes 15 and to the water spaces of said drums by water circulating tubes 16. Coverings of fire-brick resting on the tubes 16 prevent the gases passing above these tubes. A feed pipe 10' enters the rear steam and water drum 10, and the main steam outlet 9' may be connected to one of the cross boxes of a superheater 17, of standard design, placed in the space between the front and middle banks of tubes.

In the standard Stirling boiler a baffle rests against the rear tubes of the front bank, reaching from the mud drum to the top of the bank, and a second baffle rests against the rear tubes of the middle bank reaching from the center steam and water drum nearly to the bottom of the bank. Shelves are placed near the top of the front baffle and near the top of the rear bank of tubes. The baffles guide the gases up the first bank of tubes, down the middle bank, and up the rear bank to the outlet flue. The shelf near the top of the rear bank prevents by-passing of the gases between the tubes and the rear wall of the boiler setting. To increase the heat transfer rate and the efficiency of the boiler, I have provided the following described system of baffling: Supported between two of the rows of tubes of the front bank, and preferably so as to expose one or more rows of tubes to the direct heat of the furnace, is a baffle 18 extending from the mud drum 11 nearly to the top of the bank. By placing the baffle 18 between the second and third rows of tubes, as shown, the furnace temperature will be less than if placed between the first and second rows of tubes, which will tend to lengthen the life of the furnace brick-work. By adjusting the position of the baffle 18 the furnace temperature may be governed to suit any particular condition desired. This applies to any sort of fuel that may be used, but is a particularly advantageous feature in oil burning where high temperatures ordinarily result. The tubes of the middle bank support two baffles, one of which, 19, is supported between the first and second rows of tubes and extends from the center steam and water drum nearly to the bottom of the bank, and the other, 20, is supported on the rear row of tubes and extends from the mud drum upwardly to nearly the top of the bank. To cause the gases to flow downwardly among the tubes of the rear bank I introduce a baffle 21 extending from the rear steam and water drum downwardly to nearly the bottom of the bank. The baffle 21 may rest upon the rear tubes of the bank, or may be supported between the last two rows so as to expose, if desired, a row of tubes in the last pass. Shelves extend from baffle 20 across the space be-

tween the middle and rear banks; and a shelf 23 extends from baffle 19 to the front bank.

As indicated by the arrows, the gases from the furnace are first directed along the exposed tubes of the front bank, then across the upper part of the front bank of tubes directly into the secondary combustion chamber formed between the front bank and the middle bank, and then downward along the rear portion of the front bank of tubes, then upward over the middle bank of tubes, then downward over the third bank of tubes, and finally upward at the rear of baffle 21 to the flue outlet 23, this last pass upwardly to the outlet flue being practically an idle pass at the rear of the boiler.

In new installations the rear wall 2 will be set far enough away from the lower part of the rear bank of tubes to allow a proper opening for the flow of the gases, but in the case of a boiler fitted with the standard Stirling baffles and setting, converted over to the special baffles above described, it will be necessary to provide a wider opening for the passage of the gases. To accomplish this it will be necessary to cut out vertical channels 24 in the inside of the rear wall, as indicated in the drawings, leaving lines of brick-work between them, or the brick-work as a whole may be cut back.

In certain baffle arrangements of Stirling boilers all of the surface of the boiler tubes is not acted on efficiently by the hot gases. This is especially so when the gases have an idle pass downward at the back of the middle bank of tubes and thence pass upward over the tubes of the rear bank. In such case the lower part of the rear bank of tubes is ineffective. My making the gases pass downward over the tubes of the rear bank, all of the surface of the tubes is acted upon by the hot gases, and a greater efficiency thereby obtained.

In my application Serial No. 784,314, filed of even date herewith I have shown a Stirling boiler with baffles in the middle and rear banks similar to the present arrangement but with a vertical wall extending upward from the bridge wall of the furnace to the front row of tubes.

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

1. A boiler of the class described, comprising a plurality of banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a front baffle to cause the gases to cross the first bank at the upper part thereof, baffles to direct the gases upward longitudinally of the second bank, and a rear baffle arranged to direct the gases longitudinally downward among the tubes of the rear bank.

2. A boiler of the class described compris-

ing a plurality of banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, baffles to cause the gases to cross the first bank at the upper part thereof and to define the path followed by the gases in passing from one bank to the next and to cause the gases to enter the last bank at the upper part thereof, the only baffle on the last bank consisting of a single baffle at the rear thereof to cause the gases to flow downward among the tubes of the last bank.

3. A boiler of the class described comprising a plurality of banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a baffle to cause the gases to flow downward over the rear portion of the first bank, baffles in the second bank, one extending downward from the second steam and water drum and the other extending upward from the mud drum, and a baffle in the rear bank to cause the gases to flow downward among the tubes of said rear bank, and then upward at the back thereof.

4. A boiler of the class described having a combustion chamber at the front thereof, a plurality of banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, the first bank of tubes being located at the rear of the combustion chamber, a baffle extending upward from the mud drum and supported on a row of tubes of the first bank, baffles in the second bank one extending downward from the second steam and water drum and the other extending upward from the mud drum, and a baffle to cause the gases to flow downward among the tubes of the rear bank.

5. A boiler of the class described having a combustion chamber at the front thereof, a plurality of banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, the first bank of tubes being located at the rear of the combustion chamber, a baffle extending upward from the mud drum and supported on a row of tubes of the first bank, baffles in the second bank one extending downward from the second steam and water drum and the other extending upward from the mud drum, and a baffle to cause the gases to flow downward among the tubes of the rear bank, and then upward at the back thereof to the flue outlet.

6. A boiler of the class described comprising three banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a baffle to cause the gases to flow over the tubes of the front bank, a baffle extending downward from the middle steam and water drum and another baffle extending upward from the mud drum to cause the gases after leaving the front

bank to flow upward over the middle bank, and a baffle extending downward from the rear steam and water drum to cause the gases after leaving the middle bank to flow downward over the rear bank.

7. A boiler of the class described comprising a plurality of banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a baffle to cause the gases to flow downward over the rear portion of the first bank, a baffle extending downward from the second steam and water drum and another baffle extending upward from the mud drum to cause the gases after leaving the front bank to flow upward over the second bank, and a baffle extending downward from the rear steam and water drum to cause the gases after leaving the middle bank to flow downward over the rear bank and then upward back of the rear bank to the flue outlet.

8. A boiler of the class described comprising three banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a baffle in the first bank of tubes extending upward from the mud drum and supported on a line of tubes at the proper distance from the fire to maintain a given furnace temperature, a second baffle extending along the front of the second bank from the upper end thereof and terminating short of the lower end, a third baffle extending along the rear of the second bank from the lower end thereof and terminating short of the upper end, and a fourth baffle extending along the rear of the third bank from the upper end thereof and terminating short of the lower end, and an outlet for the gases in the upper part of the setting back of the third bank of tubes.

9. A boiler of the class described comprising three banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a baffle in the first bank of tubes extending upwardly from the mud drum and supported on a line of tubes at the proper distance from the fire to maintain a given furnace temperature, baffles for directing the gases downwardly over the rear of the first bank of tubes, then upward over the second bank of tubes, downward over the third bank of tubes, and then upward back of the rear bank to the flue outlet.

10. The combination with a steam boiler furnace having a combustion chamber at the front thereof and a drum in the lower portion thereof and series of tubes extending upward from the drum, the front series being located at the rear of the combustion chamber, of a baffle extending upward from the drum at the front of the front series of tubes and constituting the back of the combustion chamber, and alternately downward

and upward projecting baffles behind the first mentioned baffle and providing means for directing the products of combustion longitudinally of the series of tubes behind the first mentioned series, and finally upward back of the rear series to the flue outlet.

11. The combination with a steam boiler furnace having a combustion chamber at the front thereof and a drum in the lower portion thereof and series of tubes extending upward from the drum, the front series being located at the rear of the combustion chamber, of a baffle extending upward from the drum at the front of the front series of tubes and constituting the back of the combustion chamber, alternately downward and upward projecting baffles behind the first mentioned baffle providing means for directing the products of combustion longitudinally of the series of tubes behind the first mentioned series, a cross baffle extending from the first downward projecting baffle to the front series of tubes, and a superheater in the space above said cross baffle and between the front series of tubes and the first downward projecting baffle.

12. A steam boiler having a plurality of upper steam and water drums, a lower mud drum, banks of tubes connecting said upper and lower drums, a furnace, the first bank of tubes having a baffle at the front thereof and extending upwardly from the mud drum to the upper part of the bank and forming the rear wall of the furnace combustion chamber whereby the gases are caused to cross the upper ends of the tubes of the first bank into the secondary combustion chamber at the rear of said bank, and baffles to cause the gases to flow over and among the tubes of the remaining banks and finally upward at the back of the rear bank.

13. A serial pass multiple bank boiler of the general Stirling type having the banks provided with baffling, the only baffling on the front bank with which the flames and hot gases first contact consisting of a single baffle at the front of said bank, and alternately downwardly and upwardly extending baffles to cause the gases to flow over the other banks of tubes and finally upwardly back of the rear bank to the flue outlet.

14. A serial pass multiple bank boiler of the general Stirling type having a refractory wall facing the bank of tubes with which the flames and gases first contact, a baffle extending upwardly within said bank of tubes and constituting the back of the combustion chamber, and succeeding baffles arranged to direct the gases over the successive banks of tubes, the baffling allow-

ing the products to pass over the top of the front baffle into the secondary combustion chamber formed between the first and second banks of tubes, and finally upwardly
5 back of the rear bank to the flue outlet.

15. The combination of a steam boiler furnace having a combustion chamber at the front thereof and a drum in its lower portion, banks of tubes extending upwardly
10 from the drum with a secondary combustion chamber between the front bank and the next bank of tubes, the front bank being located at the rear of the combustion chamber, a baffle extending upwardly at the
15 front of the front bank and constituting the back of the combustion chamber, and succeeding baffles arranged to direct the gases over the successive banks, the baffling allowing the gases to pass over the top of the
20 front baffle into the secondary combustion chamber between the first and second banks of tubes and thence downwardly, and finally upward at the back of the rear bank to the flue outlet.

25 16. The combination of a steam boiler furnace having a combustion chamber at the front thereof and a drum in its lower portion, three banks of tubes extending upwardly from the drum, the front bank being located at the rear of the combustion
30 chamber and this and the second bank having a secondary combustion chamber between their upper portions, a baffle forming the back of the combustion chamber and
35 having tubes of the front bank in its rear, and succeeding baffling including two baffles in the second bank and a single baffle in the third bank, the baffling being arranged to allow the gases to cross over the upper part
40 of the front bank of tubes directly into the secondary combustion chamber and finally upward at the back of the rear bank of tubes to the flue outlet.

17. The combination of a water tube
45 boiler having a plurality of banks of vertically extending tubes, a superheater between the front and middle banks of tubes comprising headers connected by upwardly extending superheating tubes, the front
50 bank of tubes having a baffle forming the back of the combustion chamber and in front of tubes of said front bank, and baffling to cause the gases after leaving the front bank to travel upwardly among the
55 tubes of the middle bank, then downwardly among the tubes of the rear bank and finally upwardly back of the rear bank to the flue outlet.

18. The combination of a water tube
60 boiler having a plurality of banks of vertically extending tubes, a superheater between the front and middle banks, a baffle forming the back of the combustion chamber, and succeeding baffles, the baffling being ar-

ranged to cause the gases to flow down- 65
wardly over the superheated and the rear tubes of the front bank, upwardly over the tubes of the middle and finally upward back of the rear bank to the flue outlet.

19. A boiler of the class described com- 70
prising a combustion chamber at the front thereof, a plurality of banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a baffle extending upward at the front of the first
75 bank to cause the gases to cross the upper part of said bank and then to flow downward, and alternately downward and upward projecting baffles behind the first named baffle, and providing means for directing the gases longitudinally of the banks
80 of tubes behind the front bank, and downward among the tubes of the rear bank, and water circulators between the steam and water drums. 85

20. A boiler of the class described comprising a combustion chamber at the front thereof, a plurality of banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a baffle extending upward at the front of the first
90 bank, another baffle extending along the front of the second bank from the upper end thereof and terminating short of the lower end, said baffles causing the gases to cross the upper portion of the tubes of the first bank and to traverse the said bank
95 downward and then to traverse the second bank upward, a baffle in the rear bank to cause the gases to flow downward therein, and water circulators between the steam and water drums. 100

21. A boiler of the class described comprising a combustion chamber at the front thereof, a plurality of banks of tubes, steam
105 and water drums and a mud drum into which the tubes are expanded, a baffle extending upward at the front of the first bank, baffles extending longitudinally of the second bank one at the front from the steam and water drum downward and the other
110 at the rear from the mud drum upward, a baffle at the back of the rear bank extending downward from the corresponding steam and water drum, and water circulators between the steam and water drums. 115

22. A boiler of the class described comprising a plurality of banks of tubes, steam
120 and water drums and a mud drum into which the tubes are expanded, a baffle to cause the gases to flow downward over the rear portion of the front bank, baffles extending longitudinally of the middle bank, one downward from the middle steam and water drum and the other upward from the mud drum, a baffle in the rear bank to cause the gases to flow downward among the tubes
125 of the rear bank and then upward at the

back thereof to the flue outlet, and water circulators connecting the steam and water drums.

23. A boiler of the class described comprising three banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a baffle to cause the gases to enter the front bank of tubes at the upper portion thereof and to then flow over said bank at the rear of said baffle, baffles to cause the gases to flow upward over the tubes of the middle bank, a baffle to cause the gases to flow downward over the tubes of the rear bank, and water circulating tubes between the middle and rear steam and water drums.

24. A boiler of the class described comprising a plurality of banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a baffle in the front bank of tubes to cause the gases to first cross the upper portion of the front bank, baffles for directing the gases downward over the rear of the first bank, then upward over the second bank, downward over the third bank and then upward back of the third bank to the flue outlet, and water circulators between the middle and rear steam and water drums.

25. The combination of a steam boiler furnace having a combustion chamber at the front thereof and a drum in its lower portion connected by banks of tubes with three

upper steam and water drums, a baffle extending upwardly in front of tubes of the front bank and constituting the back of the combustion chamber, succeeding baffling arranged to give the gases successive up and down passes with a down pass in the rear bank, and water circulators between the middle and rear steam and water drums.

26. A boiler of the class described comprising a combustion chamber at the front thereof, a plurality of banks of tubes, steam and water drums and a mud drum into which the tubes are expanded, a baffle extending upward at the front of the first bank to cause the gases to first cross the upper part of said bank into the space between the first bank and the next bank of tubes and then to flow downward, alternately downward and upward projecting baffles behind the first named baffle providing means for directing the gases longitudinally of the banks of tubes and downward among the tubes of the rear bank, and water circulators between the rear steam and water drums.

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

DAVID S. JACOBUS.

Witnesses:

WM. SHELDRIK,

CHARLES S. JONES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."