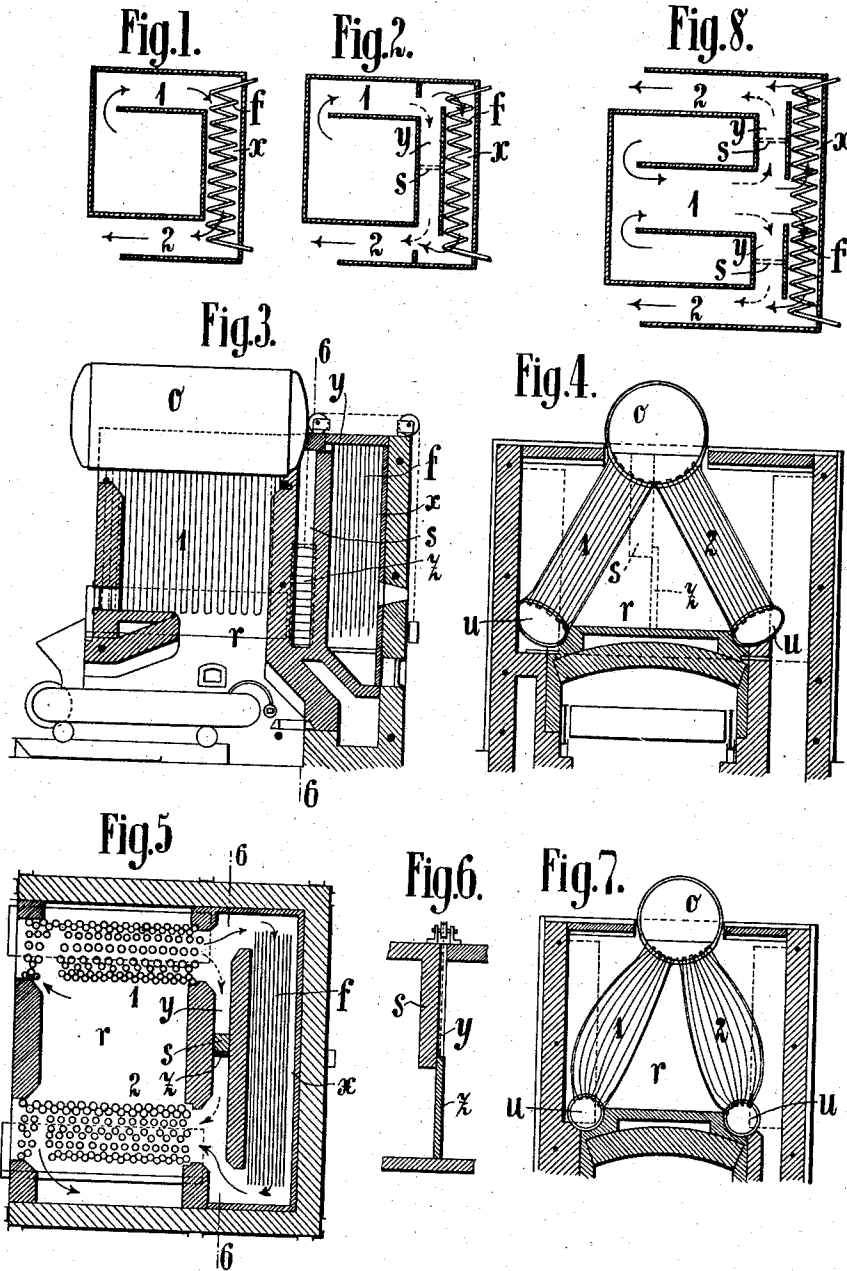


R. SCHULZ.
WATER TUBE BOILER.
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Witnesses
B. Kommer
May Ellis

Inventor
Richard Schulz
By Henry Orth
Atty.

UNITED STATES PATENT OFFICE.

RICHARD SCHULZ, OF BERLIN, GERMANY.

WATER-TUBE BOILER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RICHARD SCHULZ, a subject of the King of Prussia, residing at 2 Flensburgerstrasse, Berlin, Germany, have
5 invented certain new and useful Improvements in Water-Tube Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to
10 which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

15 My invention relates to water-tube boilers or boiler furnaces in which there are two or more sets of tubes or water legs in which or through which are formed flues for the passage of furnace gases, the flue or flues at one
20 water leg being connected to the flue or flues at the other water leg by a transverse flue in which I place a superheater. I also provide a structure in which the quantity of furnace gases acting on the superheater may
25 be controlled.

Referring to the drawings, in which like parts are similarly designated—Figure 1 is a diagrammatic view of a well known type
30 of steam boiler furnace, having a flue x connecting the flues at two lateral water legs, in which I have placed a superheater f . Fig. 2 is a similar view of a modification, in which I provide means to vary the quantity of furnace gases passing to the superheater.
35 Fig. 3 is a vertical, longitudinal section of a steam boiler furnace embodying my invention. Fig. 4 is a vertical, transverse section of Fig. 3. Fig. 5 is a horizontal section of Fig. 3. Fig. 6 is a detail section of the valve controlling the by-pass taken on
40 line 6—6 of Figs. 3 and 5. Fig. 7 is a view similar to Fig. 4, showing a modified form of the water legs. Fig. 8 is a diagram with the superheater chamber and by-pass for a
45 twin or double steam-boiler furnace.

Referring to Fig. 1, the furnace gases generated on the grate enter, in the direction indicated by the arrows, at one end of the water leg or group of tubes 1, through
50 which they flow horizontally from front to rear, then pass through the transverse passage x to the other water leg or group of tubes 2, through which they again flow horizontally from the rear to the front. The
55 gases then pass out of the group of tubes 2

to the chimney. Various forms of construction of this type of boiler having the transverse passage x are known, all of which are characterized by the passage x forming the
60 connection between the flues that are formed by the groups of tubes or water legs bordering the furnace. These constructions differ from one another only by the number and formation of the groups of tubes and the arrangement of flues in and between the tubes.
65 The cross passage x in such structures serves as a connection for guiding the furnace gases between the water legs, but it may also be formed as a combustion chamber. Now according to this invention, this transverse
70 passage is enlarged to form a chamber, which receives a superheater of any suitable kind. In Fig. 1 this is shown diagrammatically as a spiral tube f around which the furnace gases, passing through the trans-
75 verse passage x flow.

According to a modification of the invention, which is shown diagrammatically in plan view in Fig. 2, a connecting passage or by-pass y is provided in addition to the
80 transverse passage x which receives the superheater, f . This passage y is of such dimensions that only a portion of the furnace gases flow through it from one group of
85 tubes or water leg, to the other group of tubes or water leg, while the rest of the furnace gases flow through the superheater chamber. The section of the by-pass or passage y is regulated according to the size
90 of the superheater and the desired degree of the superheating. This section may itself be diminished, after the bricking in has been done, by the insertion of a cross wall s of fire-brick which only fills a portion
95 of the height of the passage, when a stronger superheating is desired. The section of the passage may also be enlarged by removing some of the bricks of this cross-wall s if the
100 superheating is too strong. Finally, a closing device or damper, for instance a vertically movable damper, may also be arranged in the connecting passage y to control the
passage of the furnace gases through the superheater chamber f . When this damper
105 is closed, all the furnace gases coming from the group of tubes or water leg 1 are forced to flow through the chamber x and superheater f in the direction shown by the arrows in full lines, in order to reach the
group of tubes or water leg 2. If, however, 110

the damper in the connecting passage y be opened, a portion of the furnace gases passes directly, as indicated by the dotted arrows, through the passage y from the group of tubes 1 to the group of tubes 2.

This construction of a water-tube boiler with attached superheater is shown in Figs. 3-5, in two vertical sections and a horizontal section. The boiler proper is of the known type previously described, and consists of an upper drum o , two lower drums u , and two groups of tubes 1 and 2 which connect the upper drum with the lower drums forming the water legs and inclose a space r between them in which the flame can develop. The outer and inner rows of tubes of the groups of tubes 1 and 2 consist of tubes arranged closely side by side, in which, however, are openings at certain places, as customary through which the furnace gases can enter or escape from the groups of tubes. Of course the furnace gases may also pass several times through the group of tubes. At the rear of the boiler is the chamber x forming the cross passage, with the superheater f therein, and a connecting passage or by-pass y is provided. The superheater f here consists of vertical tubes, but may be of any suitable construction. A transverse wall s is provided in the by-pass y , which wall extends downward from the top to half the height of the passage, as shown in Fig. 6. A vertically movable damper z may be arranged before or behind this wall s . When the boiler is fired, the damper z is drawn up, so that the gases from the group of tubes 1 can directly reach the group of tubes 2 through the passage y , as indicated by the dotted arrows, and only a small portion of the furnace gases, or even none at all, flow through the superheater chamber x . If, however, the damper z be entirely closed, all the furnace gases are forced to flow through the superheater chamber x . From this construction it results that the damper z may also be utilized for regulating within the widest limits the superheating of the steam. When the damper z is closed, it is evident that the strongest superheating will take place, and according as the damper z is opened more or less, a larger or smaller portion of the furnace gases will flow through the connecting passage y without reaching the superheater chamber x . The cross wall s may also be the full height of the passage y , and then be provided with special apertures. In the latter case the damper z may also be formed as a grating or lattice-work slide.

Arrangements for conveying the furnace gases through closing devices or dampers in such a way that they flow, more or less, through a superheater connected with the boiler are in themselves known, but they mostly consist of rotatable valves. Such

arrangements are very liable to destruction by the heated surface gases. The described arrangement of the connecting passage y with the damper z , movable vertically up and down, has, however, the advantage that the damper, where it comes in contact with the furnace gases, may be entirely made of fire-proof material. The handling of the damper by means of a chain pull is also very simple, and, finally, the damper may be easily adjusted to any suitable height. The connecting passage y with the damper z thus allows of the working of the boiler being adapted to any requirement as regards superheating.

The two groups of tubes 1 and 2 may be of equal or of different size, so that if, for instance, a high superheating is desired, the group of tubes 1 is made smaller than the group of tubes 2, more tubes being inserted in the latter than in group 1, that is to say, the tubes are arranged farther apart, so that the furnace gases here encounter less resistance than in the group of tubes 2. The form of the tubes is immaterial; they may be straight or curved, as shown, for instance, in Fig. 7. The lower drums u may even be omitted, and the tubes of the groups 1 and 2 may then, for instance, be formed as field tubes or U-shaped tubes.

The superheater may also be heated from two or more furnaces, as shown diagrammatically in Fig. 8, for instance. This figure represents a plan view of a boiler having two furnaces and three groups of tubes. The furnace gases first flow through the central group of tubes 1, and may then reach the side groups of tubes 2 either through the chamber x with the superheater f or through the two connecting passages y with or without cross walls or dampers z , as is indicated by the arrows in full lines and dotted lines, respectively. A central wall may, however, be provided in the group of tubes 1, and accordingly also the chamber x may be divided and two separate superheaters provided.

If the boiler is to be employed for marine purposes, a sheet-metal casing is employed in place of the masonry shown in Figs. 3 to 6.

In place of the chain grate shown in Figs. 3 and 4, any other suitable grate construction may of course be employed.

I claim—

1. A water tube boiler having two or more groups of tubes through which the furnace gases pass substantially horizontally, a horizontal passage at the rear of said groups of tubes through which the furnace gases pass from one group of tubes to another, a superheater in said passage, a horizontal by-pass from one group of tubes to the other, both passage and by-pass connecting the ends of the passages through the groups of tubes

and at the same level, and means to control the passage of gases through the by-pass and thereby control the volume of gases passing through the super-heater while maintaining the lengths of the paths through the passage and by-path substantially the same.

2. A water tube boiler having two or more groups of tubes through which the furnace gases pass substantially horizontally, a transverse passage at the rear of said groups of tubes through which the furnace gases pass from one group of tubes to another, a superheater in said passage, a transverse by-pass from one group of tubes to the other and at the same level and means to control the passage of gases through the by-pass and thereby control the volume of gases passing through said superheater while maintaining the lengths of the paths through the passage and by-pass substantially the same and horizontal.

3. A water-tube boiler having two or more groups of tubes, a horizontal passage through which the furnace gases pass from one group of tubes to another and at the same level, a superheater in said passage, a horizontal by-pass from one group of tubes to another also at the same level as the passages through the groups of tubes and a wall extending across and partially closing the by-pass, thereby maintaining the lengths of the paths of the gases through the passage and by-pass substantially the same.

4. A water-tube boiler having two or more groups of tubes, a transverse passage at the rear of said groups of tubes through which the furnace gases pass from the end of one group of tubes to the end of another, a superheater in said passage, a transverse by-pass from one group of tubes to another, said passage and by-pass at the same level as the passages through said groups of tubes separated by a wall and a wall extending across and partially closing the by-pass, thereby maintaining the lengths of the paths

of the gases through said passage and by-pass substantially the same.

5. A water-tube boiler having two or more groups of tubes, a horizontal passage at the rear of said groups of tubes through which the furnace gases pass from one group of tubes to another, a superheater in said passage, a horizontal by-pass for gases, said horizontal passage and by-pass at the same level as the passages through said groups of tubes, a wall extending across and partially closing the by-pass and a valve cooperating with the wall.

6. A water-tube boiler having two or more groups of tubes, a horizontal passage at the rear of said groups of tubes through which the furnace gases pass from one group of tubes to another, a superheater in the passage, a horizontal by-pass, said horizontal passage and by-pass at the same level as the passages through said groups of tubes, a substantially vertical wall extending across and partially closing the by-pass, and a vertically movable fire-proof valve cooperating with the wall.

7. A water-tube boiler having two or more groups of tubes, a transverse passage at the rear of said groups of tubes through which the furnace gases pass from one group of tubes to another, a parallel transverse by-pass between the same groups of tubes, both the transverse passage and the by-pass at substantially the same level as the passages through said groups of tubes, a wall separating said passage and by-pass, and a slide valve of fire-proof material to control the volume of gases passing through the by-pass.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

RICHARD SCHULZ.

Witnesses:

JOHANNES HEIN,
WOLDEMAR HAUPT.