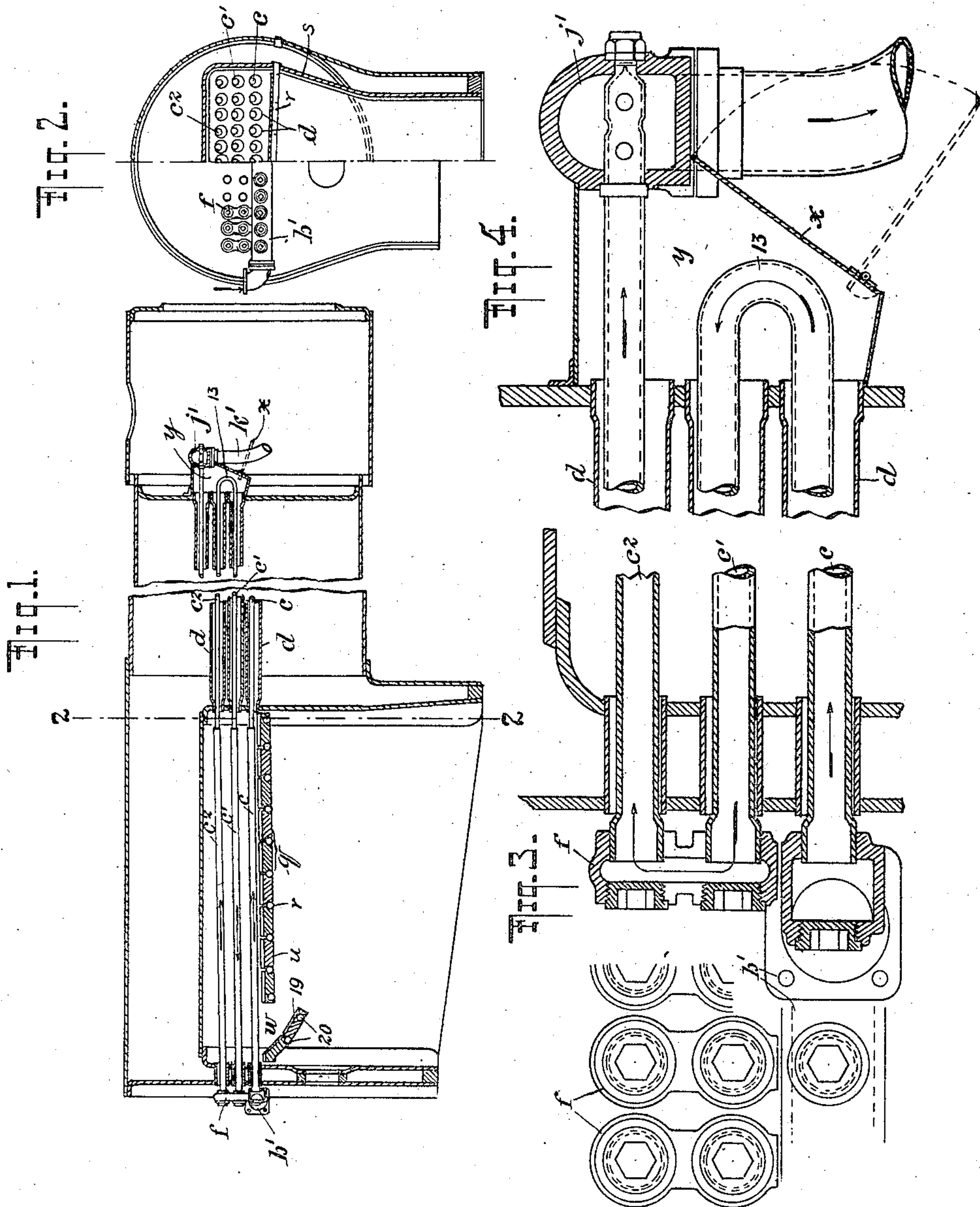


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 SUPERHEATER FOR BOILERS OF THE LOCOMOTIVE TYPE.
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922,200.

Patented May 18, 1909.
 2 SHEETS—SHEET 1.



WITNESSES

G. V. Rasmussen
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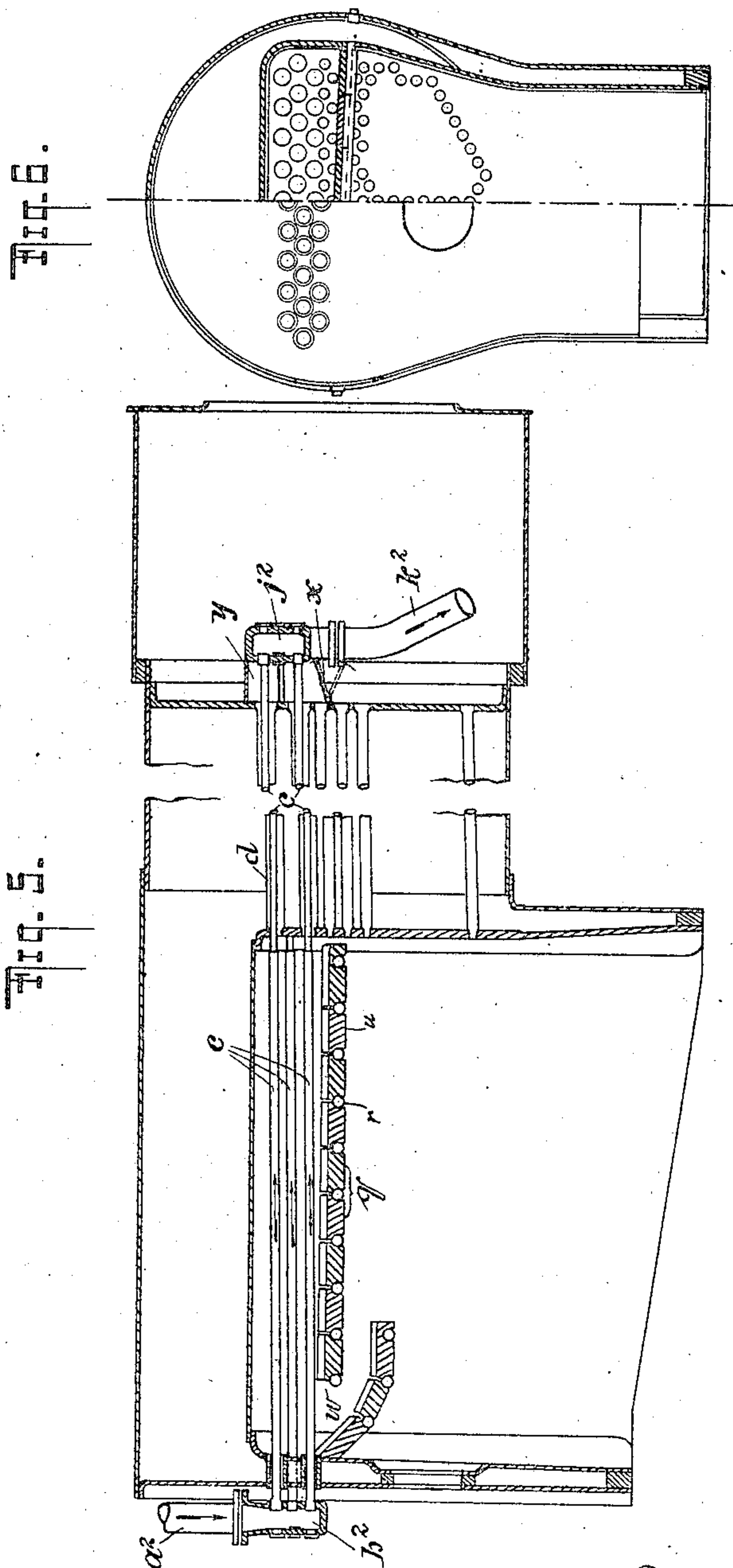
INVENTOR

Wilhelm Schmidt
 BY
 Briesen & Knautz
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UNITED STATES PATENT OFFICE.

WILHELM SCHMIDT, OF WILHELMSHÖHE, NEAR CASSEL, GERMANY.

SUPERHEATER FOR BOILERS OF THE LOCOMOTIVE TYPE.

No. 922,200.

Specification of Letters Patent.

Patented May 12, 1909.

Original application filed December 10, 1908, Serial No. 466,742. Divided and this application filed February 27, 1909. Serial No. 430,416.

To all whom it may concern:

Be it known that I, WILHELM SCHMIDT, a subject of the Emperor of Germany, and resident of Wilhelmsöhe, near Cassel, Germany, have invented certain new and useful Improvements in Superheaters Suitable for Boilers of the Locomotive Type, of which the following is a specification.

The invention herein claimed relates to superheaters specially suitable for use in boilers of the locomotive type and has been shown in my prior application, Serial No. 466,742, filed December 10, 1908, of which prior application this present one is a division.

In prior patents I have described forms of superheaters in which the superheating tubes were arranged within some of the smoke tubes in boilers of the locomotive type. It has also been proposed to arrange superheaters in the fire-box of such boilers but in all constructions previously suggested where the whole or a part of the superheating surface was arranged in the fire box, difficulties have been met with, which it is the object of the present invention to overcome.

The following specific ends have been sought for in the present invention. 1, preventing burning of the tube and tube joints during operation or when no steam is being used; 2, arranging the superheater so that it does not occupy too much space or interfere with the efficiency of the boiler; 3, providing for easy renewal, repairing and cleaning of the parts and 4, avoiding excessive weight. The above features must be embodied in one structure if full success is to be obtained.

The object of the present invention therefore, as stated above, is to provide an improved construction of fire box superheater which shall incorporate the above mentioned features.

In the accompanying drawings I have shown as examples, several embodiments of my invention, according to which the superheater consists of straight superheating tubes extending from the smoke-box through enlarged smoke tubes to the fire box and thence through hollow stay-bolts or thimbles in the rear wall of the boiler. The scope of my invention is defined in the appended claims.

I prefer that those sections of the superheater tubes which are actually in the fire box and therefore exposed to the greatest heat shall have a greater wall thickness than the sections of said tubes which lie within the

smoke tubes; preferably, also, I cause the superheater tubes to pass eccentrically through the smoke tubes so as to lie, as is shown by the drawings, closer to the upper wall of said smoke tubes than to the lower. Below the superheating tubes in the fire box a fire proof cross wall is arranged forming a superheating chamber in the upper part of the fire box, the object being to protect the tubes against the direct action of the fire and also to guide and regulate the flow of the fire gases along them, these gases entering by openings in the cross wall near the rear wall of the boiler. By sloping or lowering the cross wall so that it incloses not only the enlarged smoke tubes but also a number of ordinary tubes, the amount of gases passing through the superheater chamber and thus the efficiency of the superheating surface in the chamber formed in the upper part of the fire box can be increased. In this way I obtain a very efficient action of the heating surface within the chamber so that a high degree of superheat may be obtained with a superheater of comparatively small weight and bulk.

The smoke box ends of the smoke tubes arranged above the cross wall may be inclosed by a casing provided with a damper, by the regulation of which any desired quantity of gases from zero upward may be passed through the superheater chamber and a corresponding degree of superheat obtained. Opposite the passage or passages in the cross wall protecting means for the superheater parts may be arranged.

Referring to the drawings, Figure 1 is a longitudinal section through a locomotive boiler provided with a superheater according to my invention; Fig. 2 is partly an external end view and partly a section on the line 2—2 of Fig. 1; Fig. 3 is an enlarged sectional detail showing the arrangement of the superheater tubes as they pass through the back of the boiler; Fig. 4 is a similarly enlarged detail showing the superheater tubes, superheated steam header, and outlet pipe at the front of the boiler; while Figs. 5 and 6 show a modification of my invention in which the steam is given but one pass through the length of the boiler and this in the same direction as the furnace gases.

Referring to Figs. 1 to 4 three rows of enlarged smoke tubes *d* and three rows of superheater tubes *c*, *c'* and *c''* are employed; and the latter are so arranged as to give the

steam three passes through the entire length of the boiler. This is accomplished by introducing saturated steam at b' at the back end of the boiler, the steam then passing through the lowest row of tubes c to the smoke box end of the boiler where a bend 13 is provided to connect each tube of this lowest row with a corresponding tube of the middle row c' . At the back end of the boiler the middle row c' is connected to the upper row c^2 by a connection f as shown in Figs. 1 and 2 and in enlarged detail in Fig. 3. The superheating tubes c^2 in the top row are connected at their front ends with the superheated steam header j' arranged within the smoke box. From this header j' pipes k' lead the superheated steam to the engine.

In the fire box there is a protecting wall q placed just below the superheater pipes and inclosing the enlarged smoke tubes through which said pipes are passed. This wall is formed of transverse water pipes r expanded into the side walls s of the furnace and arranged at convenient distances apart; on these water tubes are placed fire bricks u cut away at their lower bottom corners so as to fit between adjacent pairs of tubes. At the rear of this protecting wall is a passage w provided with a protecting lip 19 which is supported by means of transverse water tubes 20 whereby direct action of the flame upon the superheater tubes is prevented. Through this passage the furnace gases are drawn into the upper part of the fire box so as to pass over that portion of the superheater tubes lying therein, and thence through the enlarged smoke tubes to the smoke box in front. This protecting wall q is shown as inclosing only the enlarged smoke tubes through which pass the superheater tubes, but I may, of course, without departing from the spirit of my invention cause this protecting wall to be differently located or differently sloped so as to include any desired proportion of such remaining smoke tubes as may not contain superheater tubes.

In the smoke box I have provided a casing y containing a damper x ; this casing should, of course, inclose such of the enlarged smoke tubes as are inclosed by the protecting wall at the fire box end.

It will be seen that the uppermost row of tubes, c^2 , can be readily extracted for repairs at the rear end of the boiler while the middle row, c' , and the lower row, c , can be extracted at the smoke box end after they have been cut off at their rear ends, so that accessibility for cleaning and repairing is obtained by this construction.

According to the form of my invention illustrated in Figs. 5 and 6, the steam is given only one pass through the length of the boiler, and for this purpose the superheater tubes all connect at the back end of

the boiler with a saturated steam header, b^2 , and at the front or smoke box end of the boiler with a superheated steam header, j^2 , from whence the steam passes to the engine by outlet pipe k^2 . In this case it will be seen that the steam passes through the superheater tubes, c , in the same direction as the furnace gases; otherwise the construction illustrated in Figs. 5 and 6 is substantially the same as that already described with reference to Figs. 1 and 4.

I claim as my invention:

1. In a steam superheater, for use with a locomotive boiler provided with three rows of enlarged smoke tubes in the upper part thereof, the combination of superheater tubes extending from the smoke box of the boiler through the lowest row of said enlarged smoke tubes and fire box and through the back wall of the boiler, a saturated steam header at said back wall connected to said superheater tubes, a second set of similarly disposed superheater tubes passing through the middle row of said enlarged smoke tubes, an end connection in the smoke box for said superheater tubes, a third set of similarly disposed superheater tubes passing through the top row of said enlarged smoke tubes, an end connection at the back wall of the boiler between the two upper sets of superheater tubes, and a superheated steam header in the smoke box connected with said third set of superheater tubes, substantially as and for the purpose described.

2. In a steam superheater, for use with a locomotive boiler provided with three rows of enlarged smoke tubes in the upper part thereof, the combination of superheater tubes extending from the smoke box of the boiler through the lowest row of said enlarged smoke tubes and fire box and through the back wall of the boiler, a saturated steam header at said back wall connected to said superheater tubes, a second set of similarly disposed superheater tubes passing through the middle row of said enlarged smoke tubes, an end connection in the smoke box for said superheater tubes, a third set of similarly disposed superheater tubes passing through the top row of said enlarged smoke tubes, an end connection at the back wall of the boiler between the two upper sets of superheater tubes, a superheated steam header in the smoke box connected with said third set of superheater tubes, and a protecting cross-wall for said superheater in the upper part of the fire box said cross wall comprising water tubes and having a passage for the fire gases, substantially as and for the purpose described.

3. In a steam superheater, for use with a locomotive boiler provided with three rows of enlarged smoke tubes in the upper part thereof, the combination of superheater tubes extending from the smoke box of the

boiler through the lowest row of said enlarged smoke tubes and fire box and through the back wall of the boiler, a saturated steam header at said back wall connected to said superheater tubes, a second set of similarly disposed heater tubes passing through the middle row of said enlarged smoke tubes, an end connection in the smoke box for said superheater tubes, a third set of similarly disposed superheater tubes passing through the top row of said enlarged smoke tubes, an end connection at the back wall of the boiler between the two upper sets of superheater tubes, a superheated steam header in the smoke box connected with said third set of superheater tubes, a protecting cross wall provided with a passage or passages for furnace gases and closing off said three rows of enlarged smoke tubes in the fire box, a casing in the smoke box inclosing said enlarged smoke tubes, and a damper on said casing for regulating the flow of fire gases drawn over said protecting cross wall and through said inclosed smoke tubes, substantially as and for the purpose described.

4. In a steam superheater, for use with a locomotive boiler provided with three rows of enlarged smoke tubes in the upper part thereof, the combination of superheater tubes extending from the smoke box of the boiler through said enlarged smoke tubes and fire box and through the back wall of the boiler, a saturated steam header at said back wall connected to said superheater tubes, a superheated steam header in the smoke box

connected with said superheater tubes, and a protecting cross wall provided with a passage or passages for furnace gases closing off a determined number of said upper smoke tubes in the fire box, substantially as and for the purpose described.

5. In a steam superheater, for use with a locomotive boiler provided with three rows of enlarged smoke tubes in the upper part thereof, the combination of superheater tubes extending from the smoke box of the boiler through said enlarged smoke tubes and fire box and through the back wall of the boiler, a saturated steam header at said back wall connected to said superheater tubes, a superheated steam header in the smoke box connected with said superheater tubes, a protecting cross wall provided with a passage or passages for furnace gases and closing off a determined number of upper smoke tubes in the fire box, a casing in the smoke box inclosing said determined number of inclosed smoke tubes, and a damper on said casing for regulating the flow of fire gases drawn over said protecting cross wall and through said inclosed smoke tubes, substantially as and for the purpose described.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILHELM SCHMIDT.

Witnesses:

JULIUS FRANKE,
MARTIN SCHMIDT.