H. E. GEER.

STEAM SUPERHEATER.

APPLICATION FILED SEPT. 4, 1919.

1,364,272.

Patented Jan. 4, 1921.

3 SHEETS—SHEET 1.

FIG. 1.

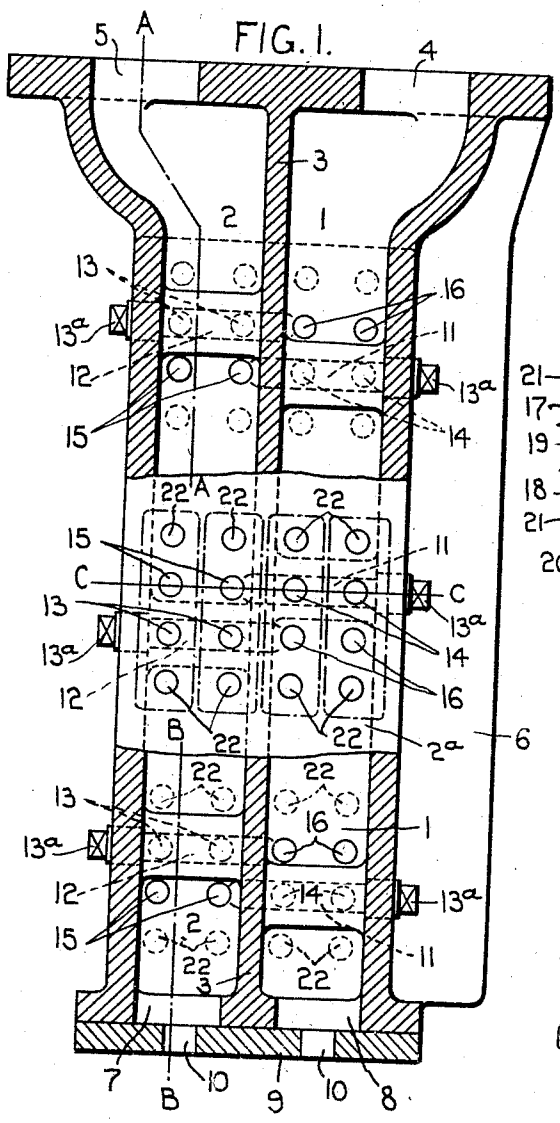
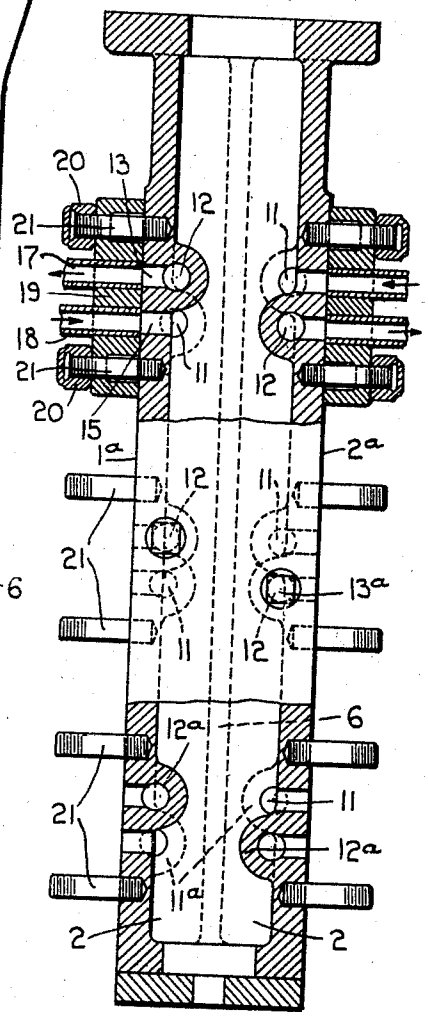


FIG. 2.



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3 SHEETS—SHEET 2.

FIG. 3.

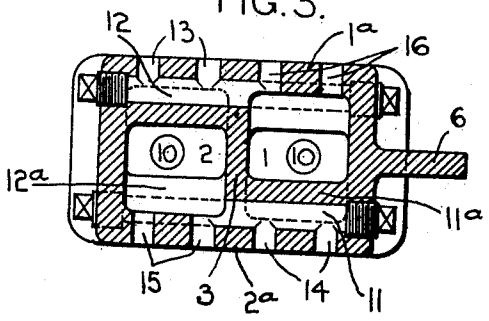
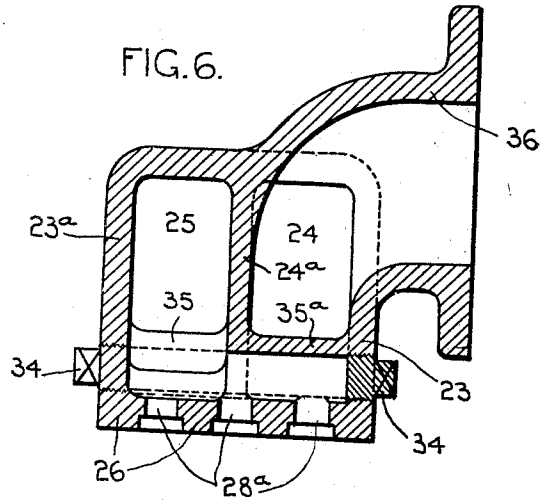


FIG. 6.



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3 SHEETS—SHEET 3.

FIG. 4.

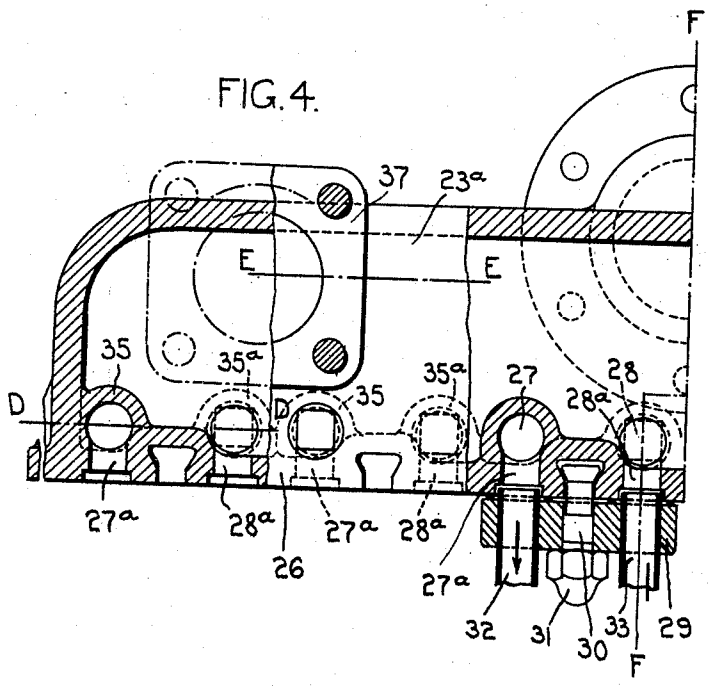
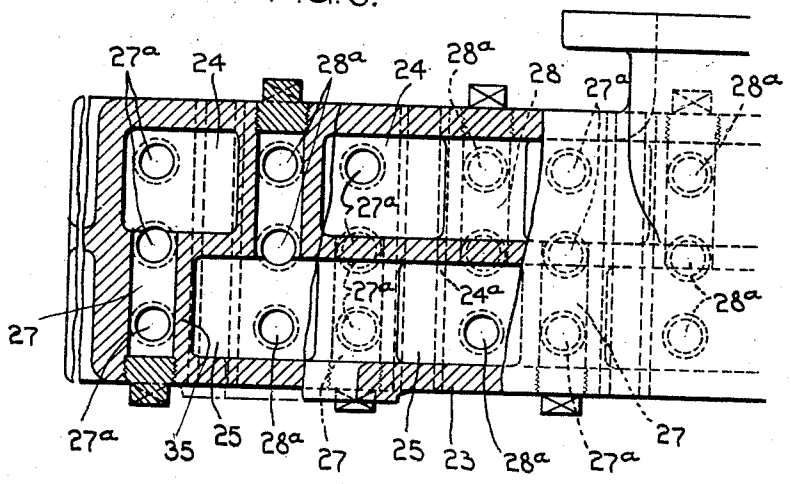


FIG. 5.



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STEAM-SUPERHEATER.

1,364,272. Specification of Letters Patent. Patented Jan. 4, 1921.

Application filed September 4, 1919. Serial No. 321,707.

To all whom it may concern:

Be it known that I, HENRY EDWARD GEER, a subject of the King of Great Britain and Ireland, residing at London, England, (whose post-office address is 14 New Burlington street, London, W. 1, England,) have invented certain new and useful Improvements in or Relating to Steam-Superheaters; 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 which it appertains to make and use the same.

This invention has for its principal object to provide a simple header casting free from intricate passages, and free from a multiplicity of steam chambers or compartments with their dividing walls, and the consequent difficulties of molding and coring and producing sound castings.

Further a header according to this invention enables a number of superheater elements belonging to the same row (horizontal row in the case of a marine boiler, and usually vertical row in the case of a locomotive boiler) of smoke tubes to have their saturated steam inlet and superheated steam outlet ends with the several flange blocks in which these ends are fixed secured to the header wall one behind the other with the element ends in the respective flange blocks registering with suitably spaced holes arranged in parallel transverse planes of the header wall. With the ends of the elements connected to the header in this way all the elements belonging to one row of smoke tubes can be disconnected from the header and withdrawn from the smoke tubes without disconnecting or in any way disturbing the joints of the elements belonging to another row of smoke tubes. The use of a header according to this invention is however not necessarily restricted to this arrangement of the element ends in connection with the header.

A header according to this invention consists of a casting of steel or iron comprising two plain steam chambers, one for saturated steam and the other for superheated steam, arranged one behind the other and extending longitudinally of the header with an integral partition or wall extending from end to end of the header between the two steam chambers; further, ports or passages are formed by drilling or like operations in the metal forming a wall (or walls in the case of a header for a marine boiler superheater) of the header and extending transversely thereof alternate passages extending respectively from the rear of the header across the adjacent steam chamber, through the aforesaid partition wall and opening at the inner end into the steam chamber remote from the rear of the header, and from the front of the header across the adjacent steam chamber, through the said partition wall and opening at the inner end into the steam chamber remote from the front of the header, these ports or passages being intersected by the inner ends of the holes in the wall of the header with which the saturated steam inlet ends, or the superheated steam outlet ends, as the case may be, of certain of the superheater elements, register, the construction and arrangement being such that the saturated steam inlet ends of those elements connected to the header wall or to the portion of the wall closing the superheated steam chamber are in communication through the aforesaid passages in the header wall with the saturated steam chamber, and the superheated steam outlet ends of those elements connected to the wall or portion of the wall closing the saturated steam chamber are in communication through the said ports with the superheated steam chamber. The outer ends of these drilled ports or passages are suitably closed for instance by means of screw plugs.

Further according to this invention, in the preferred embodiment thereof, the aforesaid drilled ports or passages in the wall or walls of the header are formed in, or partly in, suitably thickened portions of the wall or walls the said portions forming ribs or bosses on the inside of the wall or walls.

The invention further consists in the headers substantially as hereinafter described with reference to and shown in the accompanying drawings, in which:—

Figure 1 is a side view, partly in section and partly in elevation, of a header suitable for a superheater to be applied to a marine boiler.

Fig. 2 is a front view, partly in section and partly in elevation, of the header shown in Fig. 1, the upper and lower sectional portions of Fig. 2 being respectively on the lines A—A and B—B, Fig. 1.

Fig. 3 is a cross section of the header on line C—C Fig. 1.

Fig. 4 is a front view, partly in section

and partly in elevation, of one half of a header suitable for a superheater applicable to a locomotive boiler.

Fig. 5 is a plan of Fig. 4, partly in section and partly in elevation, the sectional portion to the left of Fig. 5 and the adjacent sectional portion to the right being respectively on lines D—D and E—E Fig. 4.

Fig. 6 is a cross section on line F—F Fig. 4.

Like reference numbers indicate corresponding parts in the several figures of the drawings.

Referring to Figs. 1 to 3, 1 is the saturated steam chamber in the header, 2 the superheated steam chamber, 3 the partition wall separating the two chambers, and 4 and 5 openings in the top of the casting respectively for inlet of saturated steam from the boiler to the chamber 1 and outlet of superheated steam from chamber 2 to the steam pipe leading to the engine, the steam pipe leading from chamber 2 to the engine and the pipe leading from the boiler to chamber 1 being connected to the top of the header as usual. 6 is a projection or web formed integrally with the header casting and whereby the header can be secured to the boiler tube plate by means of suitable brackets and bolts. 7 and 8 are openings in the lower end of the header provided to facilitate removal of the cores after casting, inspection of the interior of the header and removal of any deposit that may collect. These openings are closed by a cover plate 9 in which drain holes 10 are provided, suitable drain valves or cocks being provided to register with these holes.

11 and 12 are the hereinbefore mentioned drilled ports or passages in the side walls 1^a, 2^a of the header, each passage 11 extending from the rear of the header transversely across the saturated steam chamber 1, through the partition wall 3 and opening at its inner end into the superheated steam chamber 2, and each passage 12 extending from the front of the header across the superheated steam chamber 2, through the partition 3 and opening at its inner end into the saturated steam chamber 1. 13^a are screw plugs closing the outer ends of the passages 11 and 12.

As in the case of a superheater for a marine boiler the steam inlet and outlet ends of superheater elements are connected to both side walls, 1^a and 2^a, of the header, a series of the drilled ports or passages, 11, 12, are provided in each side wall as clearly shown in Figs. 2 and 3. Further as shown these passages 11 and 12 are drilled partly in the bosses or ribs 11^a, 12^a, formed on the inside of the header walls 1^a, 2^a, and partly in the metal of the walls themselves.

13 are the holes in the part of the side wall of the header which forms the wall of or closes the superheated steam chamber 2, these holes being drilled at right angles to the passages 12 and opening at their inner ends into said passages; and 14 are the holes drilled in the part of the side wall which closes the saturated steam chamber, these holes being drilled at right angles to the passages 11 and opening at their inner ends into said passages.

15 are the holes in the side wall leading direct into the superheated steam chamber 2 and 16 are the holes in the side wall leading direct into the saturated steam chamber 1. The holes 13 and 15 and 14 and 16 are, as usual, suitably spaced apart so that the saturated steam inlet and superheated steam outlet ends,—respectively marked 17 and 18 in Fig. 2—of the several elements belonging to one row of smoke tubes will register with the two holes, respectively 13 and 15 and 14 and 16, in the longitudinal plane of the header. As shown in Fig. 1 the ends of four elements would be connected to each side, 1^a, 2^a, of the header, the ends 17, 18 (Fig. 2) of each element being secured to the header wall by a separate flange block 19 (Fig. 2) in which the element ends are fixed, these blocks lying one behind the other transversely of the header wall and in parallel longitudinal planes of the wall, the flange blocks being clamped to the wall by means of nuts 20 screwed up on screw studs 21 (see Fig. 2) projecting through holes in the flange block, this arrangement and method of connecting the element ends with flange blocks to the header being the same as described and shown in specification of Letters Patent No. 1,301,606.

22, Fig. 1, are the holes in the header wall which receive the screw studs 21.

Referring now to Figs. 4, 5 and 6, which illustrate a header adapted to be situated in the smoke box of a locomotive boiler, above or to one side of the group of enlarged smoke tubes which receive the U-pipes of the superheater elements, 23 and 23^a are respectively the rear and front walls of the header casting, and 24^a is the longitudinal partition or dividing wall in the casting which divides the header into two plain steam chambers namely the rear chamber 24 for saturated steam and the front chamber 25 for superheated steam. In this case the hereinbefore mentioned drilled ports or passages, marked 27 and 28, extend alternately and respectively across the superheated steam chamber 25 and the saturated steam chamber 24 and are drilled in the wall which forms the bottom 26 of the header.

In this case there are, as usual, three superheater elements belonging to a vertical row of three enlarged smoke tubes of the boiler, and both the saturated steam inlet end and the superheated steam outlet end

of each element are fixed in a flange block 29 (Fig. 4) secured to the bottom of the header in the known manner by means of the V-headed bolt 30 with nut 31 screwed up on its outer end. 27ª are the holes in the bottom of the header with which the saturated steam inlet ends of the elements register, and 28ª are the holes in the bottom of the header with which the superheated steam outlet ends of the elements register. As clearly shown the holes 27ª in the part of the casting forming the bottom of the superheated steam chamber 25 lead into the drilled passages 27, and the holes 28ª in the part forming the bottom of the superheated steam chamber lead into the drilled passages 28 so that in the case of the saturated steam inlet ends of the elements registering with the holes 27ª leading into passages 27 saturated steam can pass from the saturated steam chamber 24 through the passages 27 out through the holes 27ª communicating with these passages and into the elements, and the superheated steam issuing from the outlet ends of the elements, registering with the holes 28ª leading into the passages 28, passes through these passages into the superheated steam chamber 25 whence it passes, through the usual steam pipes (not shown) to the engine. 32 and 33 (Fig. 4) are respectively the saturated steam inlet end and the superheated steam outlet end of an element, and the arrows show the course of the steam from the header to the element and thence back to the header. Each of the superheated elements belonging to a vertical row of boiler smoke tubes has its steam inlet and outlet ends fixed in a flange block identical to the flange block 29 Fig. 4, and these flange blocks are arranged one behind the other on the bottom of the header and secured thereto by bolts and nuts similar to the bolt and nut 30 and 31. 34 are screw plugs closing the outer ends of the drilled passages 27 and 28 which passages in this case are also drilled in thickened portions of the casting forming bosses or ribs, 35, 35ª, on the inside of the bottom of the header.

36 is the usual tubular flanged part of the header casting which is bolted to the usual flange on the saturated steam pipe of the boiler, and 37 is one of the usual flanges on the header for connection of one of the steam pipes leading to the engine, the other steam pipe being, as usual similarly connected at the opposite end of the header.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A superheater header provided with a partition dividing it into two chambers for saturated and superheated steam respectively, said header being provided with a straight and relatively long cylindrical passage in one of its side walls extending across the full width of the steam chamber on one side of the partition and communicating with the other chamber, said header having also a lateral opening for steam in the side wall having the passage in it and communicating directly with the said passage and through it with the steam chamber on the other side of the partition, and said header having also a lateral opening for steam in the said side wall and communicating directly with the first said steam chamber and the said cylindrical passage and the lateral openings being formed by drilling.

2. A superheater header provided with a partition dividing it into two chambers for saturated and superheated steam respectively, said header being provided with a transverse hemi-cylindrical boss or enlargement on one of its side walls in the chamber on one side of the partition, said header having a straight and relatively long cylindrical passage formed in the said boss and side wall which extends across the full width of the said chamber and which communicates with the steam chamber on the other side of the partition, said header having also a lateral opening for steam in the side wall having the said passage in it and communicating directly with the said passage, and said header having also a lateral opening for steam formed in the said side wall and communicating directly with the steam chamber in which the said boss is located and the said cylindrical passage and the lateral openings being formed by drilling.

3. A superheater header provided with a partition dividing it into two chambers for saturated and superheated steam respectively, said header being provided with a straight and relatively long cylindrical passage in one of its side walls extending across the saturated steam chamber for the full width thereof and communicating with the superheated steam chamber, and having a similar passage extending across the superheated steam chamber for the full width thereof and communicating with the saturated steam chamber, said passages being formed by drilling and arranged in different planes, and the said header having lateral openings for saturated and superheated steam respectively in the side wall having the said passages in it and communicating directly with the respective passages, and said header having also lateral openings for saturated and superheated steam respectively in its said side wall and communicating directly with the respective chambers.

4. A superheater header, provided with a partition dividing it into front and rear chambers for saturated and superheated steam, said header having straight and relatively long cylindrical passages in one of its side walls, said passages being formed by drilling and arranged in different planes,

one of the cylindrical passages extending across the front steam chamber and communicating with the rear steam chamber, and the other cylindrical passage extending across the rear steam chamber and communicating with the front steam chamber, the said header having also a plurality of openings in its side wall between the ends of each of the said cylindrical passages and communicating directly with them and through them with the respective steam chambers to which they pertain, and the said header having also a plurality of openings in its side wall arranged in the same planes as the said passages and communicating directly with the respective steam chambers.

In testimony whereof I affix my signature, in presence of two witnesses.

HENRY EDWARD GEER.

Witnesses:

ARTHUR JAMES HALL,

W. WASH.