

R. A. WHITTINGHAM.
STEAM BOILER,
APPLICATION FILED JAN. 16, 1915.

1,259,945.

Patented Mar. 19, 1918.
3 SHEETS—SHEET 1.

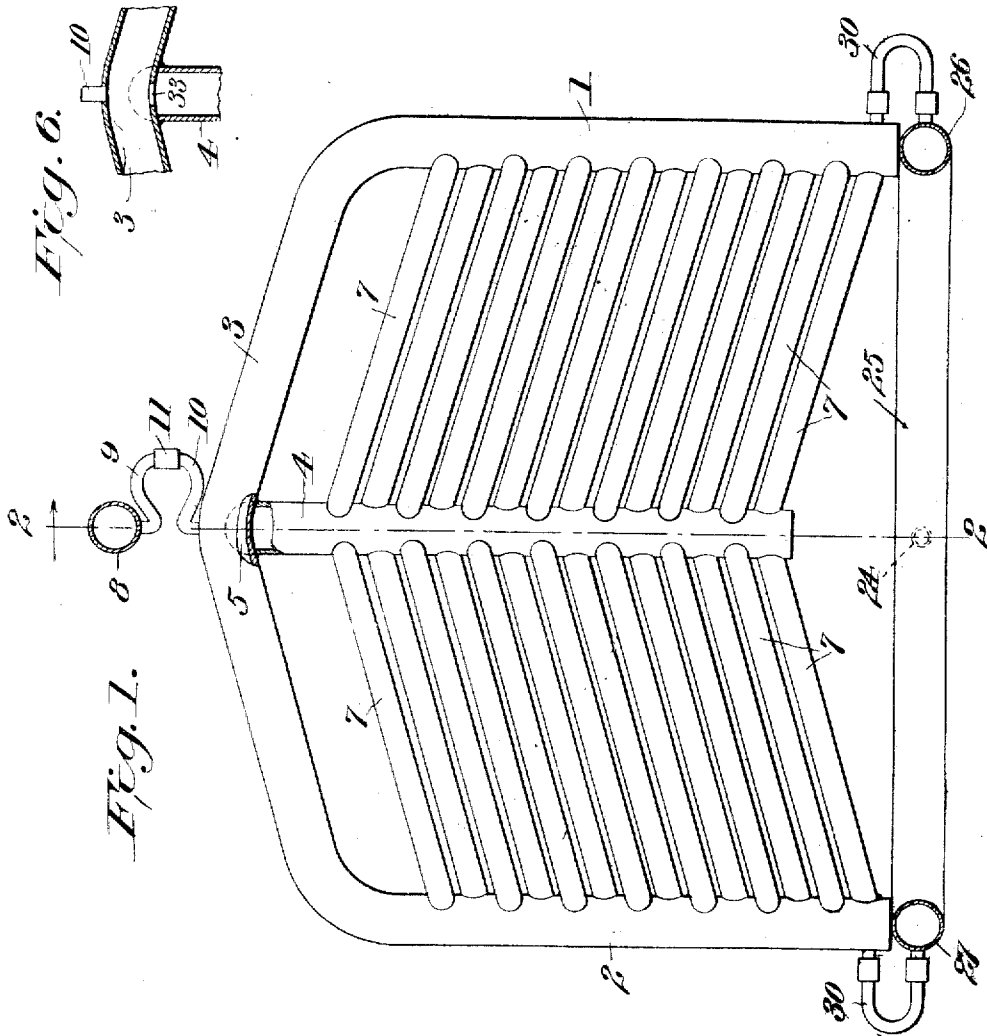
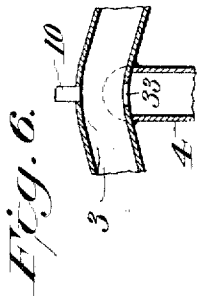
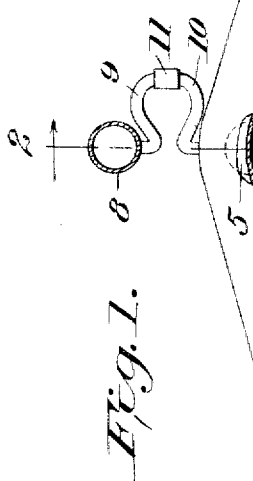
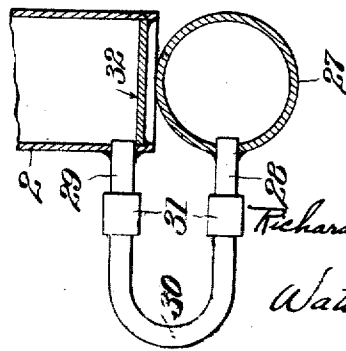


Fig. 5.



Witnesses
C. M. Walker,
L. Van Sant

Inventor
Richard A. Whittingham,
by
Watson & Boyden,
Attorneys.

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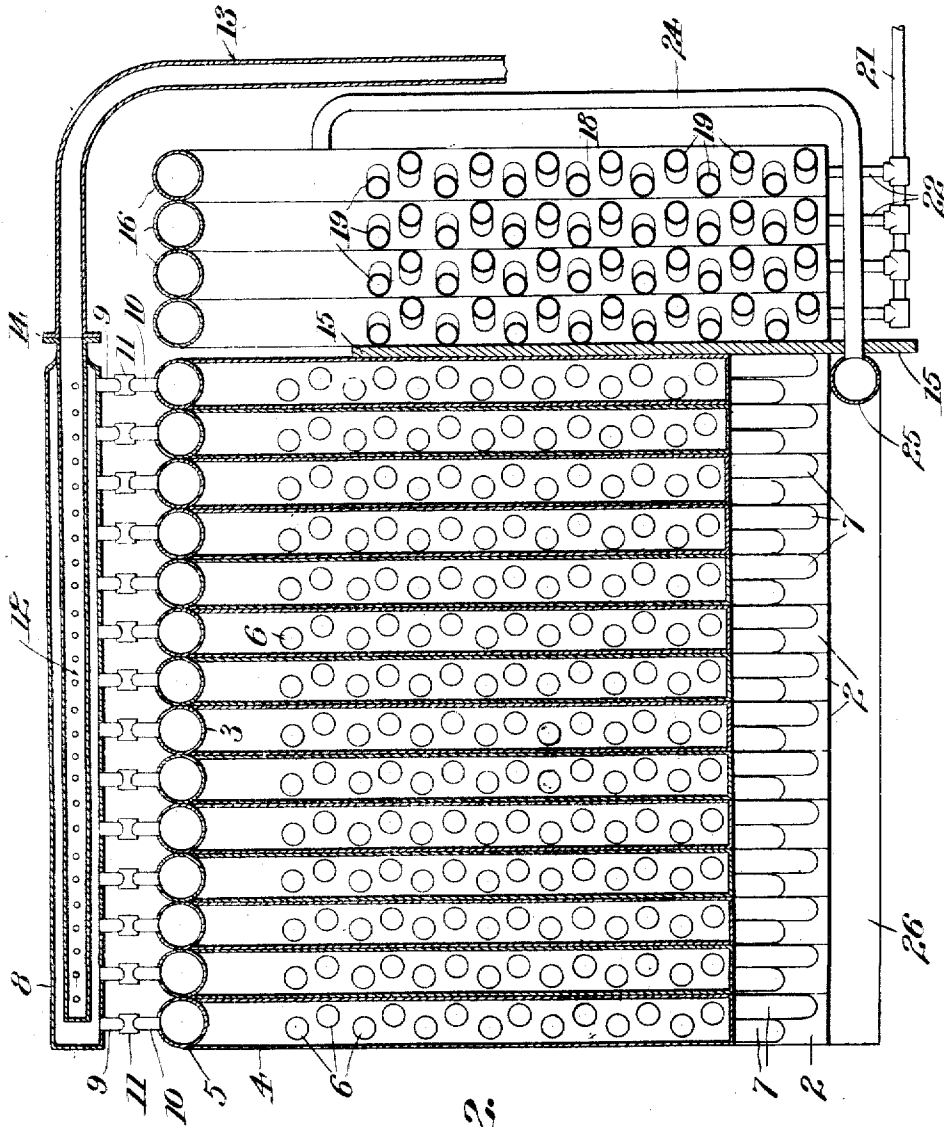


Fig. 2.

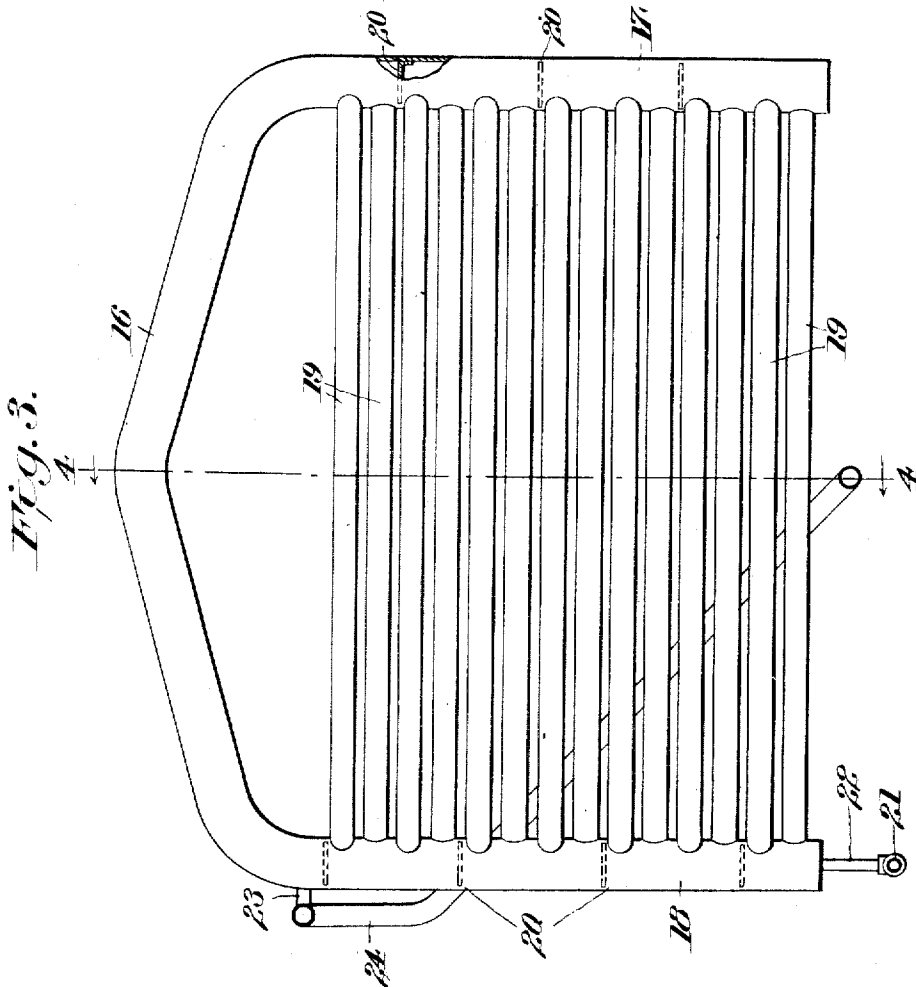
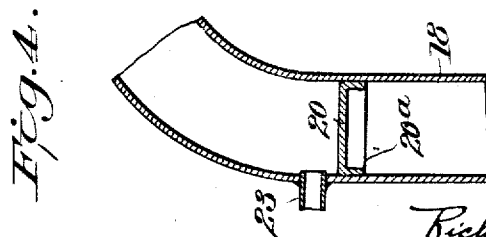
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Attorneys

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E. Van Sant

Inventor
Richard A. Whittingham,
 by
Watson & Bayden,
 Attorneys.

UNITED STATES PATENT OFFICE.

RICHARD A. WHITTINGHAM, OF NEWARK, DELAWARE.

STEAM-BOILER.

1,259,945.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RICHARD A. WHITTINGHAM, a citizen of the United States, residing at Newark, in the county of New Castle and State of Delaware, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

This invention relates to steam boilers, and especially to high pressure boilers of the sectional water tube type.

The main object of the invention is to provide a high pressure boiler of this character which shall be simple and compact in construction, efficient and powerful in operation, and in which all troubles due to leaky joints will be eliminated.

A further object is to provide an improved feed water heater or economizer having the same general characteristics of construction as the boiler, and to combine this economizer with the boiler in such manner as to produce a complete, compact, portable unit especially adapted for use on motor vehicles, motor boats, and other places where space is a consideration. To this end, I propose to construct my improved boiler of sections, each section being complete in itself, and being formed of seamless drawn tubing, having welded joints. Such a boiler may be run dry without injury, and when properly designed, will safely withstand a pressure of three thousand pounds to the square inch. It will be recognized, therefore, that boilers of this character constitute a distinct type of themselves, and are not to be confounded with low pressure or house boilers made mostly of cast iron, even though somewhat similar in outline.

In order that the invention may be clearly understood, reference is had to the accompanying drawings, forming part of this specification, and in which,

Figure 1 is an end elevation of my improved boiler, parts being in section;

Fig. 2 is a central, longitudinal section through the boiler and economizer substantially on the line 2—2 of Fig. 1, looking in the direction of the arrow;

Fig. 3 is an end view of the economizer or feed water heater;

Fig. 4 is an enlarged fragmentary section showing one of the details of construction;

Fig. 5 is an enlarged fragmentary section showing other details of construction, parts being in elevation; and,

Fig. 6 is a fragmentary sectional view showing a slightly modified construction.

Referring to the drawings in detail, my improved boiler consists of a series of similar sections, each section being of substantially inverted U-shape, as shown in Fig. 1. The outer frame or header consists of a piece of seamless drawn tubing of relatively large diameter bent to form a U-shaped body 3, having the legs 1 and 2. The lower end of each of these legs is closed, preferably by means of a disk 32 (see Fig. 5) inserted in the tube and welded in position as by means of an oxy-acetylene flame. Midway between the legs 1 and 2 is provided a central header member 4, of similar size, and extending vertically downward from the center of the body 3. This central header 4 is secured at its upper end to the body 3, as by welding. As shown in Figs. 1 and 2 of the drawings, such upper end of the header 4 is closed, and this construction will be employed where it is desired that the boiler furnish superheated steam. Where the boiler is intended to supply saturated steam, however, an opening 33 is provided in the wall of the body 3, as shown in Fig. 6, through which opening steam may pass directly from the header 4 into such body. The lower end of the header 4 is closed in a manner similar to that shown in Fig. 5.

Throughout its length on each side, the central header member 4 is provided with a series of openings 6, preferably staggered as clearly shown in Fig. 2. The inner sides of the legs 1 and 2 of the main header are also provided with a similar series of openings. Extending between the central header 4 and each of the legs 1 and 2, is a series of relatively small tubes 7, having their ends set into the holes 6 and welded in position. As clearly shown in Fig. 1, these tubes 7 preferably slope upwardly toward the central header, the lower end of such header preferably terminating at a point above the lower ends of the legs 1 and 2.

It will be understood that any desired number of sections such as above described, and illustrated in Fig. 1, are assembled side by side to form a boiler of any required dimensions. The main and central headers lie with their surfaces in substantial contact so as to form continuous walls.

Extending along above the boiler is a steam header 8, which is connected to the highest point of each U-shaped section by

the means shown in Fig. 1. Such means consists of short pieces of tubes 9 and 10, welded into the headers 8 and 3, respectively, and connected by means of a suitable coupling 11. Inside of the header 8 extends a steam collecting pipe 12, provided with small perforations throughout its length in a manner well known in the art, for the purpose of preventing excessive steam flow from any one section. From the pipe 12 extends the main steam pipe 13 to the engine, the pipes 12 and 13 being connected by any suitable coupling 14.

In order to more fully utilize the heat of the furnace and to raise the temperature of the incoming water, I provide a feed water heater or economizer at the rear of the boiler and separated therefrom by means of a baffle plate 15. This economizer, like the boiler, is also formed of sections, each section being made up of seamless drawn tubing with welded joints. Each section of the economizer comprises a U-shaped header, preferably of the same size and outline as the boiler sections. Such an economizer section is shown in Fig. 3, and comprises the header 16 having the legs 17 and 18.

In the economizer sections, however, there is no central header, but a plurality of relatively small tubes 19 extend across from one leg to the other, being preferably staggered in the same manner as the boiler tubes, and welded in position. These economizer tubes are preferably arranged horizontally, as clearly shown in Fig. 3.

In the legs 17 and 18 are placed baffle plates 20, each preferably consisting of a disk pressed from sheet steel and provided with a marginal flange 20^a, which frictionally grips the inside of the tube so as to maintain the baffle plates in position. These plates are so spaced as to include a definite number of tubes 19 between each pair of plates at each end, the baffle plates being arranged alternately in the two legs so as to provide, in combination with the tubes 19, a zig-zag path through which the incoming feed water must flow. Such feed water is supplied through a pipe 21, from a suitable pump or automatic regulator of any desired kind, and is delivered to the bottom of a leg, such as 18, of each section, through a branch pipe 22. It will be seen, therefore, that the incoming water flows to the right, as viewed in Fig. 3, through the two lower pipes 19, thence upwardly and back to the left through the next two pipes, etc., thus flowing back and forth until it reaches the right hand end of the two uppermost tubes 19. From this point it flows upwardly and to the left through the header 16. Above the uppermost baffle plate 20, in the leg 18, a nipple 23 is welded into each header 16, and all of these nipples tap a pipe 24, which extends along the side of the economizer sec-

tions. The water, therefore, passes from the headers 16, through the nipples 23, and into the pipe 24.

The pipe 24 passes downwardly and forwardly and connects immediately in front of the baffle plate 15 with a U-shaped water supply main 25. This main 25 has parallel legs 26 and 27, which extend forwardly along the lower ends of the legs 1 and 2 of the boiler sections. In fact, the boiler sections preferably rest upon the legs 26 and 27 of the water main. The water main is connected with each leg of each boiler section, preferably by means of the construction shown in Fig. 5. Referring to this figure, it will be seen that nipples 28 and 29 are welded into the main 27 and each header 2, such nipples being connected by means of a bent tube 30, and joined to the nipples by means of suitable couplings 31.

It will be seen that the economizer practically forms an extension of the boiler, both having the same outline, and together forming a compact unit. Any suitable source of heat, using either solid, liquid or gaseous fuel, may be employed, the products of combustion passing upwardly between the boiler tubes 7, and thence downwardly over the baffle plate 15 and between the economizer tubes 19. The incoming feed water is therefore raised to a very high temperature before it passes into the boiler proper. While wide variations in water levels are permissible, probably the best results are obtained when the boiler is kept substantially half full of water. In the lower tubes 7, therefore, the water flows upwardly toward the central header and back through the tubes above, thus setting up a rapid circulation. The tubes 7 intermediate the top and bottom of the boiler carry a mixture of steam and water, and it is in such tubes that the separation takes place. The upper tubes carry only steam, and as they are exposed to the full force of the fire, the steam is raised to a very high degree of superheat. It will be particularly noted that the steam cannot pass upwardly and out through the upper end of the header 4, where, as shown in Figs. 1 and 2 of the drawing, no opening in the wall of the header 3 is provided. It must therefore pass downwardly and outwardly from the central header through the upper tubes 7, in order to escape into the main header 3, thus becoming superheated as above described.

It will also be particularly noted that owing to the sectional construction of the boiler and economizer, a failure of any one section does not disable the entire plant. If a section becomes defective, it is only necessary to disconnect it from the water pipe and close the same with a plug, whereupon the remaining sections will operate as before. Moreover, it will be observed that

there are no rolled, expanded, riveted, or other joints to become damaged by excessive heat.

It will thus be seen that I have provided a high pressure boiler of exceptional strength, efficiency, and compactness, and have combined the same with an economizer in such a manner as to produce a portable unit well adapted for motor vehicles and the like, and it is thought that the many advantages of my improved construction will be readily appreciated without further discussion.

What I claim is:

1. In a sectional boiler, a section comprising a main header formed of a tube bent to substantial U-shape, a central header comprising a tube closed at both ends, and lying parallel with the legs of the main header midway between the same, and a series of tubes connecting each of said legs with the central header.

2. In a sectional boiler, a section comprising a main header of inverted U-shape, a central header, closed at both ends, and located between the legs of the U-shaped header, and a series of tubes extending from each of said legs to the said central header.

3. A high pressure boiler consisting of a

plurality of sections, each section comprising a main header made of a seamless drawn tube of inverted U-shape closed at its ends, a central tube or header closed at both ends and extending parallel with the legs of the main header, and a series of tubes extending from each leg of the main header to said central header, said tubes sloping upwardly from said legs toward said central header.

4. A combination boiler and economizer unit comprising a plurality of sections all similar in outline, and arranged one behind the other in registering relation, each of said sections for both boiler and economizer being formed of a piece of seamless tubing of uniform cross section throughout bent into substantial inverted U-shape, with a series of smaller, transversely extending tubes establishing communication between the legs of each of said U-shaped tubes, and means for feeding water from said economizer to each of said boiler sections.

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

RICHARD A. WHITTINGHAM.

Witnesses:

FRANK C. KANE,
RALPH L. JACOBS.