(No Model.)

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J. BUCKLEY.

STEAM BOILER.

No. 535,441. Patented Mar. 12, 1895.

Fig. 1.

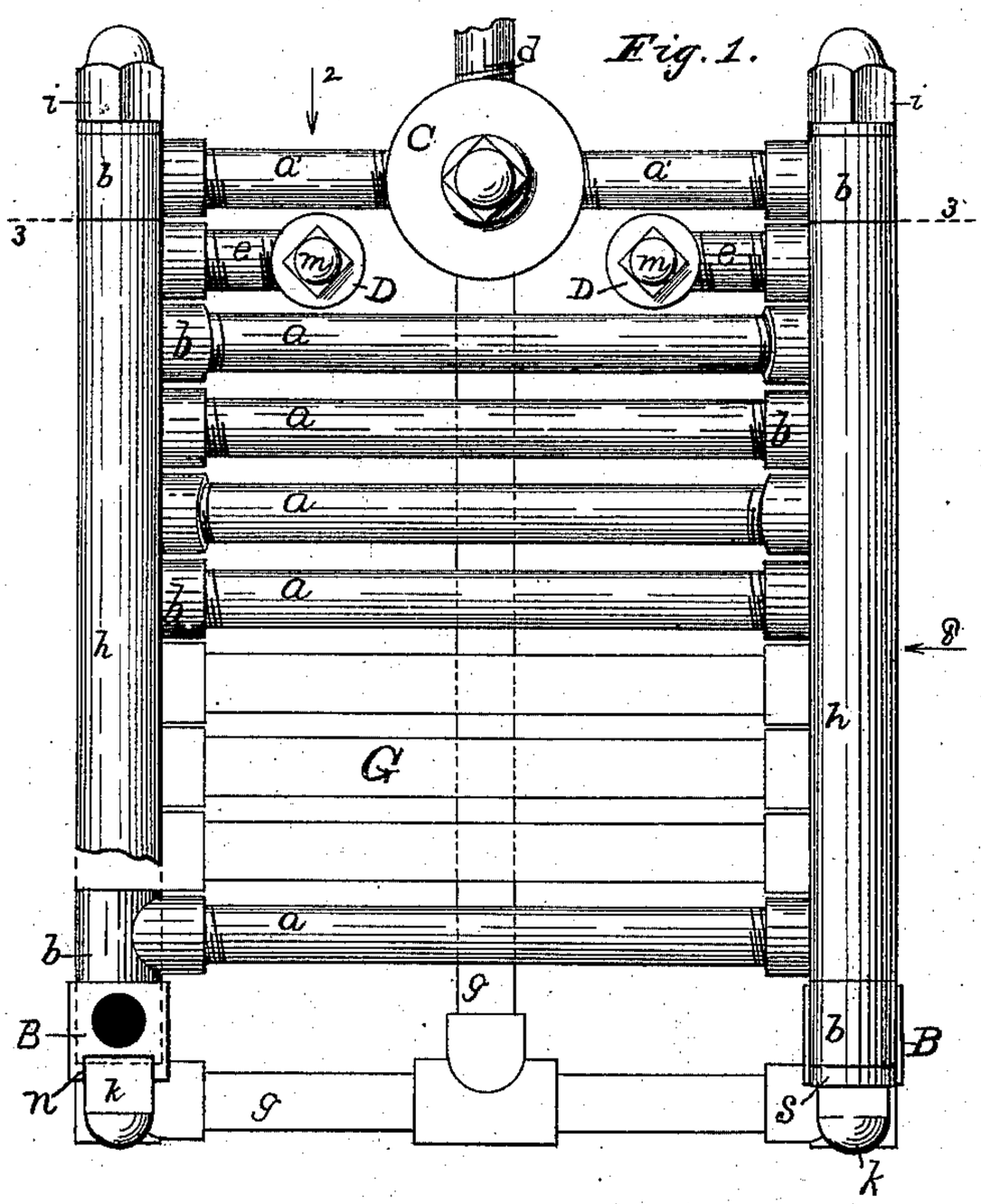

Fig. 6.

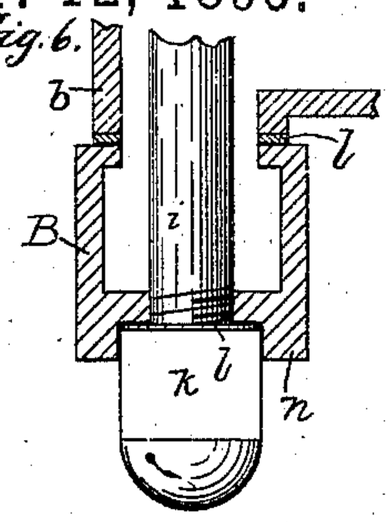

Fig. 4.

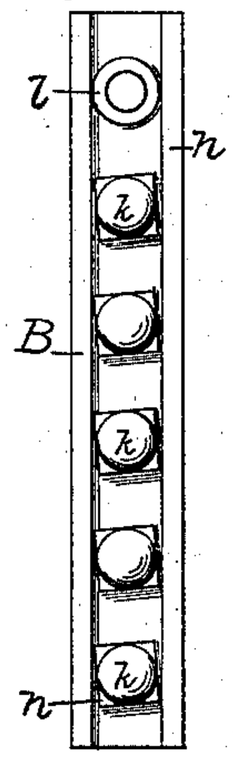

Fig. 5.

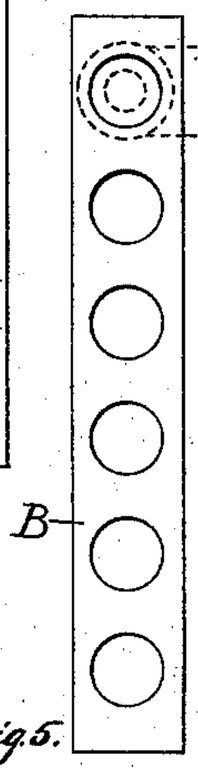

Fig. 7.

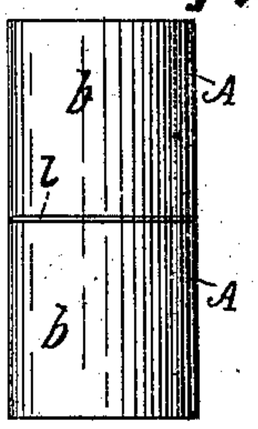

Fig. 3.

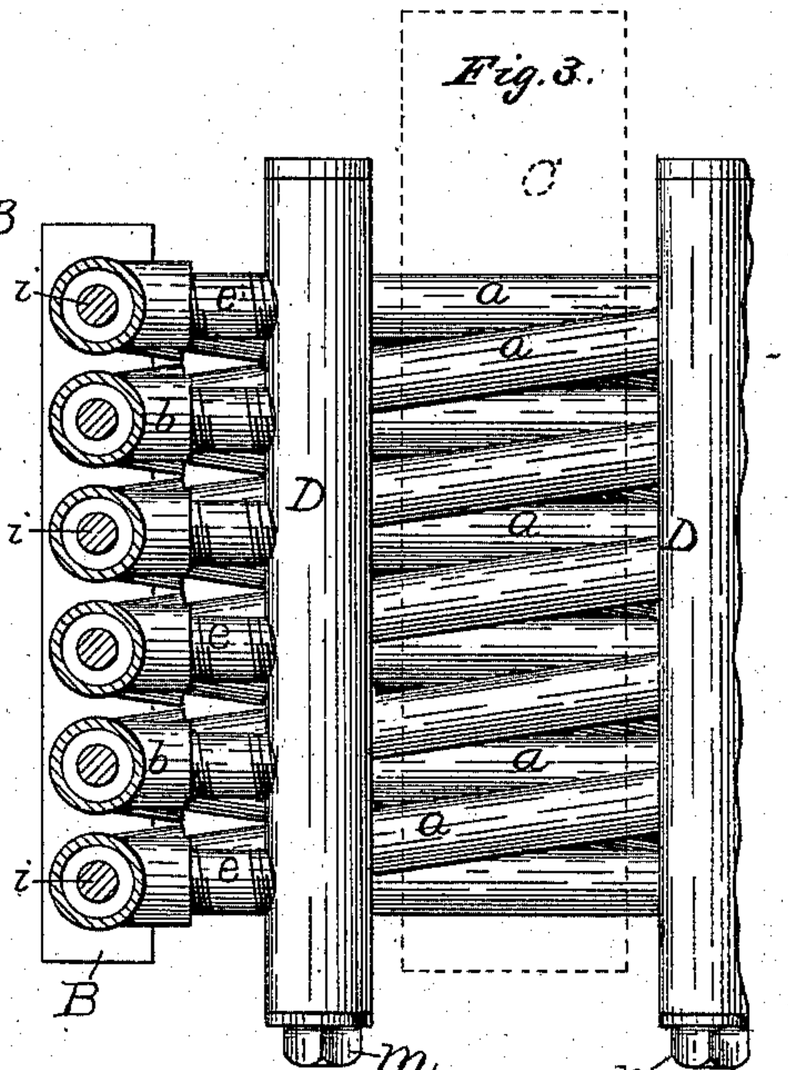

Fig. 2.

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STEAM BOILER.

No. 535,441. Patented Mar. 12, 1895.

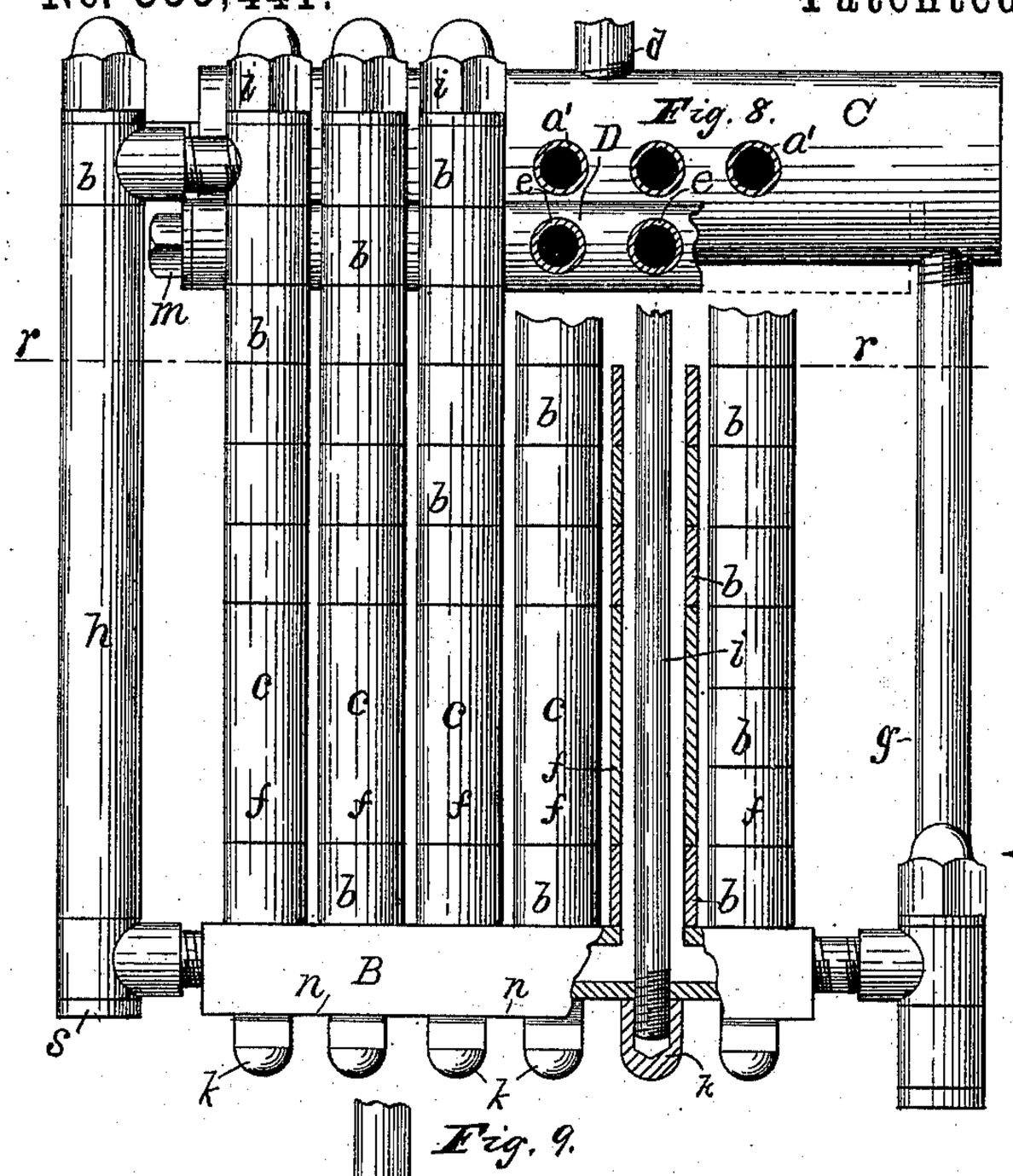

Fig. 9.

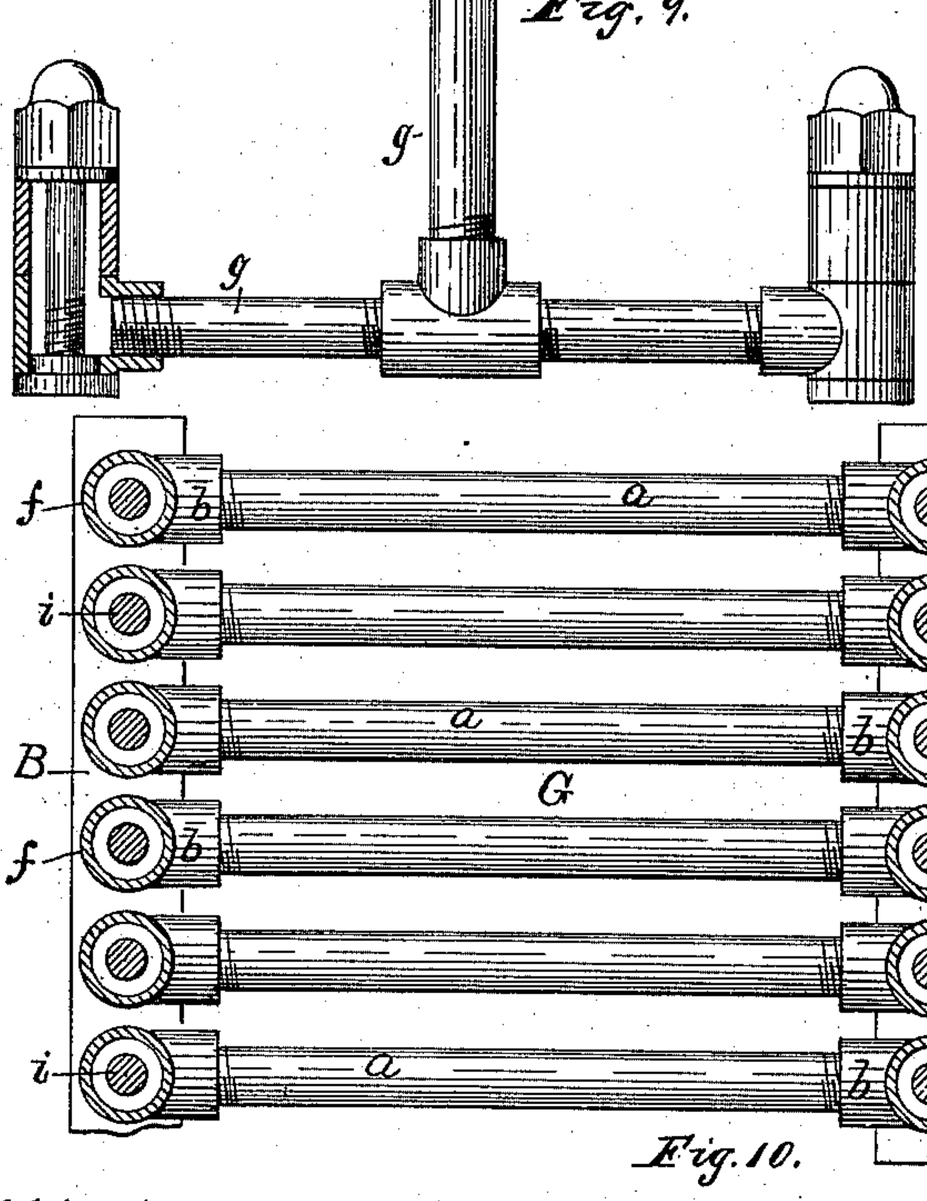

Fig. 10.

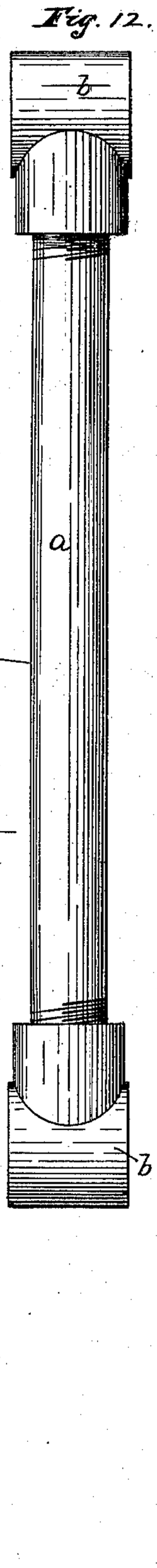

Fig. 11.

Fig. 12.

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STEAM BOILER.

No. 535,441. Patented Mar. 12, 1895.

Fig. 13.

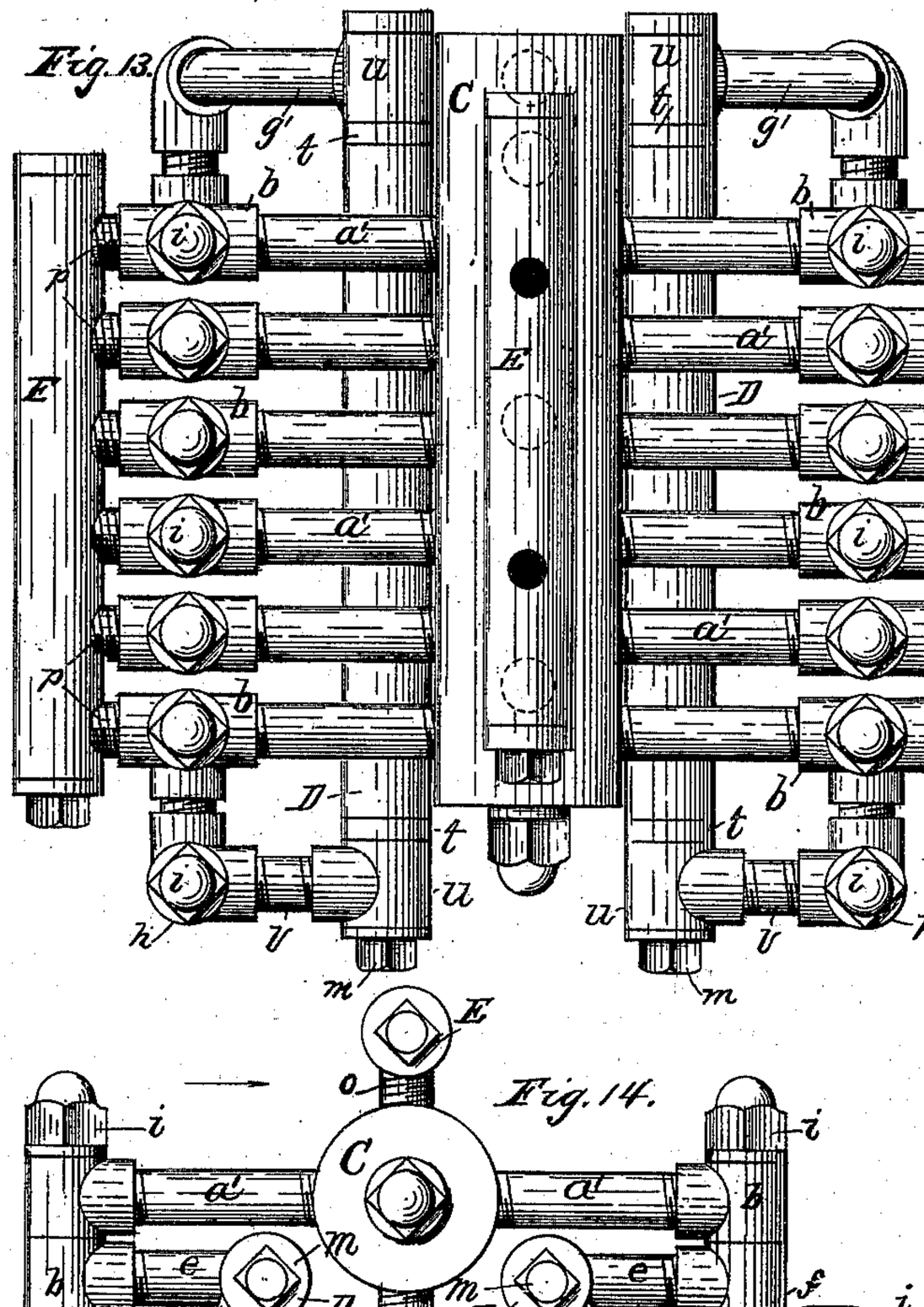


Fig. 15.

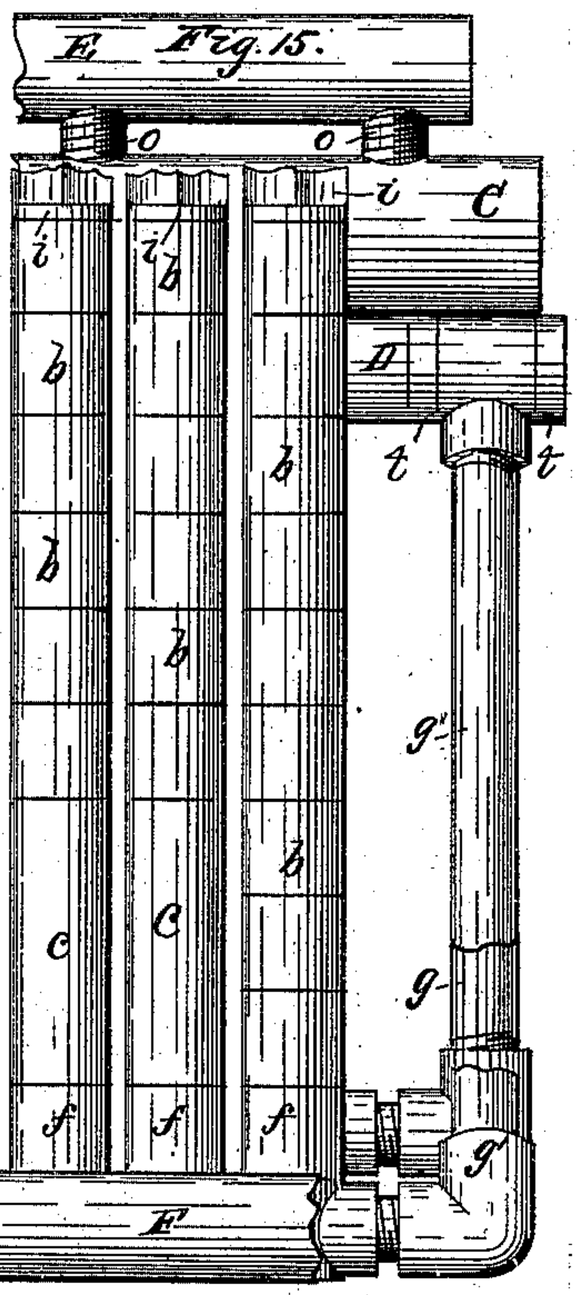


Fig. 14.

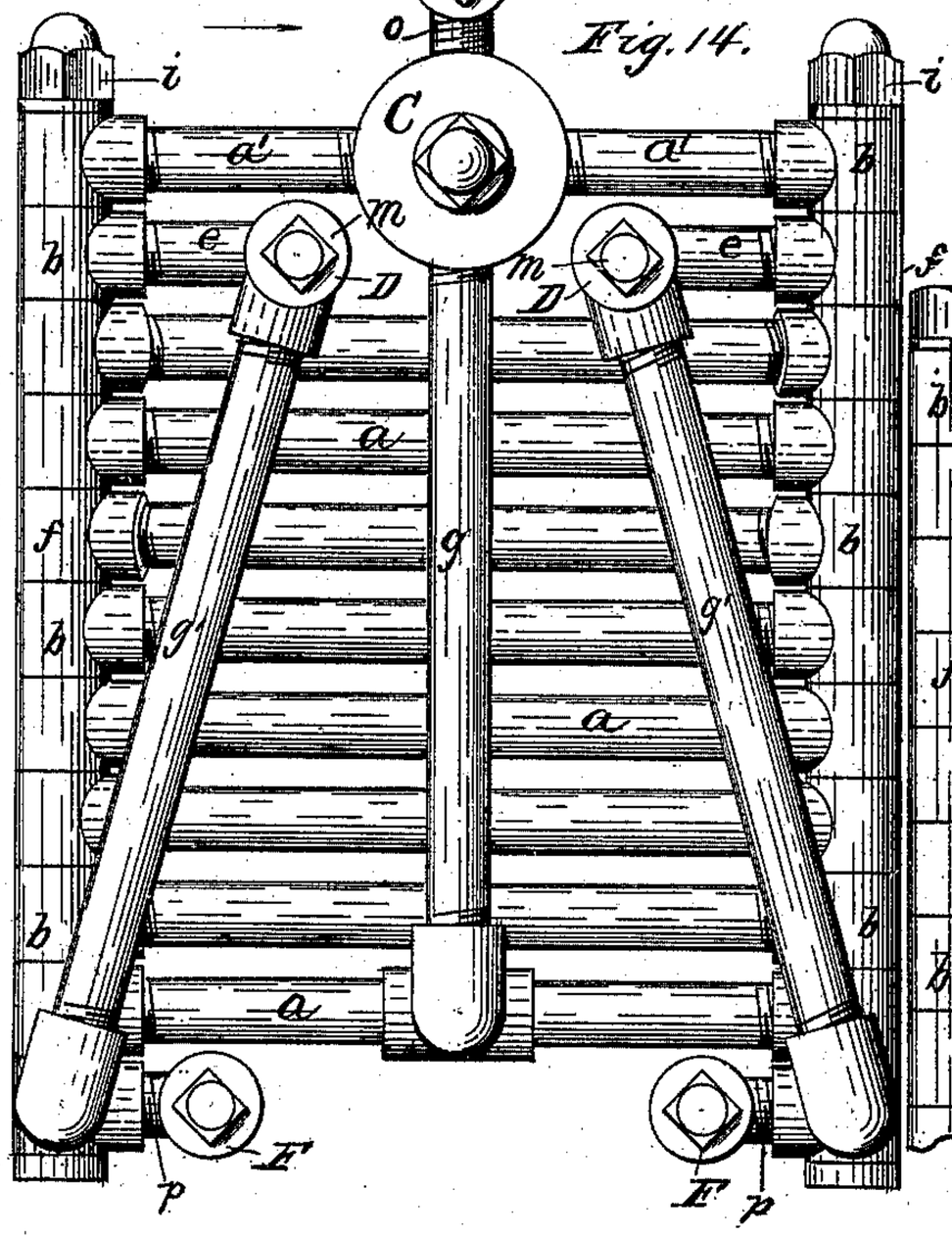
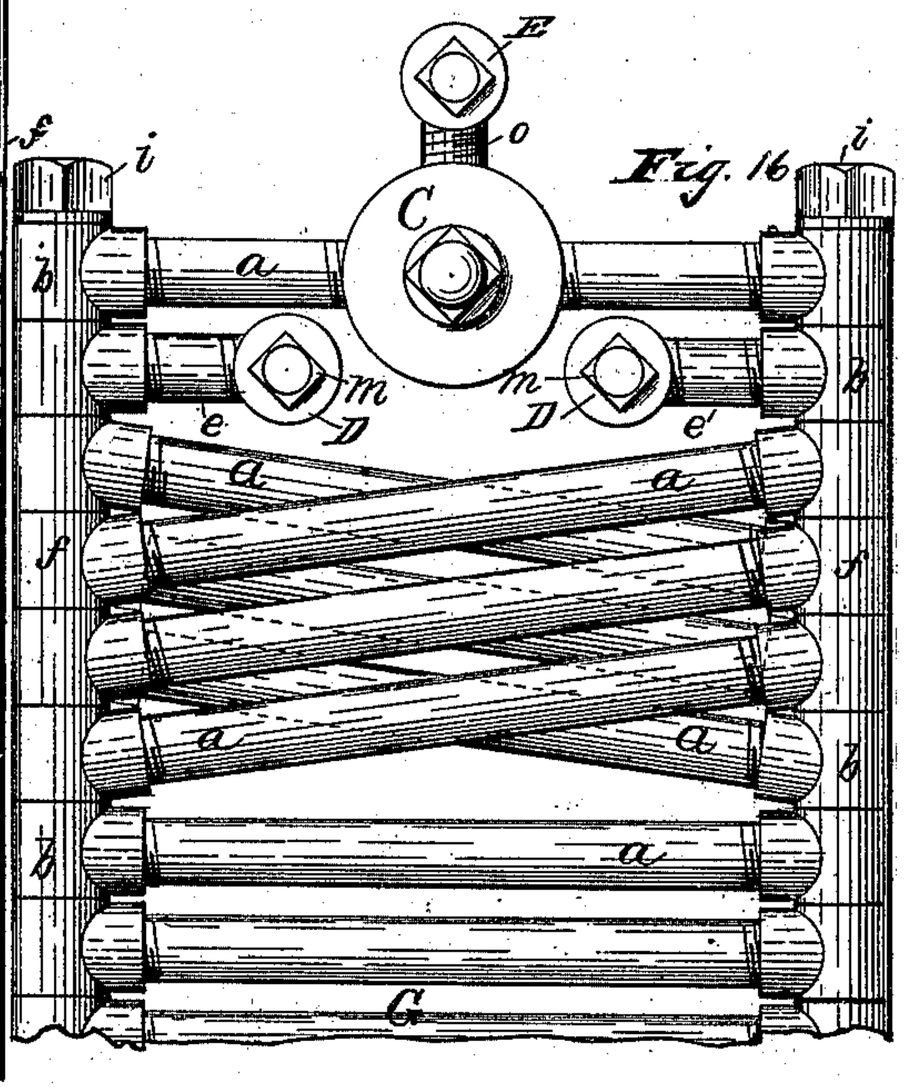


Fig. 16.



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UNITED STATES PATENT OFFICE.

JOHN BUCKLEY, OF ROCHESTER, NEW YORK, ASSIGNOR TO THE ROCHESTER MACHINE TOOL WORKS, OF SAME PLACE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 535,441, dated March 12, 1895.

Application filed February 15, 1893. Serial No. 462,462. (No model.)

To all whom it may concern:

Be it known that I, JOHN BUCKLEY, of Rochester, in the county of Monroe and State of New York, have invented a new and useful Improvement in Steam-Boilers, which improvement is fully set forth in the following specification and shown in the accompanying drawings.

This boiler is designed more particularly for a "coal boiler" and it is made up wholly of tubes or pipes with their elbows and connections, and suitable fasteners for the parts; and one of the important features in its construction is that all of the numerous screw-threads employed in joining the various parts are "right-hand," on account of which the boiler is much simplified in construction and the putting together or taking apart of the same is rendered easy and convenient. Furthermore, as constructed with right-hand threads only, and simple sections and parts, any part of the boiler may be removed and examined or replaced by a new part in most cases without interfering with other parts of the boiler; in other cases or with disturbing but few of those parts.

The boiler is mainly made up of similar, horizontal sections each being simply a straight piece of pipe with end connections.

The invention is hereinafter more fully described and particularly pointed out.

Referring to the drawings, Figure 1 is a front elevation of the boiler, a part being broken away. Fig. 2 is a plan. Fig. 3 shows some of the parts below the dotted line 3 3 in Fig. 1. Fig. 4 shows the under side of a water sill. Fig. 5 shows the upper side of a water sill. Fig. 6 is a cross-section of a water sill, taken as on the dotted line 6 in Fig. 2 and viewed as indicated by the arrow pointed thereon. Fig. 7 shows the adjacent ends of two sections with a packing gasket between them. Fig. 8 is a side elevation of the boiler seen as indicated by arrow 8 in Fig. 1, parts being broken away and one of the vertical columns and a portion of a water sill being vertically and centrally sectioned. Fig. 9 is a rear view of some of the lower rear parts of the structure seen as indicated by arrow 9 in Fig. 8, a part being vertically sectioned. Fig. 10 is a plan of the furnace floor and back. Figs. 11 and 12 show two views of a section. Fig. 13 is a plan of the boiler showing some simple changes in its construction. Fig. 14 is a rear elevation seen as indicated by arrow in Fig. 13. Fig. 15 is a side elevation of the rear part of the boiler seen as indicated by arrow in Fig. 14, parts being broken away. Fig. 16 shows pipes over the furnace inclined in vertical planes. Figs. 6, 7, 11 and 12 are drawn to scales larger than those of the remaining figures.

Referring to the parts shown, A, Figs. 11 and 12, is a section of the boiler, a number of which put together in order and held by suitable fasteners constitute the main part of the boiler. This section consists of a straight piece of pipe, *a*, provided with heads *b b*, at its ends, joined to the pipe by right-hand screw-threads. These heads are cylindrical, with their axes parallel and in the plane of the axis of the pipe, and either at right angles with said axis or inclined thereto.

In constructing the boiler the sections are placed one upon another so that the heads shall form vertical hollow columns, *f*, at the sides of the boiler, as shown in Fig. 8.

The boiler has its sides vertical and is substantially cubical or prismatic in form, some of the sections being omitted to form a fire space or furnace, G, within which the coal is burned. As shown in Figs. 1 and 8 fifteen of these sections are omitted, near the bottom and at the front of the boiler, to form a fire space. Short pieces of pipe or thimbles *c*, are inserted in the columns to fill the places of the section heads omitted, as shown in Fig. 8. In the construction shown in Figs. 2 and 8 the columns rest at their bases upon horizontal water sills B, rectangular in cross section, one at either side of the boiler, with the interiors of which sills the columns have water communication. When put together as shown in these figures the sections are in horizontal layers, the lower layer constituting the floor of the furnace, as shown in Fig. 10. There may be any number of these layers of sections over the furnace that may be thought desirable, and in building up the boiler I prefer to form some of the layers by placing the pipes at right-angles with the sides of the boiler, and others with the pipes inclined in

horizontal planes, as shown in Figs. 1, 2 and 3. In the layers formed of inclined sections the latter are inclined in opposite directions, as shown, these layers being alternated with layers in which the sections run straight across. This is for the purpose of causing the sections of each layer to cross the spaces between the sections of the layer beneath it, which complex structure of overlying pipes results in a more perfect contact of the heat currents and the pipe surfaces than if the pipes were all placed with their axes parallel.

The rear wall of the furnace consists of three (more or less) sections in a vertical plane, as shown in Fig. 1, the sides of the furnace being composed of the vertical thimbles *c*. In the upper horizontal layer the sections are placed straight across the boiler and are cut away at their middle parts in which space is inserted a main horizontal steam drum, C, as shown in Figs. 1 and 2. The inner ends of the short pipes, *a'*, of this layer are screw-threaded into opposite sides of the drum in horizontal lines, the axes of said pipes *a'* and the axis of the drum being in a horizontal plane. When no other drum is employed over this main drum the steam is taken out at the middle of the drum through a pipe *d*. Below the main drum C I employ other smaller or minor drums, D D, as shown in the figures. These drums are parallel with the main drum and are usually placed in line with the layer of sections next to the upper one. These minor drums are preferably placed on each side of, and nearly in contact with the main drum so as to tend to throw the ascending heat currents toward the sides of the boiler. There is no direct connection between these minor drums, each being held by short horizontal pieces of pipe *e*, the heads of which form integral parts of the columns *f*. A drip pipe *g* connects the lower side of the main drum with the water sills when the boiler is constructed as shown in Figs. 2 and 8. This drip pipe consists of vertical and horizontal parts, clearly shown in Figs. 8 and 9, and connects with both sills. By this means communication is opened between the main steam drum and the parts at the base of the boiler so that any water that might tend to accumulate in the drum will be directly conveyed to the base.

At the front corners of the boiler I place vertical water posts, *h h*. These posts, as the boiler is sometimes constructed, are connected at their upper ends with the respective upper heads *b b* of the forward columns *f*, and at their lower ends with the respective water sills, as shown in Fig. 8. Upon these posts I place the usual gage-cocks and the water glass; and, besides, they constitute additional direct downward passages for water that might be temporarily carried above the general water level or water line (*r r*, Fig. 8) by upward flowing currents of steam.

The sections and parts forming the columns *f* are held rigidly together and to the respective water sills by vertical bolts *i* which pass down through the axes of said columns and enter the sills. This is clearly shown in Fig. 8. Similar bolts also pass downward through the water posts *h* and are threaded into heads *s*, at the feet of the posts. The lower ends of these bolts may be threaded directly into the lower walls of the sills but I prefer to have them pass wholly through the sills and enter cap-nuts, *k*, Figs. 1, 4, 6 and 8, bearing upward against the under surfaces of the sills. I usually form the under surfaces of the sills with parallel ribs, *n n*, between which the nuts *k* are placed. These prevent the nuts from turning with the bolts. Thin copper gaskets, *l*, Fig. 7, are placed between the heads of the sections and in the joints between other parts where a leak might otherwise occur. The heads of the minor drums D D are also preferably held to place by longitudinal bolts, *m m*, Figs. 1 and 2.

When the boiler is used as a marine boiler I prefer to mount a small steam drum, E, over and parallel with the main drum C, as shown in Figs. 13, 14 and 15; and in most cases I prefer to directly connect the ends of the minor drums D D with the base of the boiler—at the front by means of the posts *h h*, as shown in Fig. 13, and at the rear by inclined pipes, *g' g'*, Figs. 13, 14 and 15. In this construction I usually join the drip pipe *g* at the rear end of the main drum, with the rear section level with the furnace floor, as shown in Figs. 14 and 15. The sections over the furnace are not always inclined in horizontal planes as shown in Fig. 2. Where the boiler is used as a stationary boiler, more particularly, I prefer to incline them in vertical planes as shown in Fig. 16. This admits of a more rapid refilling of the pipes with water due to circulation when certain portions of the water are driven out of these pipes by the action of steam generated within them, than if they occupied horizontal planes. When the boiler is used as a marine boiler the rocking of the boat tends to keep these pipes refilled when they are put in horizontally, that is to say, at right-angles with the sides of the boiler. When I employ these vertically-inclined sections I alternate them in vertical planes, as shown in the figure. Also in constructing some of these boilers, particularly those that are built high over the furnace and have long vertical columns *f*, I dispense with the rigid, prismatic water sills B, shown in Fig. 8, and substitute in their places tubular, offset sills, F, Figs. 13, 14 and 15, connecting them with the bases of the columns *f* with nipples, *p*. These sills may be placed to project beyond the vertical sides of the boiler, as shown in Figs. 13 and 15, or they may be turned horizontally under the furnace, as shown in Fig. 14. This construction gives greater flexibility to the sides of the boiler and admits without injury to the boiler of an unequal expansion or contraction of the columns *f* on account of their being subjected simultaneously to different degrees of heat. These offset water

sills are headed up in any convenient manner, preferably similar to the way in which the minor drums D are closed at their ends.

In constructing these boilers for marine purposes I usually do not vary the different sizes very much as to the dimension of width. To make boilers of greater power I build them higher over the furnace by adding additional layers of sections and by making the boiler deeper from front to rear.

When constructing any particular boiler I employ one or the other of the different styles of water sills shown and also choose as to the different manners of inclining the sections, and of connecting the steam drums with the base of the boiler, &c., according to the use to which the boiler is to be put and the requirements of the case.

The feed water is introduced into the boiler through one of the water sills in the usual manner; and a blow-off cock is usually inserted into each sill so as to clear both of sediment and mud.

In the larger boilers I use ordinary grates upon the pipes forming the furnace floor, but in the smaller boilers I sometimes fire directly upon the floor sections; also, in the larger boilers, I employ simple cast gratings at the sides and back of the fire box or furnace.

When the upper drum E is employed I take steam out of its upper side in the usual manner and also attach to this drum the usual safety valve.

It has before been stated that the parts of this boiler are joined by screw-threads in all of which the spirals or screw-threads advance or lead relatively in the same direction when turned from left to right or from right to left; that is to say, the threads are all, for instance, "right-hand" threads; or, it may be, "left-hand" threads. This much simplifies and cheapens the construction of the boiler and renders it much easier and more quickly put together or taken apart. To enable the parts to be put together with right-hand threads, say, only, I sometimes employ rings of metal between parts which have to be turned independently of each other in putting the boiler together. For instance, in the minor drums D D, shown in Fig. 13, I employ rings, *t*, between the central portions of the drums and the head-connections *u*. This, when the rings are removed, admits of said head-connections being turned upon the respective pipes *g' g'* and *v v*, while the drums are in place. Finally these head-connections are brought in line with the drums and the rings, with the packing gaskets, are then put in place, and all bolted together by the longitudinal bolts *n*.

When the upper steam drum E is employed it is usually connected with the main drum by three nipples, *o*, one at the middle and one near either end, as shown.

What I claim as my invention is—

1. A steam boiler composed of a water sill upon each side, the under side of each of which sills is provided with parallel ribs, columns of cylindrical heads connected with the sills, having their axes parallel, pipe sections connecting the heads upon opposite sides, drums connected with the sections and the sills, and a bolt through each column of heads, the nut of which fits between the ribs of the sills, substantially as set forth.

2. A steam boiler, composed of water sills, vertical columns thereon, series of pipe sections connecting the columns upon opposite sides of the boiler, a main steam drum connected with the central portion of the upper series of pipe sections, two minor drums at the sides of and nearly in contact with the main drum, each of said minor drums being connected with the columns at its respective side, a pipe extending from each water sill to one of the minor drums, the upper end of which is provided with a head connection, and a ring between the end of the drum and the head connection of its respective pipe section, whereby the head connection may be turned upon the pipe while the drum is in position, substantially as set forth.

In witness whereof I have hereunto set my hand, this 3d day of February, 1893, in the presence of two subscribing witnesses.

JOHN BUCKLEY.

Witnesses:
ENOS B. WHITMORE,
M. L. WINSTON.