March 6, 1928. 1,661,544

H. A. NICHOLSON

STEAM GENERATOR

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Fig. 1.

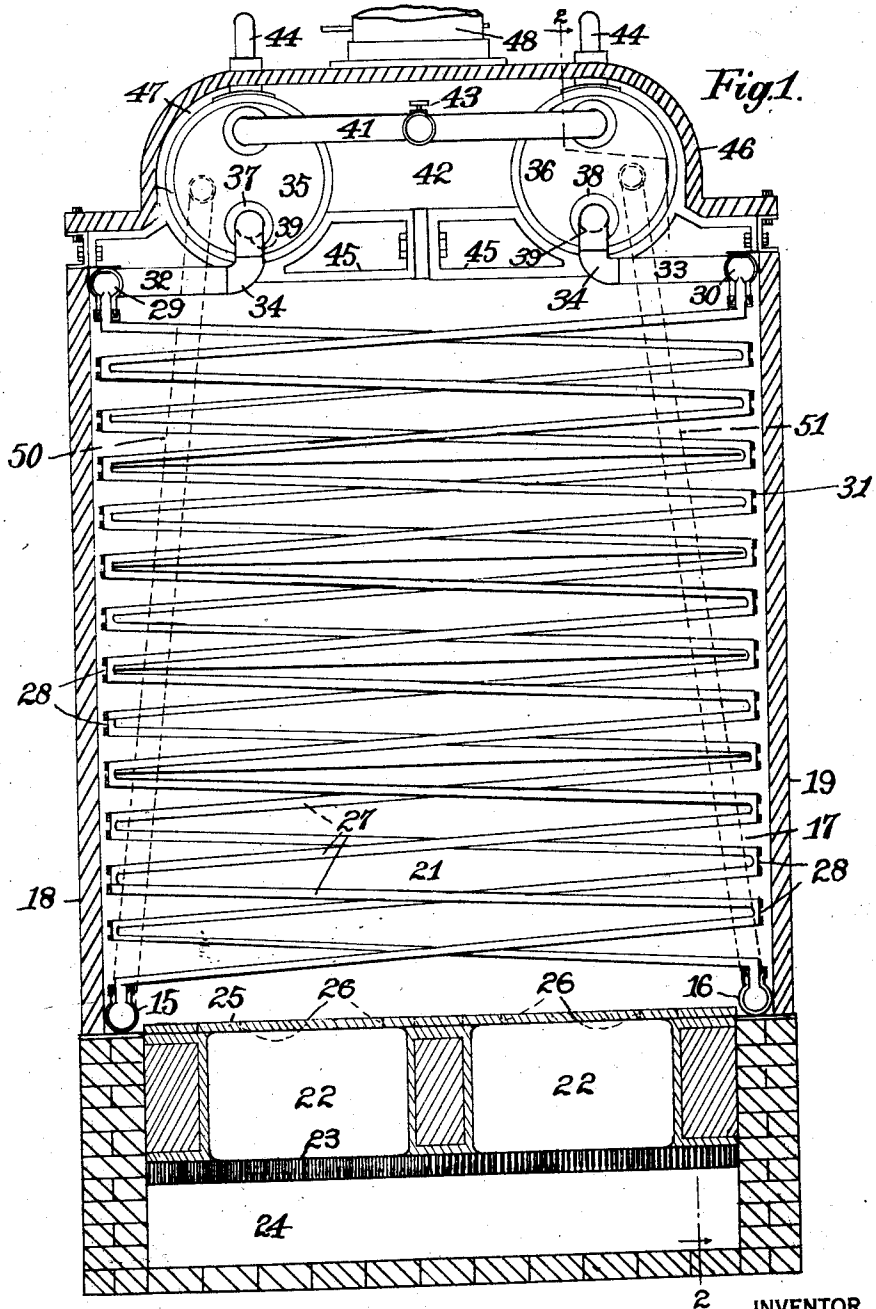

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Fig. 2.

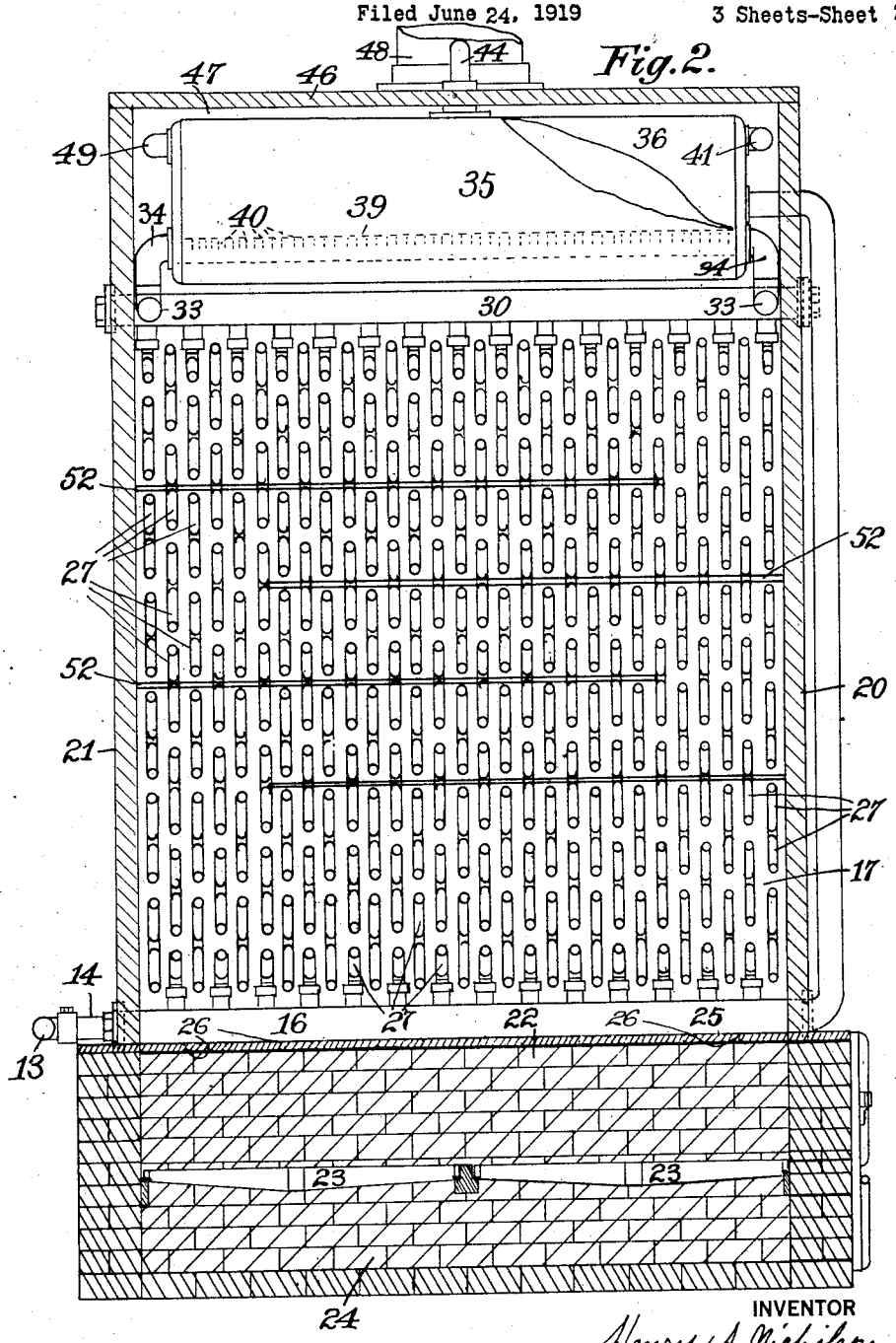

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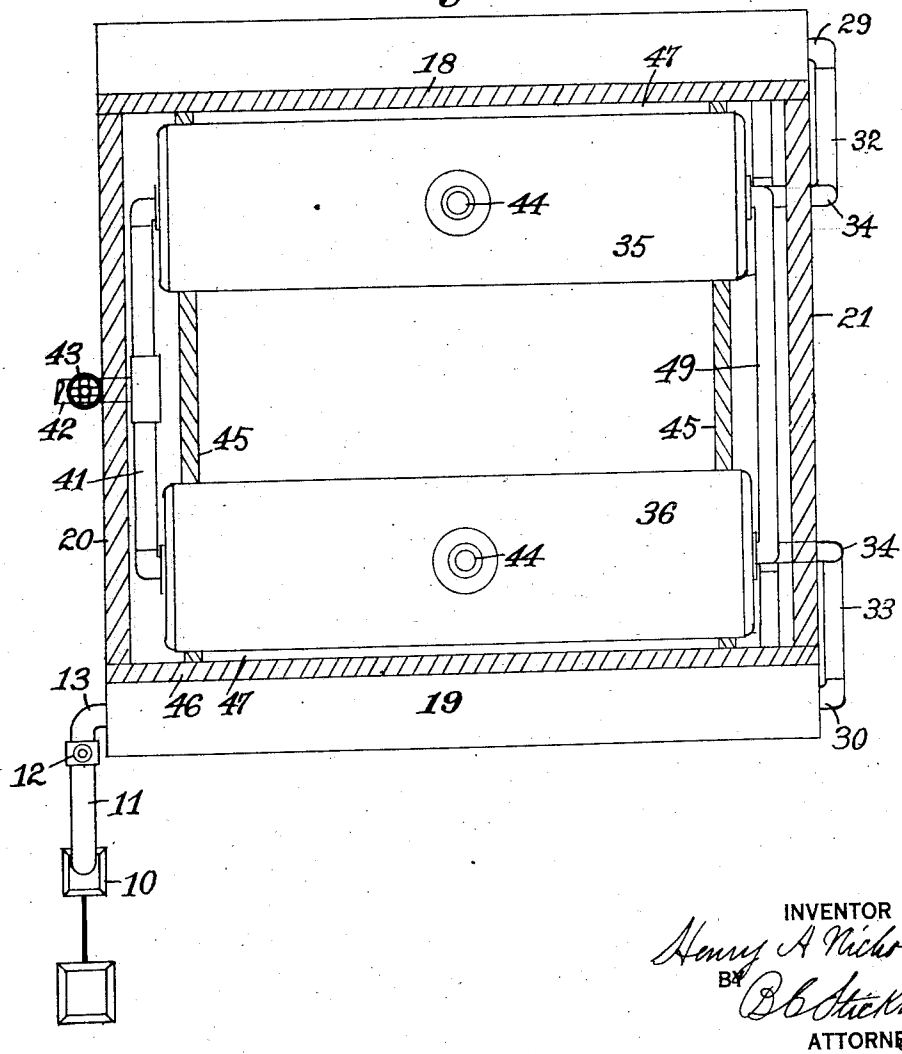
Fig. 3.



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UNITED STATES PATENT OFFICE.

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STEAM GENERATOR.

Application filed June 24, 1919. Serial No. 306,399.

This invention relates to steam-generators, and one of the main objects is to improve the water-tube system in a boiler in which a circulation of water is maintained.

To this end the feed water is caused to flow into distributing headers placed at the bottom of the combustion chamber of the generator, and by means of these headers the water is divided up into fine streams, which rise in a gridwork composed of a set of sections or coils of zigzag tubing. Each section is comprised of lengths of inclined tubes, the upper end of each tube being joined to the lower end of the next above, which returns over the first, thus forming a zigzag coil or section, up which the heated water readily flows. At the top the grid sections are joined to collecting headers, from which the heated water rises to one or more drums. From the drums, which are connected, the cooler water may be led through a descending main back to the distributing headers, whereby the circulation is maintained. Provision is made for inspection and cleaning of the water tubes. The flames are preferably caused to pursue a zigzag course up through the gridwork.

Other features and advantages will hereinafter appear.

In the accompanying drawings,

Figure 1 is a sectional side elevation of a generator embodying the present improvements in one form.

Figure 2 is a front-sectional elevation, taken on about the line 2—2 of Figure 1.

Figure 3 is a sectional plan of the generator.

The feed water flows from a pump 10 through a main 11 having a back-check valve 12 to a horizontal cross-main 13, to a header 16 at one side of the combustion chamber 17, there being a similar header 15 at the other side of said chamber. Said combustion chamber has removable side walls 18 and and 19, and front and rear walls 20 and 21, and surmounts a fire-box 22, having grates 23 and an ash pit 24. Openings in the top or bridge 25 of the fire-box are indicated at 26.

From said headers extend upwardly zigzag coils or sets of water tubes. The tubes 27 are inclined upwardly in each section, the upper end of each length of tube being coupled by a union 28 to the lower end of the next length, to leave clear openings across the flame chamber, and the upper end of the top length in each section being coupled to a collecting header 29 or 30. Each length of tubing may be cleaned out from either end, the unions being provided with clean-out holes closed by plugs 31. If desired, each section may be made individually detachable from the boiler.

There are two horizontal collecting headers 29, 30 at the top of the combustion chamber, and preferably each coil of tubing 27 is joined at its lower end to the distributing header at one side of the boiler, and to the collection header at the opposite side of the boiler.

Said collecting headers 29, 30 are connected by pipes 32, 33 and elbows 34 to drums 35 and 36, respectively, header 29 being connected at 37 to one end of drum 35, and header 30 being connected at 38 to drum 36. The water and steam do not discharge directly into the drums, but are led into a horizontal distributing pipe 39 in each drum, said pipe extending from end to end of the drum at the lower portion thereof, and having in its upper side numerous perforations 40 through which the water and steam may be delivered to the drum.

The perforated distributing pipe 39 lies below the level of the water in each drum; and it distributes the heated water evenly from end to end of the drum, giving even temperatures of water throughout, giving advantages over delivering the water and steam in a stream at one end of the drum. There is avoided all danger of priming and foaming, and liability is also avoided of the delivery pipe drawing over water with the steam, which is thus kept dry. The headers 29, 30, may deliver to both ends of the drums as at Figure 2, and in that case the perforated inlet pipe 39 may open into both elbows 34.

The drums are connected at their upper portions by a horizontal main 41, from which may lead a service pipe 42 having a stop valve 43. Each drum may be provided with a safety valve 44. The drums may be set on a bridge work 45, and lie just beneath the dome 46 of the boiler, leaving a space 47, so that the heated gases must pass all around the drums on their way to the stack 48. The drums may also be connected to each other at their opposite ends by a pipe 49, as at Figure 3.

From each drum may extend down a re-

turn main (50, 51) leading to the header which is connected by grid sections to the opposite drum. The water which rises in the grid sections to the drums, may thus descend through these mains to the distributing headers at the bottom of the combustion chamber, whereby circulation is maintained.

Baffle plates 52 may be introduced in the aforesaid clear openings among the inclined tubes which form the gridwork, and by extending these plates alternately from opposite sides of the chamber, they may be arranged to leave flame passages at alternate ends, so that the flames may pursue a zigzag course in rising to the top of the combustion chamber.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. A boiler comprising a combustion chamber, distributing headers one at each side of said chamber, means for feeding water directly to one of said headers, a grid work of sections of tubes forming coils crossing each other in said chamber and connected at their lower ends to said headers, the tubes being inclined upwardly in each section, the upper end of each length of tubing being coupled with the lower end of the next length, leaving clear openings across the flame chamber, collecting headers one at each side near the top of said combustion chamber, and each connected to said coils, the coils beginning at the header on one side of the chamber and ending at the header on the opposite side thereof, and being the only water circulating connection between said headers, a drum on either side of the chamber connected to an upper header and to which the heated water is delivered from said header, and a return means from each drum to the header on the same side of the boiler as is the drum.

2. A boiler comprising a combustion chamber, a header near the bottom of each side of said chamber, means for feeding water directly to one of said headers, a grid work of sections of tubes forming coils crossing each other in said chamber and connected at their lower ends to said headers, a collecting header on each side of the top of said combustion chamber, the coils connected to the lower header on one side of the chamber being also connected to the upper header on the opposite side of the chamber, and being the only water circulating connection between said opposite upper and lower headers, drums on either side of the boiler connected to said upper headers by pipes for conducting water and steam from said headers to said drums, said pipes extending into the drum and therealong and provided with numerous perforations within said drums, and a return pipe leading from each drum to the lower header on the same side of the boiler.

3. A steam boiler comprising a combustion chamber, distributing headers, one at each side of the lower part of said chamber, and one at each side of the upper part thereof, means for feeding water directly to a lower header, a grid-work of two series of tubes, the tubes of each series leading from a lower header and ending at the opposite upper header and the tubes of the other series from the other lower header and ending at the opposite upper header, the tubes of both series forming coils zigzaging from one side of the chamber to the other, two drums above the tube on either side of the boiler, connections from each drum to an upper and a lower header on the same side of the boiler the drums being disconnected for water passage between them whereby water forced into one lower header must pass in its circulation to each drum and header, baffles extending alternately from first one side of said chamber within the other between the adjacent coils of tubing of both series, and a casing having removable side walls whereby the baffles are easily inserted or removed for cleansing purposes.

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