P. ROHAN.

BOILER.

APPLICATION FILED FEB. 10, 1911.

1,069,184. Patented Aug. 5, 1913.

2 SHEETS—SHEET 1.

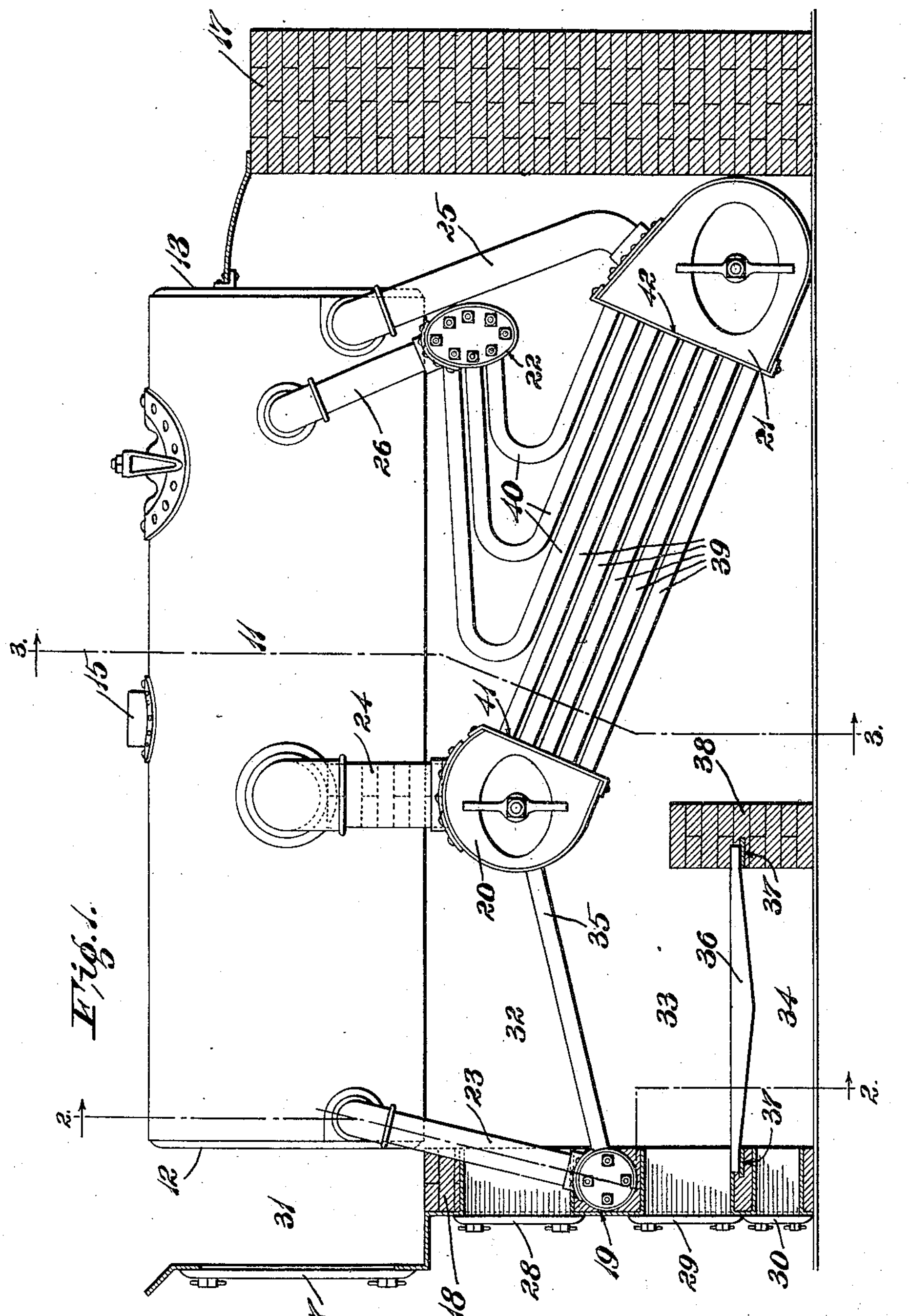

Fig. 1.

Witnesses:

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2 SHEETS—SHEET 2.

Fig. 3.

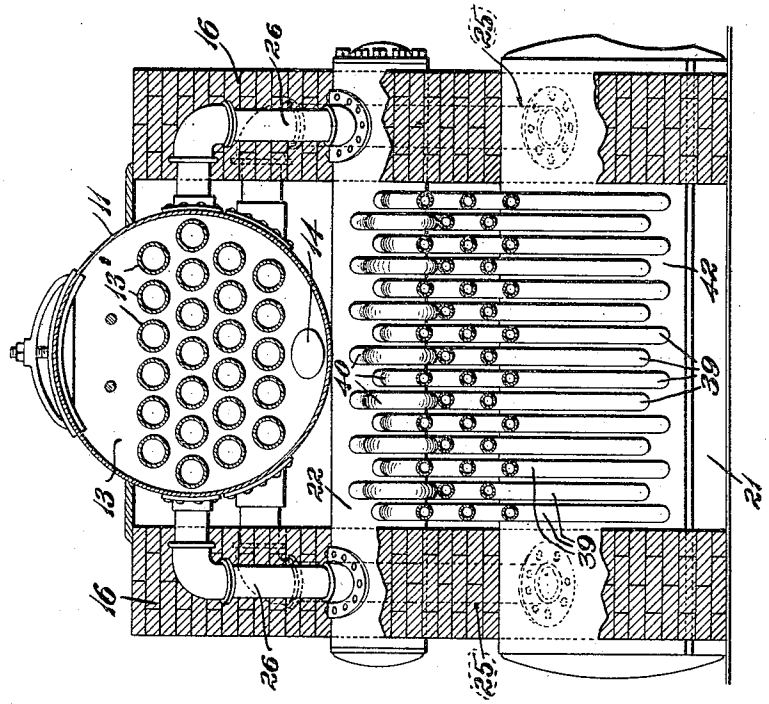
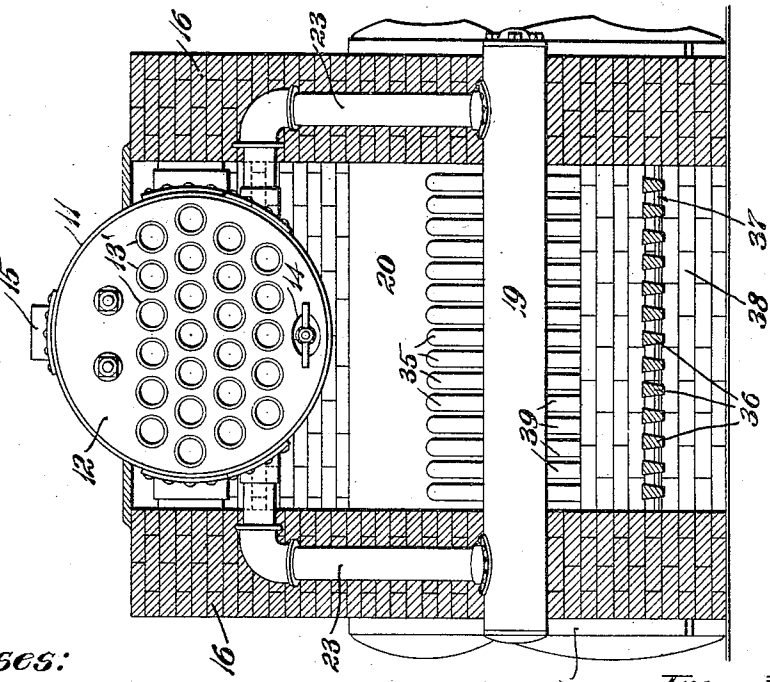


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

PHIL ROHAN, OF ST. LOUIS, MISSOURI.

BOILER.

1,069,184. Specification of Letters Patent. Patented Aug. 5, 1913.

Application filed February 10, 1911. Serial No. 607,842.

To all whom it may concern:

Be it known that I, PHIL ROHAN, a citizen of the United States, and a resident of the city of St. Louis and State of Missouri, have invented a new and useful Improvement in Boilers, of which the following is a specification.

My invention relates to boilers of the water tube type for heating and power purposes and resides in a novel arrangement of parts whereby the water circulation is improved and the assembling of the parts and the removal and replacement of tubes is facilitated.

Further objects of my invention are the provision of a down-draft water-cooled grate of large area in connection with an adequate combustion chamber; the securing of large heating surfaces with comparatively short tubes arranged in such a way that substantially all the tubes are exposed to the same heat throughout their entire length; and the arrangement of tubes secured at their ends in large drums so as to be easily cleaned and replaced.

Further objects of my invention will appear in connection with the description of the boiler shown in the drawings accompanying this application, and will be more particularly pointed out in the claims.

In the accompanying drawings, which form a part of this specification and wherein like figures are used to designate like parts throughout the several views—Figure 1 is a side elevation of my improved boiler with the side walls of the brick setting removed; Fig. 2 is a section on the line 2—2 of Fig. 1 showing the boiler, water drum and connections in front elevation; and Fig. 3 is a section on the line 3—3 of Fig. 1 with parts of the side walls of the setting broken away to show the drums and connections embedded therein in elevation.

In the drawings 11 is the boiler shell, the front and rear ends of which, 12 and 13′, are perforated and fire tubes 13 expanded into them. Hand holes 14 are provided at the lower side of the boiler heads, and a steam connection 15 is riveted upon the top of the boiler shell. The boiler shell is mounted in a brick setting composed of side walls 16, rear wall 17 and front end 18, and supported upon the horizontal drums 19, 20, 21 and 22 set in the setting, by means of the water connections 23, 24, 25 and 26 and attached fittings. The front end of the setting is brick and cast iron and provided with doors 27, 28, 29 and 30 leading into the smoke uptake 31, fire box 32, combustion chamber 33 and ashpit 34, respectively.

The drums 19 and 20 are termed the forward and after down-draft drums respectively, and are connected by the down-draft grate-bars 35 which are tubular and form part of the water circulation system. Ordinary cast-iron grate-bars 36 are supported on front and back bearing-bars 37 in the front wall and fire or bridge wall 38 of the boiler setting. The after down-draft drum 20 and the mud drum 21 are provided with flat surfaces 41 and 42 on the sides facing each other, into which surfaces or tube sheets the rows of water-tubes 39 are expanded. Between the front side of the rear circulating drum 22 and the tube sheet 42 are arranged a series of bent water-tubes 40 the ends of which are expanded into the drum 22 and tube sheet 42. The drums 19, 20, 21 and 22 are provided with hand or man holes with covers at their ends in order to permit of access to the interior thereof. The large size of the drums 20 and 21 and the fact that the tube sheets 41 and 42 are flat enable the tubes 39 to be expanded into these drums without difficulty, thus cheapening the first cost and also permitting of ready removal and replacement. This arrangement also enables the drums and water tubes to be assembled as units and tested in the shop, shipped as unitary parts, and connected to the boiler shell at the place of erection without loss of time or requiring anything more than making up the pipe connections.

The connections 23 and 25 leading to the front down-draft drum and mud drum respectively, both leave the boiler shell at points relatively near the bottom, and at op-

posite ends of the boiler. The connections 24 and 25, leading from the after down-draft drum and rear circulating drum respectively, enter the boiler shell at points about half way up the side thereof, and between the points of attachment of the other pair of connections. The circulation in the boiler is downward at the ends and upward in the intermediate portion, due to the mid-portion being subjected to greater heat than the ends, and this corresponds with the arrangement of water connections, as the colder water leaves the boiler at the ends and returns to the midportions. The relative arrangement of the drums 19, 20, 21 and 22 gives considerable slope to the tubular grate-bars and water tubes, thus assuring good circulation of water in the tubes, and as the slope is upward toward the middle the hot water enters the boiler at its hottest part. The compact arrangement of the rows or tubes 39 and 40 directly in the path of the heated furnace gases subjects these tubes to substantially the same temperature through their length and prevents their fouling or scaling and results in their being subjected to comparatively even erosion by the hot furnace gases. The addition of the rear circulating drum enables a larger number of water tubes to be put into the short space under the rear end of the boiler than would be possible to connect to the after down-draft drum, thus increasing the heating surface, and being placed directly in the path of the hot furnace gases divides this current into two streams causing a better distribution of heat along the tubes. It also assists in the circulation of the water by discharging in to the hottest part of the boiler.

In the operation of the boiler coal is fed onto the down-draft or water grate 35 and as the draft is admitted through the door 28 above this grate the gaseous products of combustion go down between the grate bars into the combustion chamber 33 and passing out over the bridge wall 38 find their way between the series of water-tubes 39 and 40 to the space under the rear end of the boiler shell and thence through the fire tubes 13 to the uptake 31, from whence they pass into the stack.

Small incandescent pieces of coal falling through the grate-bars 35 are arrested upon the grate-bars 36 where they burn as on an ordinary grate with an updraft through the ashpit. This updraft through the bed of incandescent coal on the lower grate produces an intense heat and aids in the total oxidation of the furnace gases coming through the down-draft grate to form carbon dioxid, and raises these furnace gases to a very high heat. This reduces the black smoke from my boiler to a minimum, and results in considerable saving in the amount of coal wasted up the stacks.

Having thus described my improved boiler, I do not wish to be limited to this particular arrangement and details shown, as manifestly the relative proportions may be modified without departing from my invention.

What I desire to secure by Letters Patent is:

1. A water tube boiler comprising a horizontally disposed shell, transverse drums below the same, one of which drums is located centrally of the shell and another of which is located below the rear end of the shell, water connections between these drums and the shell entering the shell at points about half way up the side thereof, and a mud drum positioned below the shell and at a lower elevation than the two first mentioned drums and connected with the two first mentioned drums by inclined tubes and to the shell near its bottom.

2. A water tube boiler comprising a horizontal shell, forward and after down-draft drums provided with water connections extending between them and said boiler shell, a mud drum positioned below the rear end of the boiler shell and provided with a water connection therewith, tubular grate-bars between the two first mentioned drums, water tubes extending between the mud drum and after down-draft drum, and a circulating drum arranged transversely to said shell and adjacent and beneath its rear end and having water connections therewith and connected with said mud drum by water tubes.

3. A water tube boiler comprising a horizontal shell, forward and after down-draft drums provided with water connections extending between them and said shell, a mud drum positioned below the rear end of the shell and provided with a water connection therewith, tubular grate-bars between the two first mentioned drums, water tubes extending between the mud drum and after down-draft drum, and a circulating drum arranged transversely to said shell adjacent and beneath its rear end and having water connections therewith and connected with said mud drum by inclined water tubes extending parallel with said first mentioned water tubes for part of their length and the remainder of their length being in a reverse direction.

4. A water tube boiler comprising a horizontal shell supported on transversely arranged drums by means of pipe connections, two of said drums being arranged adjacent the shell between its ends and connected with a third drum by inclined water tubes, the water tubes leading to one drum being rebent.

5. In a water tube boiler comprising a boiler shell and setting independent thereof, transverse drums arranged below the shell and supported in the setting, water connections between the shell and said drums forming supports for the shell, and inclined water tubes within said setting and extending between said drums and secured thereto at their ends, said drums being provided with means for access to said tubes.

Signed at St. Louis, Missouri, this 6th day of February, 1911.

PHIL ROHAN.

Witnesses:
A. M. HOLCOMBE,
M. A. SHELTON.