

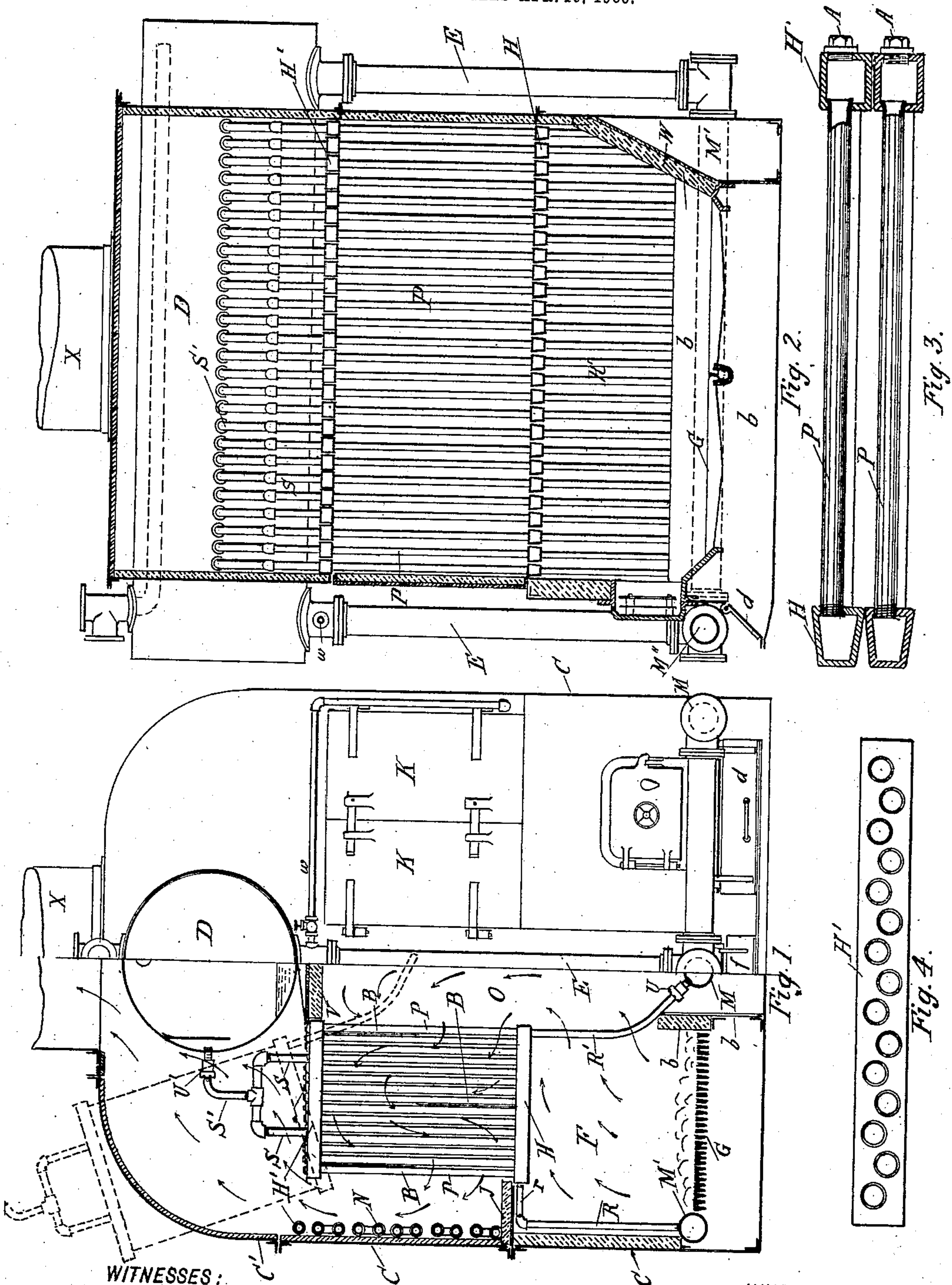
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F. A. BALLIN.

BOILER.

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FRED A. BALLIN, OF PORTLAND, OREGON.

BOILER.

No. 883,852.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRED A. BALLIN, a citizen of the United States, residing at Portland, county of Multnomah, and State of Oregon, have invented a certain new and useful Improvement in Sectional Boilers; and I declare the following to be a clear, full, and exact description of the invention, such as it appertains to make and use the same, by reference to the description and the accompanying drawings, which form part of this specification.

My invention has as its object an improved sectional boiler of new construction and usefulness.

My invention aims to overcome the difficulties of repairing and the loss of heat through the external casing or inclosures, to do away with horizontal generating pipes, to obtain by baffling a horizontal flow of the heating gases through the tubes, to provide an ample combustion chamber longitudinally through the center of boiler, and to make each section independent of the others, so that it may be removed or replaced without disturbing an adjacent section, and further to construct the individual section that repairs to any tube can be made without disturbing any other tube.

My invention also aims to obtain perfect internal circulation of water and to prevent water from being carried into the steam drum with the steam.

My invention consists of the construction, combination and arrangement of devices hereafter described and claimed, and illustrated in the accompanying drawings, in which:

Figure 1, is a front elevation of a sectional boiler embodying my invention, half of the front inclosure having been removed, showing the internal construction and in dotted lines a section partly removed. Fig. 2, is a longitudinal section through the furnace, looking towards the center. Fig. 3, is a vertical cut through a couple of sections. Fig. 4, is a plan view of one of the top headers.

The same letters in the different views denote the same parts.

My invention is carried out as follows:

M, M' and M'' denote horizontal drums or pipes, suitably supported.

M is the middle pipe, M' and M'' are the two outside pipes, running longitudinally and parallel, with M.

M'' connects these three pipes transversely outside of the inclosures as shown. At the outer ends of M, rise the two vertical pipes E, E, carrying on top the horizontal drum D. M, M' and M'' will be called hereafter the mud drums, E the down-flow pipes and D the steam drum.

From the outside mud-drums rise the riser-pipes R and from the center mud-drum, the double row of riser-pipes R', so spaced that a pair of R and R' are in line and support a section consisting in the headers H and H', the pipes P and the steam outlets S, and S'. The bottom headers H and the top headers H', have the same width and are grouped close together as shown in Figs. 2 and 3, so that the bottom headers form a continuous crown sheet over the furnace F and the top headers, a continuous inclosure over the nest of tubes P.

G are the grates, bounded by the mud-drums M' on the outside, a division wall b, on the inside, and at the ends by a brickwall W.

The two furnaces F extend the full length of the boiler and are inclosed on top by the bottom headers H, and the incombustible filling J, and on the outside by the incombustible casing or inclosure C. The only outlet for the fire from the grates and furnaces is through the risers R' into the space O, which constitutes the combustion chamber, extending the length of the boiler. The baffle V, closes the top of this combustion chamber and the gases are drawn through the nest of tubes P, around the baffles, B, B, in the direction of the arrows, and when emerging from these tubes, strike against the heater coils N, which lie against the outer casing and which coils absorb most of the remaining heat and protect the casing from being over-heated. The gases then follow the path indicated by the arrows, filling the space around the steam outlets S and S' and around the steam drum, and then pass away through the smoke pipe X, into the atmosphere.

Each section consists of a top and bottom header, a staggered double row of tubes, screwed into the bottom headers and expanded into the top headers. My object in staggering the tubes is to force the gases to strike as much of the surface as possible, thus absorbing more heat and obtaining a higher efficiency than where the tubes are behind each other, and have a clear path between them, as in most boilers of this type.

The bottom headers, I propose to make of trapezoidal section, so as to leave, when assembled in place, an opening underneath, and thus increase the effective heating surface. (See Figs. 2 and 3). The tubes I propose to screw into these headers to facilitate inserting and removing. The top headers will be of rectangular section, and the tube holes will correspond exactly with those of the lower headers. Over each tube will be a tapped hole, large enough to permit the tube of being inserted and closed with a shallow plug A of suitable material. I propose to expand the tubes into the top headers, as this mode permits the tube to be inserted and screwed to place in lower headers before the tops are expanded and tightened. The holes in top headers will be slightly larger than the tubes, and copper ferrules may be used and expanded between tubes and tube sheets of header. The steam outlets S and S' will take the place of plugs, and will have to be removed if it happens to be necessary to replace the tube below it. The number of steam outlets will depend on size of sections. They will connect with the steam drum by means of the metal union U' of suitable construction. The riser-pipes R' are similarly connected to the center mud-drum and the pipes R may have a union connection or a right or left nipple *r*, which may be cut and renewed whenever it becomes necessary to remove a section and replace it.

Having thus described the construction of the section, it will be plain to understand the easy manner in which any section may be taken out and replaced, by the simple work of breaking the unions U, U' and *r*, and withdrawing it through the removable cover C' on top of casing. The dotted lines show such section partly removed. Before removal it will be necessary to open the doors K in front or back of the boiler, and to withdraw the baffles B. These baffles I propose to make of two thicknesses of asbestos boards with a plate of sheet iron between them and the top ones will be supported in position by suitable clamps at each end. The number and location of baffles will depend on the size of the boiler.

The drawing shows a boiler of my invention inclosed in a sheet iron casing, but this latter may be replaced with brick walls if desired. As shown the soot in combustion chamber can be removed through the cleaning door *f*, the ashes under grate through ash-pit doors *d*. The feed coils N, may be increased by additional coils in the upper casing along side of the steam drum. The feed water, I propose to take from the bottom of the coils and introduce into the boiler through the pipe *w*, connecting with the top of the downflow pipe. The plugs A, in the top headers, besides permitting the withdrawal or insertion of the tubes, are also in-

tended for the inspection and cleaning of the inside tubes, without necessitating the removal of the section.

The doors K, when open permit of inspection and cleaning of all the tubes and of the combustion chamber O and the flue space, inclosed by tubes and heater coils. In cleaning the combustion chamber the soot will fall between the two partition walls *b*, and can be, as stated, withdrawn through the door *f*.

As a steam-generator, I claim an improvement over boilers of this type by reason of having comparatively short headers, in conjunction with vertical tubes, which permit the steam generated in the lower headers and tubes a more direct path towards the steam drum, than where the headers are the full width of the boiler or the tubes are inclined.

In my boiler the evaporation will be the greatest in that part of the section next to the combustion chamber. It is evident that the center mud-drum, being in direct communication with the down-flow pipes E, E, will always be able to supply the riser-pipes R' with water necessary for evaporation. In other boilers of this type the sections are continuous over two or more furnaces and reaching from side to side, with the steam drum overhead, the steam evaporated has to travel considerably farther in the horizontal headers than in my invention. It is also apparent that by dividing the sections and providing each with a separate supply pipe from the center mud-drum, better circulation is obtained, than where the headers reach from side to side with single connections from these mud-drums.

As the fire from the grates has to pass the riser pipes, the space between them must be ample, and for constructional reasons the holes in the mud-drums and steam drum should leave sufficient material between them for strength, and the spaces must be wide enough to permit of making the union connections, as shown. For these reasons I propose to make the headers wide enough for two staggered rows of tubes, whereby without loss of heating surface, I obtain the necessary spacing on drums. It will be noted that the union connection of riser-pipes are placed at the bottom near the mud-drum, where they are not exposed to any direct flame, being protected by the partition wall *b*, which may be made above the grates of removable fire brick, as shown. Unions could be also used in lieu of the nipples *r* on the risers R, but from experience I found it preferable to use these right and left nipples, as the unions are liable to get burned, if continually exposed to direct heat. The nipples can be cut and replaced in a few minutes at small expense, if removal of any section becomes necessary.

I prefer to use only two rows of tubes in the sections, as this construction enables me

to get at any tube with a pipe wrench, after the section has been removed from the boiler. If three or more rows were used, the inner ones could not be reached with a wrench without disturbing one of the outer ones.

What I claim is,

1. A boiler comprising a plurality of nests of vertical tube sections spaced apart to form a combustion chamber therebetween, running the full length of the boiler, a plurality of furnaces one beneath each nest of tube sections and in communication with the combustion chamber, substantially as shown and described.

2. A boiler, having its full length two nests of vertical tube sections, having between them a central combustion chamber, the full length of boiler, communicating with two furnaces, underneath each nest of sections, substantially as described.

3. A boiler comprising a plurality of independent nests of tube sections, top and bottom headers therefor, said headers forming continuous crown sheets, furnaces beneath said headers, a combustion chamber located between the nests of tube sections and in communication with the furnaces substantially as shown and described.

4. A boiler comprising a plurality of nests of sections of vertical tubes, inclosing a central combustion chamber, bottom and top headers for said sections, the bottom headers having trapezoidal cross sections and the top headers having rectangular cross sections, removable plugs fitted into the top of the top headers, substantially as shown and described.

5. In a boiler of the class described, a plurality of nests of sections inclosing between them a common combustion chamber, each section including a plurality of rows of vertical staggered tubes, substantially as shown and described.

6. A boiler of the class described, comprising two independent nests of tube sections with vertical tubes, detachable headers in which said tubes are secured, said boiler having a combustion chamber centrally located between the nests of tube sections, and a baffle closing the top of the combustion chamber and deflecting the flow of heated gases in a horizontal direction through the nests of tubes, substantially as shown and described.

7. A boiler, having a central combustion chamber between two nests of sections of vertical tubes, in combination with two outside chambers alongside of these sections and heating coils on the outside of these last

named chambers, lying against the inclosure of the boiler, substantially as shown and described.

8. A boiler, having two nests of sections of vertical tubes inclosing a central combustion chamber, a removable section of the boiler through which any section of tubes can be withdrawn, without disturbing any other section, substantially as and for the purpose set forth.

9. A boiler comprising a steam drum, outside vertical down-flow pipes supporting said steam drum, a central mud-drum connecting with said down-flow pipes, a plurality of outside horizontal mud-drums parallelly arranged with said first mentioned mud-drum, a plurality of nests of sections of vertical tubes, each section having a connecting pipe to the central mud-drum and to one of the outside mud-drums substantially as shown and described.

10. A boiler comprising a steam drum, outside vertical down-flow pipes supporting said steam drum, a central mud-drum connecting with said down-flow pipes, two outside horizontal mud-drums parallelly arranged with said first mentioned mud-drum, two nests of sections of vertical tubes, each section having a connecting pipe to the central mud-drum and to one of the outside mud-drums, substantially as shown and described.

11. A boiler comprising a steam drum, three horizontal mud-drums connected together on the outside, two vertical down-flow pipes connecting the middle mud-drum with the steam drum, two nests of top sections with vertical tubes, each section connecting with two of the mud-drums and with the steam drum substantially as shown and described.

12. A boiler, having two nests of sections of vertical tubes inclosing a central combustion chamber, the bottom headers of said sections having a trapezoidal cross section for the purpose set forth.

13. A boiler, having two nests of sections of vertical tubes grouped around a common combustion chamber, a steam drum above such chamber and an opening in the inclosure of the boiler, through which any section can be withdrawn without disturbing any other section or steam drum, substantially as shown and described.

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Witnesses:

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