

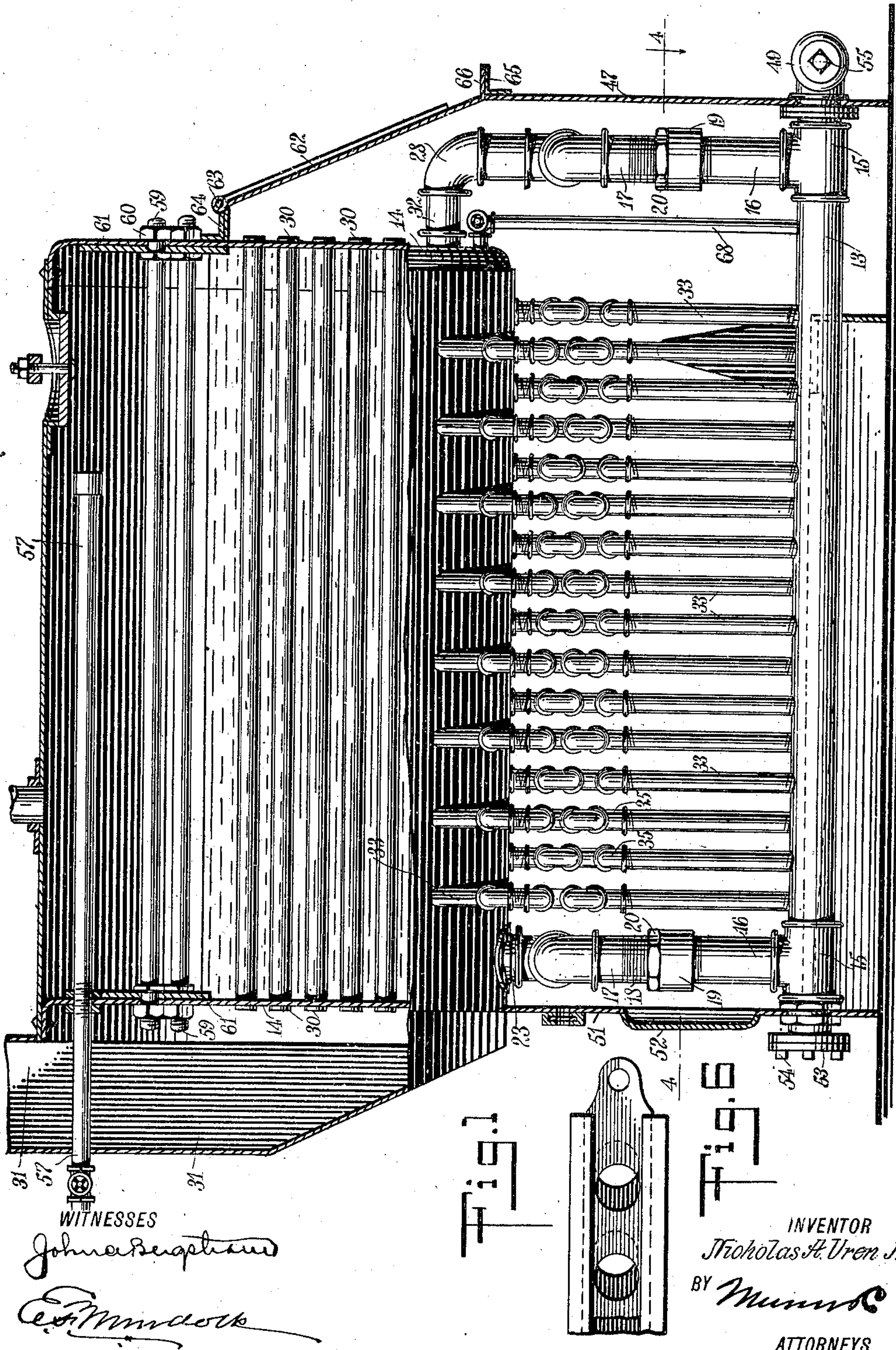
N. A. UREN, JR.  
STEAM BOILER.

APPLICATION FILED NOV. 8, 1910.

995,929.

Patented June 20, 1911.

3 SHEETS-SHEET 1.



WITNESSES  
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Fig. 1

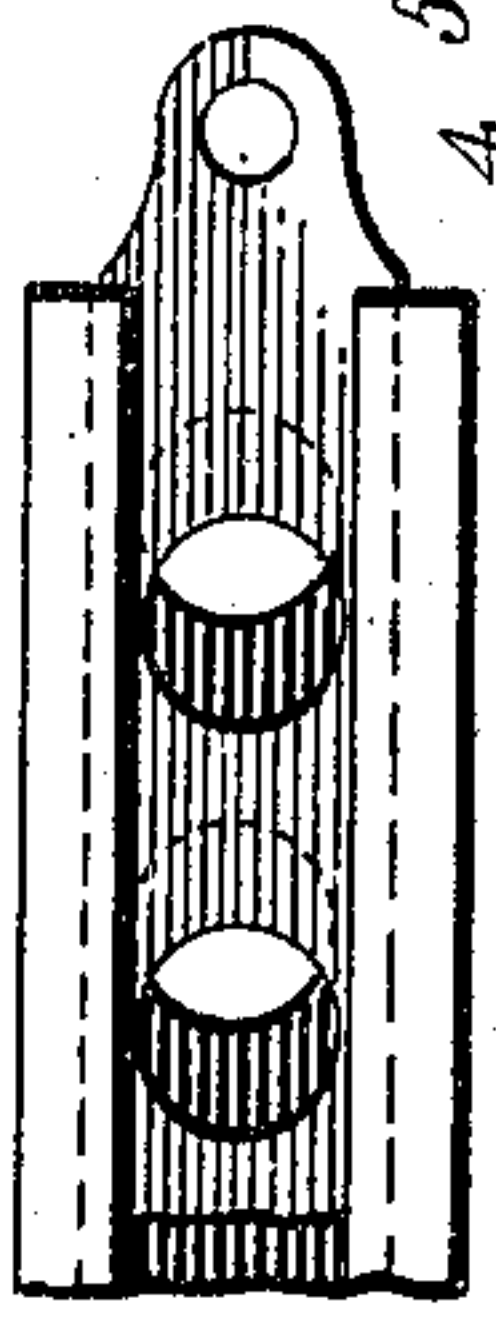


Fig. 2

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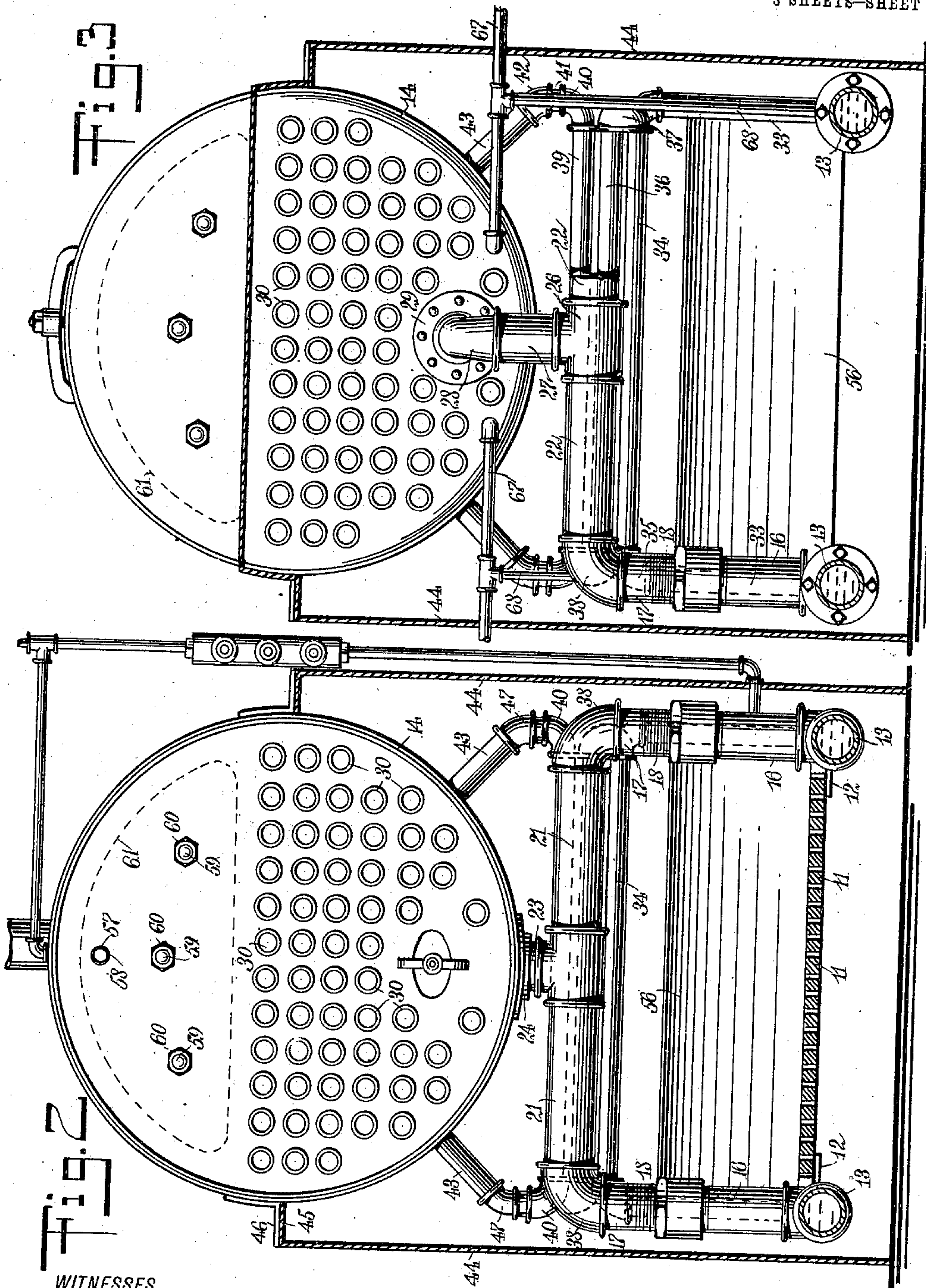


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3 SHEETS—SHEET 2.



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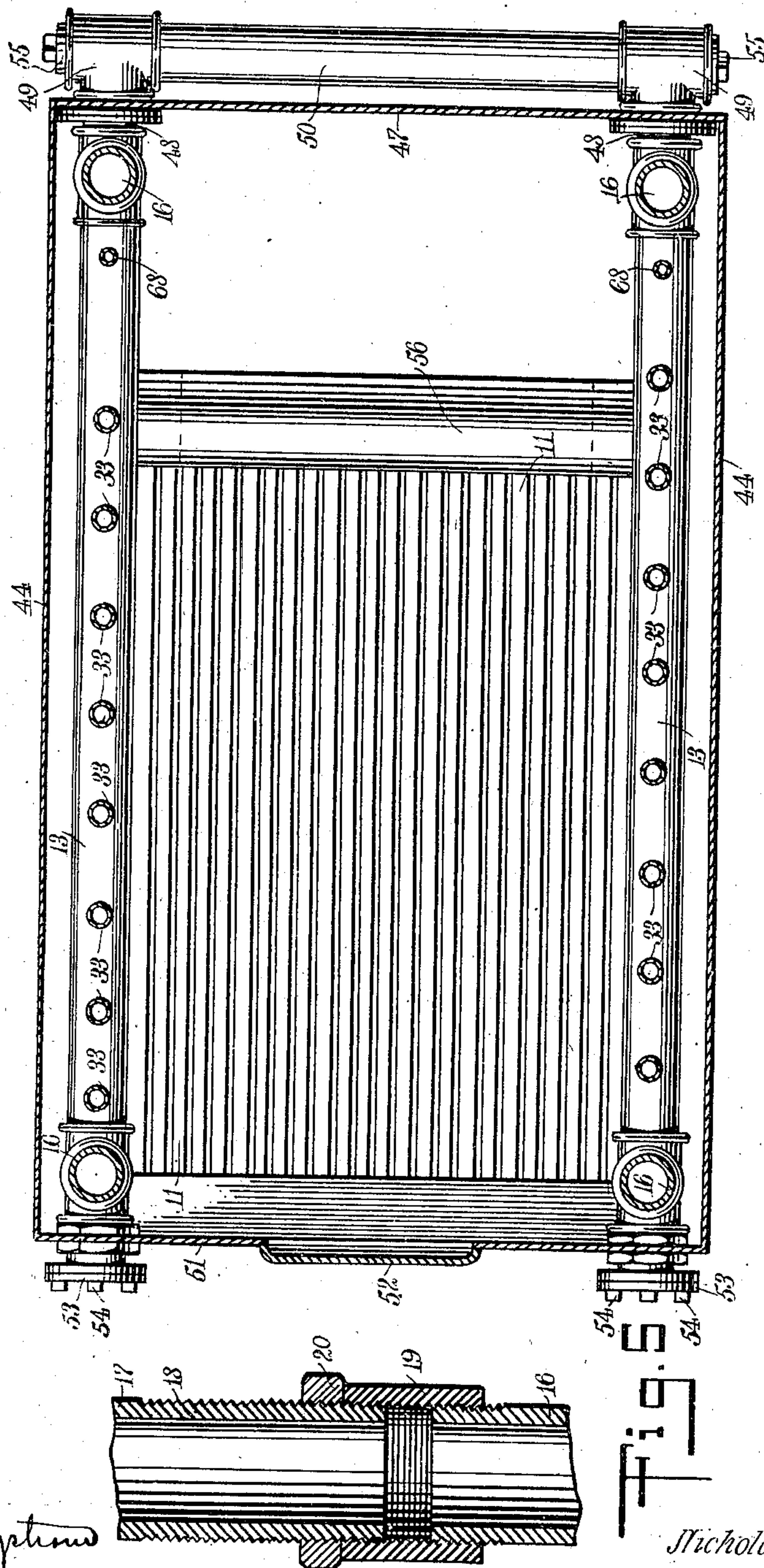
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3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

NICHOLAS ANDREW UREN, JR., OF JUNEAU, DISTRICT OF ALASKA.

## STEAM-BOILER.

995,929.

Specification of Letters Patent. Patented June 20, 1911.

Application filed November 8, 1910. Serial No. 591,283.

*To all whom it may concern:*

Be it known that I, NICHOLAS A. UREN, Jr., a citizen of the United States, and a resident of Juneau, District of Alaska, have invented a new and Improved Steam-Boiler, of which the following is a full, clear, and exact description.

Among the principal objects which the present invention has in view are: to provide for a boiler of the character mentioned a supporting structure formed of water circulating tubes connected with the boiler drum; to provide for a boiler of the drum type a fire box, the side and head walls of which are formed in part by water circulating tubes connected with said boiler; to provide a supporting structure for the drum boiler comprising a series of laterally disposed circulating tubes arranged to enter the boiler below the horizontal median line thereof to avoid lateral extension of the fire box; to provide in a boiler of the character mentioned a water circulating system embodying circulating manifolds, the exit passage whereof is restricted to form a circulating retarding member; to provide a connecting pipe between the said manifolds to balance the water supply thereto, said connecting pipe being constructed to form a double ended settling chamber; and to provide a supporting structure for the drum boiler constructed from circulating vertical tubes disposed in rectangular arrangement and at the front and rear of said boiler, said tubes having screw threaded connections by the manipulation of which the horizontal arrangement of said boiler may be varied.

One embodiment of the present invention is disclosed in the structure illustrated in the accompanying drawings, in which like characters of reference denote corresponding parts in all the views, and in which—

Figure 1 is a vertical longitudinal section of a boiler constructed and arranged in accordance with the present invention; Fig. 2 is a front elevation of the same, the casing and grate bars being cut away and shown partly in section; Fig. 3 is a rear elevation of the same, the casing being cut away and shown in section; Fig. 4 is a horizontal section taken on the line 4—4 in Fig. 1; Fig. 5 is a detail view in vertical section, showing the union of the sections of the vertical supporting tubes; and Fig. 6 is a detail view of the overhead damper with

which the fire box is provided in the present invention.

The present invention resembles in many respects the construction shown and described in a co-pending application for patent filed under date of April 30, 1909, bearing number 493,155, to which cross reference is here made.

In the present invention the fire box is provided with a series of grate bars 11, 11. The grate bars 11, 11 are supported upon bracket plates 12, 12. The bracket plates 12, 12 are rigidly mounted upon and extended laterally from the manifolds 13, 13. The manifolds 13, 13 are large tubes extended parallel with the boiler drum 14. The manifolds 13, 13 are provided at the ends thereof with T-connections 15, 15, with which are connected the lower members 16, 16 of the vertical columns at the front and rear of the said manifolds for connecting the same with the drum 14. The columns are formed preferably in two sections, 16, 16 and 17, 17. The sections 17 are provided with elongated screw threaded portions 18, to each of which is engaged a union 19 and a lock nut 20. By manipulating the unions 19 it will be seen that the length of the columns 16—17 may be varied to level the drum 14 irrespective of the foundation.

The columns 16—17 are united by cross tubes 21, 22. The tube 21 is extended under the drum 14, and is connected therewith by means of a short nipple 23. The nipple 23 is suitably connected by means of a socket plate 24 with the drum 14 in open circulating communication therewith. The cross tube 21 is divided into two sections, as shown best in Fig. 2 of the drawings, which are united by means of a T-connection 25.

The cross tube 22 and the columns 16—17 at the rear of the boiler are extended beyond the rear of the drum 14, and the T-connection 26 of the tube 22 is connected by means of an elongated nipple 27 with a reducing elbow 28. The reducing elbow 28 enters the drum 14 slightly above the bottom thereof through the head of the said drum and the flange plate 29 securely mounted thereon.

It will be noted that the rear column 16—17 and the nipple 27 and elbow 28 are disposed in the fire box casing, and at the rear thereof in the path of the burning gases or heated air passing to the hot air tubes 30, 30 through which the said gases and air are



drawn to a smoke flue 31. Due to the height in the boiler at which the nipple 32, extended from the reducing elbow 28, enters the same, the circulation of the water from the manifolds 13, 13 is induced upward through the said columns 16—17 at the rear of the said boiler. The cooler water at the forward end of the drum 14, and at the bottom thereof, advances through the column 16—17 at the front end of the boiler to feed the manifolds 13, 13 as the water is drawn therefrom to rise in the column 16—17 at the rear of the boiler.

It will be understood that by reason of the engagement of the manifolds 13, 13 whereby the same form part of the fire box structure, the water in the said manifolds is heated partly through direct radiation from the fire box, thus accelerating the circulation of the water in the said manifolds and in the said columns 16—17. By reason of the reduced area of the elbow 28 and the nipple 32 leading therefrom, as compared with the manifolds 13, 13 and the columns 16—17, it will be seen that the circulation is somewhat retarded, thus affording extra time for the heating of the water in the said manifolds and columns connected therewith.

By means of the structure thus far described it will be seen that the drum 14 and the grate bars 11 are supported on the structure embodying the manifolds and circulation rising and falling columns connected therewith. It will also be seen that by manipulation the unions 19, 19 on the four corner disposed columns 16—17, the level of the drum 14 may be varied, and that when so varied, by setting the lock nuts 20, 20, the arrangement of the drum 14 is thereby fixed.

The lateral straight walls of the fire box are formed from short tubular risers 33, 33. The risers 33, 33 are suitably connected in open communication with the manifolds 13, 13, and are juxtaposed as closely as the needs of the fire box demand or the desire of the designer dictates. The upper wall of the fire box for the present boiler is formed by horizontal tubular sections 34, 34. The sections 34, 34 are disposed in the same transverse plane as the risers 33, and are therefore juxtaposed as closely each to the other as are the said risers. The risers 33 and the sections 34 are connected by elbows 35, 35. The sections 34, 34 are horizontally disposed, as shown best in Fig. 3 of the drawings. At the end of the section 34 opposite that connected with the elbow 35, the said section is connected with an intermediate transverse section 36, being joined thereto by a loop connection 37. The section 36 is disposed in the same vertical plane as the section 34, and is arranged substantially parallel thereto, the two sections being

slightly spread to raise the delivery end of the section 36. At the delivery end of the section 36, or the end removed from the loop connection 37, the said section is connected by means of a second loop connection with a third transverse tubular section 39. The repetition of the transverse sections may be carried to any extent desired. At the delivery end of the uppermost of the said transverse sections, and as shown in the drawings, the section designated by the numeral 39, the said section is provided with an elbow 40, nipple 41, elbow 42, and nipple 43, and is connected with the drum 14, entering the said drum in line with the radius thereof and at a point midway between the horizontal and vertical diameters of the said drum. By entering the nipples 43 on opposite sides of the drum 14, and below the median center thereof, the entrance of the circulating water within the said drum is materially facilitated.

It will be understood that the risers 33, 33 and the tubular sections 34, 36 and 39, and the connections between the same, and of the same with the drum 14, are disposed on opposite sides of the fire box formed thereabout in alternate arrangement. That is to say, the transverse tubes are nested in the horizontal extension of the fire box, and are connected to the risers 33 alternately on opposite sides of the said fire box. It will be observed that when now heat is produced in the fire box formed by the manifolds 13, 13, grate bars 11, 11, risers 33, 33, and the transverse sections connected therewith, the water received from the drum 14 through the front columns 16—17 and delivered to the manifolds 13, is heated and carried upward through the risers 33 and across the top of the fire box one or more times in each of the risers and transverse sections connected therewith, to enter the drum 14 as heated water. It will be understood that the heated air and gases produced in the fire box will circulate upward through the transverse sections 34, 36 and 39, heating the water contained therein at a ratio proportioned to the length of the risers and transverse sections.

The fire box or furnace chamber is formed by the box-like structure embodying flat metal side walls 44, 44 and top flanges 45, which are bolted to angle iron brackets 46 for securing the same to the drum 14. The side walls 44 are, at the rear, connected with a rear facing wall 47, which is pierced at the lower end thereof to pass nipples 48, 48, by which, in conjunction with T-connections 49, 49, the manifold is connected with a settling pipe 50. In this manner the pipe 50 is extended beyond the heating chamber contained within the walls 44, 44 and 47. By extending the nipples 48, 48 the pipe 50 may be farther removed from the heated chamber formed by the said walls 44 and 47.



The front end of the heating chamber is closed by a face wall 51, wherein is formed an opening closed by the fire door 52. The face wall 51 is likewise perforated at the lower end to pass forward extensions of the manifolds 13, 13, to be there closed by means of caps 53, 53. The caps 53, 53 are so held in position by suitable screw bolts 54, 54, and are so arranged that when removed the manifolds 13, 13 may be scraped or otherwise cleaned from the face of the boiler without removing the front wall 51.

The T-connections 49 are closed on the outer sides by means of screw plugs 55, 55. When the plugs 55, 55 are removed a straight passage is exposed through the pipe 50 whereby any sediment or scale may be scraped or otherwise removed from the said pipe 50. Further, it will be observed that if the pipe 50 be thus opened, the manifolds 13 may be cleared by pushing detritus or other fouling substances through the said pipe to the rear thereof to pass into the pipe 50 to be ejected therefrom. A further advantage in the employment of the settling pipe 50 is that water communication between the two manifolds is maintained, thereby preventing water remaining in one of said manifolds after the other has been drained.

The rear of the fire box is formed by a bridge wall or shield 56. The shield 56 is constructed from vitreous or other suitable fire resisting material.

Where the boiler drum 14 is not provided with a steam dome, a horizontally disposed outlet pipe 57 is employed. The pipe 57 is disposed adjacent to the side wall of the drum 14 and extended longitudinally therein. The pipe 57 is slotted or otherwise opened to form a down-turned opening 58. The steam is collected in the said pipe where the water is eliminated, and the said steam delivered from the drum 14 as dry steam.

The heads of the drum 14 are held against longitudinal displacement by means of tie rods 59, 59, which are secured in position by screw nuts 60, 60. To reinforce the walls of the heads of the drum above the tubes 30, 30 each head is provided with a reinforcing plate 61. The plates 61 are intimately connected with the heads of the drum 14.

At the rear of the fire box casing, and above the wall 47 thereof, is hinged a door 62. The door 62 is hinged at 63 upon a bracket 64, mounted on the head of the drum 14 and above the uppermost tier of the tubes 30. A foot flange 65 is provided on the wall 47 to receive the extended edge 66 of the door 62 when the same is closed.

By reason of the construction described, wherein is employed the door 62 mounted and arranged as shown in the accompanying drawings, the heat tubes 30, 30 may be read-

ily and quickly exposed, it being only necessary to raise the door 62. Any suitable means may be employed for securing the door 62 in normal or closed position.

Water is supplied to the drum 14 by means of inlet pipes 67, 67. The pipes 67, 67 are provided with downwardly extended branch pipes 68, 68, which pipes are secured upon and in open communication with each of the manifolds 13, 13, whereby when the feed water is delivered to the boiler a portion thereof is introduced directly into the manifolds 13.

It will be observed that by employing a supporting structure constructed and arranged as shown in the drawings, wherein the nipples 43, 43 are introduced into the boiler at a point below the horizontal diameter thereof, the supporting structure and the casing inclosing the same may be confined in lateral dimensions no larger than the horizontal diameter of the drum 14. Further, by reason of the fact that the water circulated in the supporting structure is entered into the boiler below the heating tubes 30, 30, the said water is brought into direct and primary contact with the said tubes.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a steam boiler having a drum provided with a superposed steam space and heating tubes extending therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality of vertical pillar tubes connected with said manifold tubes at near the ends thereof; cross tubes transversely extended between and connected in open communication with said pillar tubes, said cross tubes being directly connected and in open communication with said drum, entering the same at different heights at the front and rear thereof; a fire box casing, the walls whereof surround said supporting structure; an open ended settling pipe mounted upon and in open communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and outside the said casing; and removable closure members for said settling pipe.

2. In a steam boiler having a drum provided with a superposed steam space and heating tubes extending therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality of vertical pillar tubes connected with said manifold tubes at near the ends thereof; cross tubes transversely extended between and connected in open communication with



said pillar tubes, said cross tubes being directly connected and in open communication with said drum, entering the same at different heights at the front and rear thereof; a fire box casing the walls whereof are disposed about said drum to infold said supporting structure, the front and rear walls of said casing being perforated to permit the front and rear ends of said manifold tubes to extend therethrough; an open ended settling pipe mounted upon and in open communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and outside the said casing; and removable closure members for said settling pipe.

3. In a steam boiler having a drum provided with a superposed steam space and heating tubes extending therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality of vertical pillar tubes connected with said manifold tubes at near the ends thereof; cross tubes transversely extended between and connected in open communication with said pillar tubes, said cross tubes being directly connected and in open communication with said drum, entering the same at different heights at the front and rear thereof; a fire box casing, the walls whereof surround said supporting structure; an open ended settling pipe mounted upon and in open communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and outside the said casing; removable closure members for said settling pipe; grate bars supported between and upon said manifold tubes; and a bridge wall disposed between said manifold tubes at the rear of said grate bars.

4. In a steam boiler having a drum provided with a superposed steam space and heating tubes extending therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality of vertical pillar tubes connected with said manifold tubes at near the ends thereof; cross tubes transversely extended between and connected in open communication with said pillar tubes, said cross tubes being directly connected and in open communication with said drum, entering the same at different heights at the front and rear thereof; a fire box casing, the walls whereof surround said supporting structure; an open ended settling pipe mounted upon and in open communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and outside the said casing; re-

movable closure members for said settling pipe; grate bars supported between and upon said manifold tubes; a bridge wall disposed between said manifold tubes at the rear of said grate bars; and a plurality of circulating tubes connecting said manifold tubes and said drum, said tubes being disposed in juxtaposed relation to form the side walls of the fire box constructed about said grate bars, said tubes being bent at the upper end to enter the said drum below the horizontal median plane thereof.

5. In a steam boiler having a drum provided with a superposed steam space and heating tubes extending therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality of vertical pillar tubes connected with said manifold tubes at near the ends thereof; cross tubes transversely extended between and connected in open communication with said pillar tubes, said cross tubes being directly connected and in open communication with said drum, entering the same at different heights at the front and rear thereof; a fire box casing, the walls whereof surround said supporting structure; an open ended settling pipe mounted upon and in open communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and outside the said casing; removable closure members for said settling pipe; grate bars supported between and upon said manifold tubes; a bridge wall disposed between said manifold tubes at the rear of said grate bars; and a plurality of circulating tubes connecting said manifold tubes and said drum, said tubes being disposed in juxtaposed relation to form the side walls of the fire box constructed about said grate bars, said tubes being bent to form above the said fire box transversely extended straight sections to form a cover for said fire box, the ends of said sections being bent to enter said drum in line with the radii thereof, said radii being disposed at an angle approximately 45° from the horizontal median plane of said drum.

6. In a steam boiler having a drum provided with a superposed steam space and heating tubes extending therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality of vertical pillar tubes connected with said manifold tubes at near the ends thereof; cross tubes transversely extended between and connected in open communication with said pillar tubes, said cross tubes being directly connected and in open communication with said drum, entering the



same at different heights at the front and rear thereof; a fire box casing, the walls whereof surround said supporting structure; an open ended settling pipe mounted upon and in open communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and outside the said casing; removable closure members for said settling pipe; grate bars supported between and upon said manifold tubes; a bridge wall disposed between said manifold tubes at the rear of said grate bars; and a plurality of circulating tubes connecting said manifold tubes and said drum, said tubes being disposed in juxtaposed relation to form the side walls of the fire box constructed about said grate bars, said tubes being bent to form a series of superposed transverse straight sections arranged across the top of said fire box, the end of the last of said sections in each series being bent to enter said drum in line with the radii thereof, said radii being disposed at an angle approximately  $45^\circ$  from the longitudinal median plane of said drum.

7. In a steam boiler having a drum provided with a superposed steam space and heating tubes extending therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality of vertical pillar tubes connected with said manifold tubes at near the ends thereof, said pillar tubes formed in tube connected sections; means disposed between said sections for extending said tubes; cross tubes transversely extended between and connected in open communication with said pillar tubes, said cross tubes being directly connected and in open communication with said drum, entering the same at different heights at the front and rear thereof; a fire box casing, the walls whereof surround said supporting structure; an open ended settling pipe mounted upon and in open communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and outside the said casing; and removable closure members for said settling pipe.

8. In a steam boiler having a drum provided with a superposed steam space and heating tubes extending therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality of vertical pillar tubes connected with said manifold tubes at near the ends thereof, said tubes embodying a plurality of screw threaded sections; screw thread unions for said sections adapted to be arranged to vary the longitudinal extension of said pillar

tubes; a plurality of lock nuts disposed on one of said sections for locking the said unions in adjusted position; cross tubes transversely extended between and connected in open communication with said pillar tubes, said cross tubes being directly connected and in open communication with said drum, entering the same at different heights at the front and rear thereof; a fire box casing, the walls whereof surround said supporting structure; an open ended settling pipe mounted upon and in open communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and outside the said casing; and removable closure members for said settling pipe.

9. In a steam boiler having a drum provided with a superposed steam space and heating tubes extended therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality of vertical pillar tubes connected with said manifold tubes at near the ends thereof; cross tubes transversely extended between and connected in open communication with said pillar tubes, said cross tubes being directly connected and in open communication with said drum, entering the same at different heights at the front and rear thereof; a fire box casing, the walls whereof surround said supporting structure; an open ended settling pipe mounted upon and in open communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and outside the said casing; removable closure members for said settling pipe; and a feed water system embodying feed pipes connecting an outside water supply and the lower portion of said drum and said manifold tubes.

10. In a steam boiler having a drum provided with a superposed steam space and heating tubes extended therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality of vertical pillar tubes connected with said manifold tubes at near the ends thereof; cross tubes transversely extended between and connected in open communication with said pillar tubes, said cross tubes being directly connected and in open communication with said drum, entering the same at different heights at the front and rear thereof; a fire box casing, the walls whereof surround said supporting structure; an open ended settling pipe mounted upon and in open communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and



outside the said casing; removable closure members for said settling pipe; and a feed water pipe for said boiler, in open communication with an outside water supply  
 5 and with one of said manifold tubes to supply said boiler with water through said manifold tube.

11. In a steam boiler having a drum provided with a superposed steam space and  
 10 heating tubes extended therefrom, a supporting structure therefor, comprising a plurality of longitudinally disposed open ended manifold tubes; a plurality of removable closure members for said tubes; a plurality  
 15 of vertical pillar tubes connected with said manifold tubes at near the ends thereof; cross tubes transversely extended between and connected in open communication with said pillar tubes, said cross tubes being di-  
 20 rectly connected and in open communication with said drum, entering the same at differ-

ent heights at the front and rear thereof; a fire box casing, the walls whereof surround said supporting structure; an open ended settling pipe mounted upon and in open  
 25 communication with said manifold tubes, said settling pipe being extended transversely between the ends of said manifold tubes and outside the said casing; removable closure members for said settling pipe; and  
 30 a plurality of feed pipes in open communication with an outside water supply and with said manifold tubes on opposite sides of said boiler to supply the said boiler with  
 35 water through said manifold tubes.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

NICHOLAS ANDREW UREN, JR.

Witnesses:

LLOYD VALENTINE WINTER,  
 FRANK HORACE NEWHALL.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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