

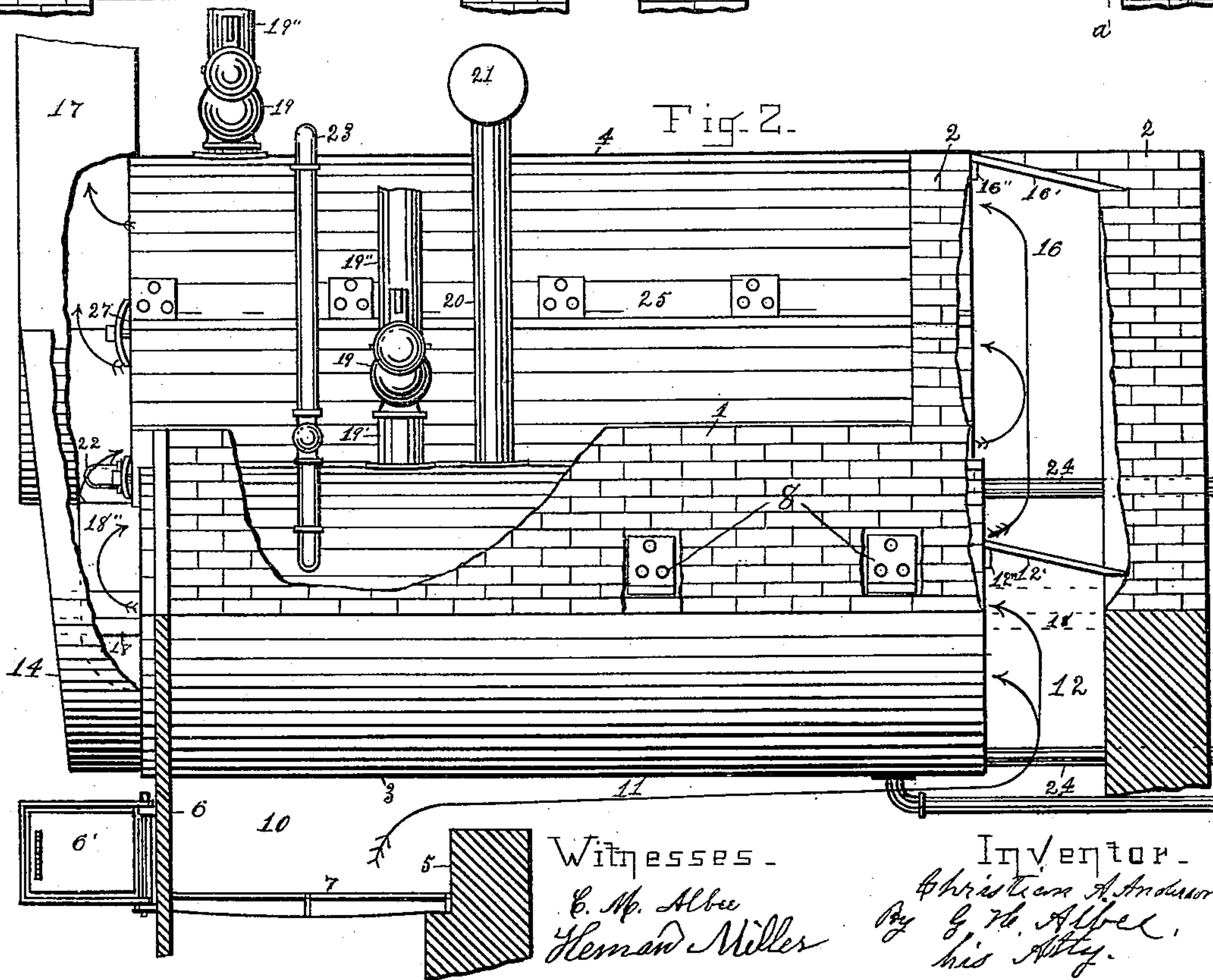
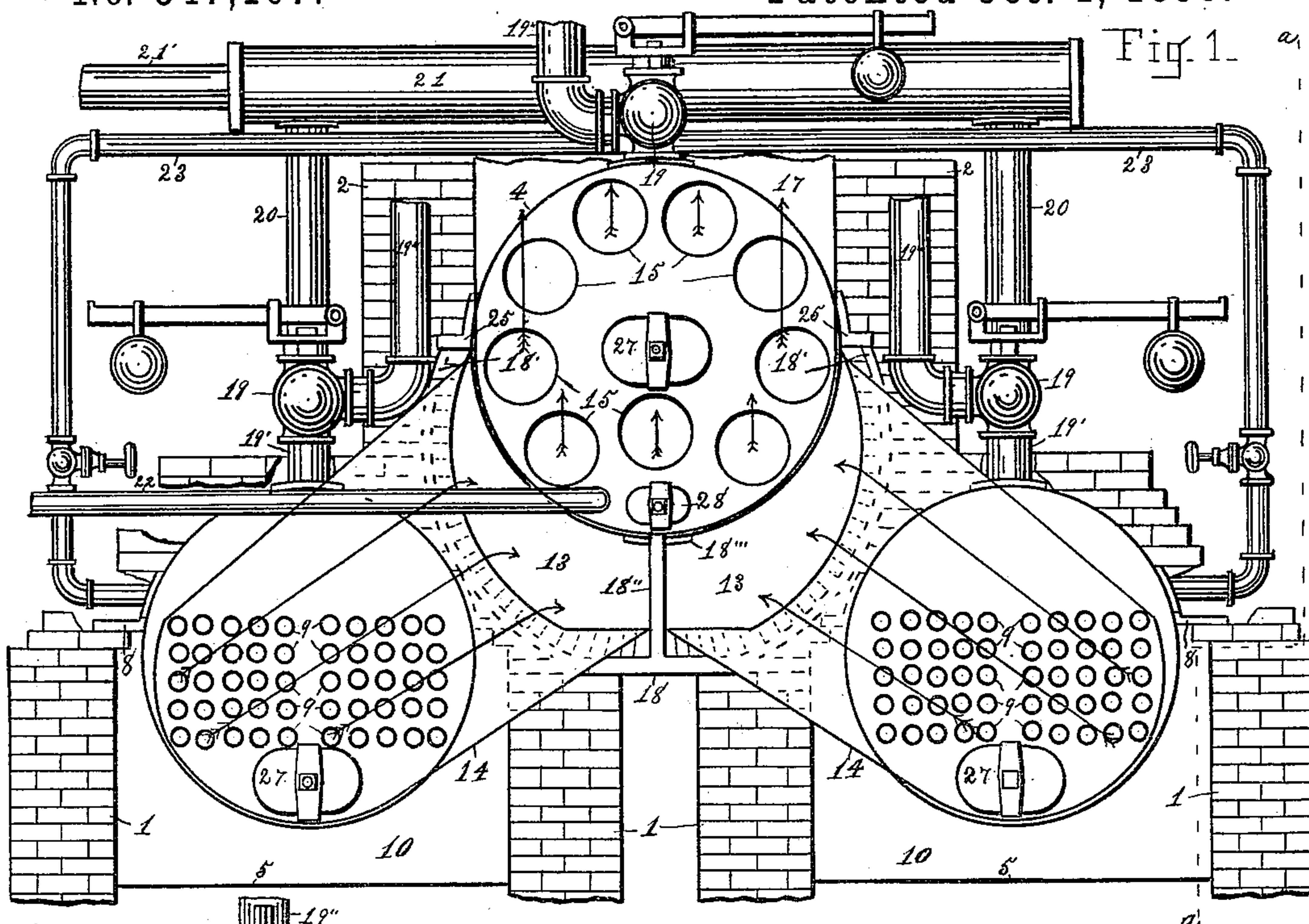
(No Model.)

2 Sheets—Sheet 1.

C. A. ANDERSON.  
BOILER FURNACE.

No. 547,107.

Patented Oct. 1, 1895.



Witnesses -

E. M. Albee  
Herman Miller

Inventor -

Christian A. Anderson  
By E. M. Albee,  
his Atty.



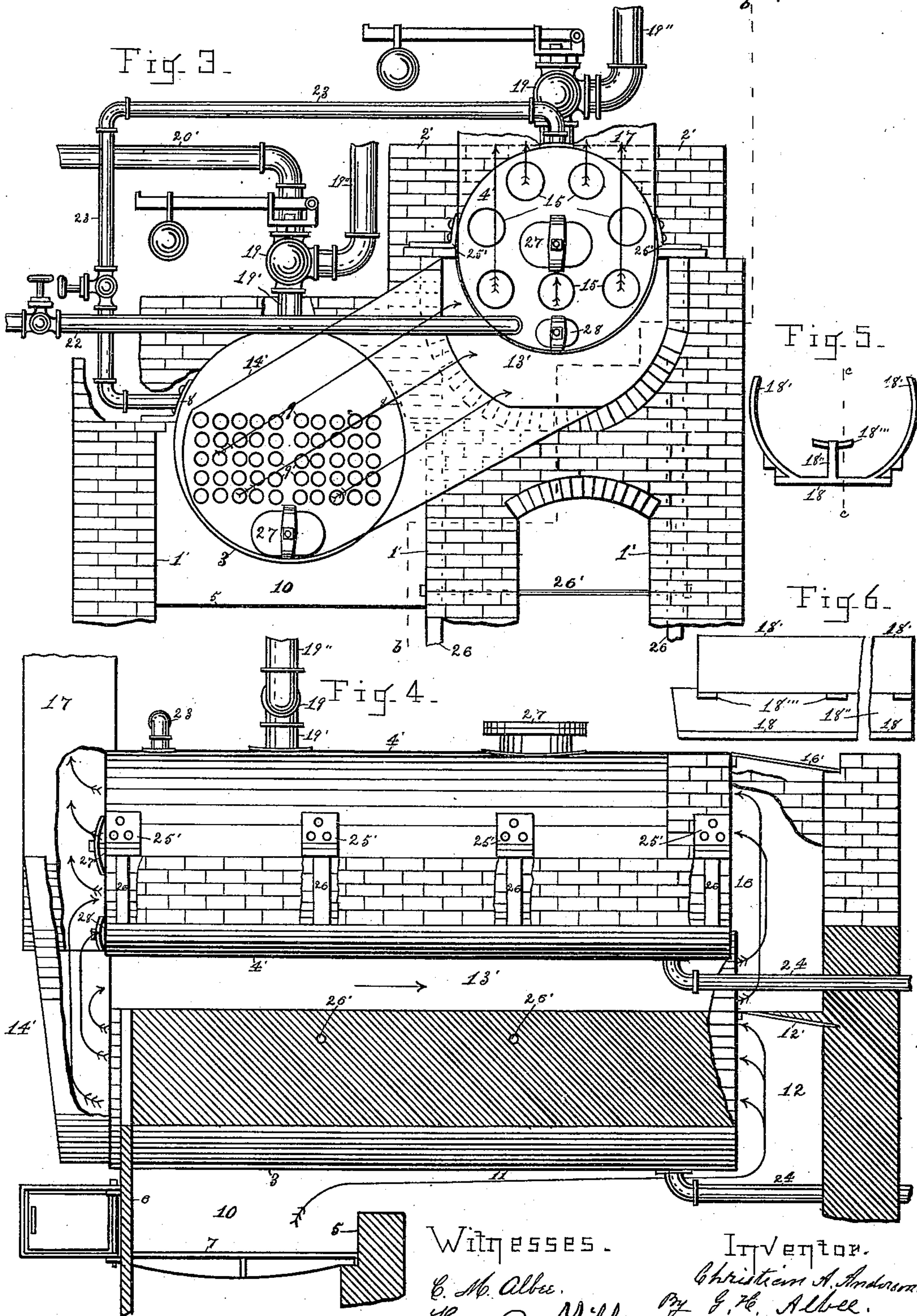
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# UNITED STATES PATENT OFFICE.

CHRISTIAN A. ANDERSON, OF KAUKAUNA, WISCONSIN.

## BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 547,107, dated October 1, 1895.

Application filed April 15, 1893. Renewed March 30, 1895. Serial No. 543,909. (No model.)

*To all whom it may concern:*

Be it known that I, CHRISTIAN A. ANDERSON, a citizen of the United States, residing at Kaukauna, in the county of Outagamie and State of Wisconsin, have invented a new and useful Improvement in Boiler-Furnace Settings, of which the following is a specification.

My invention relates to the arrangement in two horizontal planes in a furnace of two or more boilers for the purpose of making steam for heating purposes or for producing motive power, either two or three boilers being adapted for the arrangement, and the boiler or the boilers, if there are three in the nest in the lower one of said planes, being arranged for receiving the entire heat arising from the combustion of the fuel directly under and through the tubes thereof, the other boiler being located in the higher plane and receiving the heat remaining unexpended after it has passed under and through the tubes of the boiler or the boilers of said lower plane.

The boiler of the higher plane is supplied with water from any available source, which water is heated therein to a high degree of temperature, after which it is delivered to the boiler or the boilers of said lower plane, and the object of this arrangement is to utilize to the greatest extent possible the heat of the fuel which is burned, and also to supply the steam-making boiler or boilers of the lower plane with water of a high degree of temperature and from which the lime or other mineral impurities have been removed. I attain these objects by means of the arrangement of the boilers in a furnace-setting as illustrated in the accompanying drawings, in which—

Figure 1 is an end view of three boilers in a furnace embodying my improvement, the boiler-front and the front of the breeching of all of the boilers being removed and only the brickwork of the furnace-wall being shown from a point just below the bridge-wall to its top. Fig. 2 is a longitudinal elevation of the boiler-setting as it appears in looking at it toward the left from the line *a a* of Fig. 1, a portion of the boiler-front and of the bridge-wall with a grate-bar extending from one to the other being shown and a portion of the breeching and of the brickwork of the furnace-wall being broken away for the purpose of a better illustration of the several parts. Fig. 3 is an

end view of the improvement having but two boilers in the furnace, the boiler-front and the front of the breeching of the two boilers being removed. Fig. 4 is a longitudinal and vertical section of the two boilers and their setting, taken upon the line *b b* of Fig. 3. Figs. 5 and 6 are upon a reduced scale, Fig. 5 being an end view of the upper boiler-supporting casting as shown in Fig. 1, and Fig. 6 is a vertical section longitudinally of a portion of each end of said casting as seen in looking toward the left of the line *c c* of Fig. 5.

Similar figures of reference indicate like parts in the several views.

1 1' indicate the brick walls of the furnace immediately about the sides of the lower boilers; 2 2', the walls about the rear end of said furnace; 3, the lower boilers; 4 4', the upper boilers; 5, bridge-walls; 6, boiler-fronts; 6', a door of the front; 7, grate-bars; 8, brackets which are secured to the lower boilers for supporting them upon the side walls of the furnace; 9, a series of tubes which extend lengthwise of the lower boilers from end to end; 10, fire-chambers under each lower boiler; 11, flues extending from said fire-chambers to the rear end of each lower boiler for carrying off the products of combustion; 12, return-flues at the rear end of each lower boiler for conducting said products of combustion to the tubes 9; 13, a flue which extends under the upper boiler lengthwise thereof for receiving said products; 14, a breeching for receiving said products from the tubes 9 and conducting them into the flue 13; 15, a series of flues arranged in the upper boiler and extending from one end thereof to the other; 16, a return-flue at the rear end of the upper boiler for conducting the heat, &c., from the flue 13 to the series of flues 15; 17, a breeching at the front end of the upper boiler for conducting the remaining heat and smoke to the chimney; 18, the base of a casting having curved sides 18', a straight central flue-dividing plate 18'', and ears 18''' upon each side of the upper edge of said plate for supporting the upper boiler upon and for forming within its curved sides the flue 13; 19, safety-valves arranged upon the several boilers; 19', pipes for connecting said valves to the boilers; 19'', steam-escape pipes; 20 20', steam-delivery pipes for carrying the steam from the boilers;



21, a drum or pipe connecting the pipes 20 of the boilers in Figs. 1 and 2; 22, a water-supply pipe for supplying the upper boiler with water; 23, a pipe connecting the upper 5 to the lower boiler for delivering water from the former to the latter; 24, blow-off pipes extending from the lower part of each boiler; 25 25', brackets secured to the upper boilers for supporting them; 26, iron pillars within 10 the side walls of the furnace in Figs. 3 and 4, upon which the upper boiler is supported; 26', iron rods connecting each pair of said pillars for preventing the pillars from spreading apart; 27, manhole-plates upon the several 15 boilers; 28, hand-hole plates upon the upper boilers.

The important features of my improvement are the arrangement of the combustion-chamber under the lower boiler or boilers, the flue 20 leading therefrom, the return-flue at the rear end of the furnace, the series of tubes 9, the breeching connecting with said tubes at the front of the boiler, the flue under the upper boiler, the return-flue at the rear end of the 25 upper boiler, the flues through the upper boiler, and the breeching at the front end of the upper boiler leading to the chimney, in connection with a water-supply for the several boilers in the order shown and the delivery 30 of steam from the lower boiler or boilers.

The boiler or boilers of the lower plane are arranged within brick walls and are provided with the usual boiler-front, supporting-brackets, grates, and bridge-wall, each one being in- 35 closed with a side wall its entire length, whereby the combustion-chamber and flue leading therefrom are separated from those of the other from one end of the furnace to the other. After the heat from the burning fuel has 40 passed under the boilers of the lower plane it ascends and passes through the tubes 9 and thence under the boiler of the upper plane. A flue-division plate 18'' is provided in the arrangement shown in Figs. 1 and 2 for dividing 45 the flue under the upper boiler into two equal parts longitudinally of the boiler. This division-plate is only used when there are two boilers in the lower plane and is for the purpose of keeping the products of combustion from each 50 of said boilers separate from each other until they have nearly reached the rear end of the upper boiler. Fair results may be obtained if the heat from the two boilers is merged into a single flue; but the divided flue is preferable.

It is often necessary in running the boilers to sweep out the flues in order to secure a perfect draft, and for doing this to one boiler while the other one is kept running the divided flue is desirable. The flue-dividing 55 plate may be cast in sections longitudinally of the boiler and its base provided with arms extending upward, upon the upper end of which arms the upper boiler is supported by means of brackets 25, which brackets are se- 60 cured to the boiler. The outer arms 18' are concave in form upon their inner sides and form the inclosing sides of the flue under the

upper boiler and may be lined with brick, fire-clay, or other desired lining. The central division-plate is provided with ears 18''' for the 70 boiler to rest upon.

Where there is but one boiler in the lower plane, the upper one requires no flue-division and may be supported upon brick walls, as shown in Figs. 3 and 4. Brick walls may also 75 be used for supporting the upper boiler when there are two boilers in the lower plane by placing the lower boilers at a sufficient distance apart for allowing the necessary supporting-walls for the upper boiler. 80

In Figs. 3 and 4 pillars 26 are shown for supporting the upper boiler and its side walls. These pillars may be provided with bases for resting upon a suitable foundation and each pair of pillars may be connected together with 85 bolts 26' within the brick walls, as shown, for the purpose of strengthening said walls. Brackets 25', which are secured to the boiler 4', rest upon the pillar-tops and support said boiler. The flue 13' is formed under the boiler 90 4' by means of the brick side walls and a brick filling underneath the boiler. An arch is turned below the flue 13', but is only for the purpose of lessening the number of brick which are required for the furnace-wall. 95

I do not confine my invention to the form of the upper-boiler supports which are shown, to the particular arrangement of the boiler-supporting walls, or to any particular material for their construction. The upper and 100 lower boilers are shown with their ends uneven with each other; but this is not a necessary element of their position, they being so illustrated for the easier distinguishing of the upper from the lower one. 105

The flues for the return of the heat, &c., from below the boiler or boilers of the lower plane into the tubes thereof are made separate from each other and also separate from the return-flues of the upper boiler. A plate 110 12' is provided, which extends transversely of said boiler or boilers the necessary distance and from the rear boiler-wall to said boiler or boilers, to which they may be removably connected by resting upon a bar 12'', which bar 115 may be secured to the boiler in any suitable manner. These plates form the top of the return-flues at the rear end of the furnace. Similar plates 16' are provided for the closing of the tops of the return-flue at the rear of 120 the upper boiler.

At the front end of the boilers a breeching 14 or 14' is provided for conducting the heat, &c., from the tubes of the lower boiler or boilers under the boiler of the upper plane, and 125 also a breeching 17 for conducting the smoke, &c., from the flues of the upper boiler to the chimney.

In Fig. 1 the division-plate 18'' with its base 18 is extended forward the necessary distance 130 for connecting with the breeching 14 for conducting the heat, &c., under the upper boiler, and it may be extended at the rear in Fig. 2 for forming the bottom of the return for said



heat, or said return may have its bottom and sides built up of brick.

The upper boiler is to be supplied with water from some suitable source through the  
 5 pipe 22 by means of a pump or suitable device, the time and amount of said supply being regulated by means of the valve 22'. This boiler is to be kept full or nearly full at all times and the boiler or boilers of the  
 10 lower plane supplied from it through the pipes 23, said pipes being provided with valves 23' for shutting off the supply, as desired. The upper boiler being connected with the lower ones only by the pipe 23, which  
 15 pipe extends from out of the upper side of the boiler, said boiler must be full and sufficient pressure applied so that the water will overflow and supply the lower boiler or boilers. The upper boiler being large and used for  
 20 heating the water to a high degree of temperature before delivering it to those upon the lower plane, the lime and other mineral impurities have ample time to become separated from the water therein, whereby water  
 25 of a pure quality and high degree of temperature is provided for the supply of the steam-producing boiler or boilers.

The lower boilers may be provided with tubes 9, as shown, or with flues of a large size,  
 30 the small tubes being preferred for their better distribution of heat, and as the water therein is comparatively free of scale-producing material after it has passed through the upper boiler no difficulty is likely to occur  
 35 from that source.

The upper boiler I make with large flues, the area of which, it is essential, equals or exceeds the combined area of the tubes or flues in the boiler or boilers of the lower plane.  
 40 These flues being large and of the necessary distance apart, they can be reached by the boiler-cleaner upon their entire surface for removing any scale which may form.

Steam is taken from the lower boiler or  
 45 boilers through the pipes 20 or 20', from which it can be delivered to the desired point. Two boilers being used in the lower plane, the pipes 20 20 are connected with a larger pipe or drum 21, from which the pipe 21' extends for carrying the steam where desired.  
 50

Each boiler is provided with a safety-valve 19 and blow-off pipe 24, which latter may have valves at a convenient point outside of the boiler-wall.

55 Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination in a boiler furnace setting of a nest of boilers of approximately equal  
 60 length arranged parallel with each other in two horizontal planes of different elevation, each boiler of the lower plane being arranged in a diagonal direction from a boiler in the upper plane, those in the lower plane being provided  
 65 with a series of comparatively small tubes arranged longitudinally thereof, and the boiler of the nest in the upper plane having flues

similarly arranged of a larger size than the aforesaid tubes, said boilers being so arranged that the heat and gases first pass under the  
 70 boiler, or boilers, of the lower plane, then return through the tubes thereof, then pass under the boiler of said nest in the upper plane, returning then through the flues thereof to the front of the boilers, and then pass into the  
 75 chimney, the boiler of the upper plane being provided with a water supply and being used as a water heater, the water from which after being heated is conducted to and supplies the boiler, or boilers, of said lower plane, substantially as described.  
 80

2. The combination in a boiler furnace setting, of a nest of boilers of approximately a uniform length, arranged parallel with each  
 85 other in horizontal planes of different elevation, each boiler of the lower plane being arranged in a diagonal direction from a boiler in the upper plane, the boiler of the nest in said upper plane having a series of flues extending from end to end thereof, and communicating at their rear ends with a flue  
 90 extending longitudinally with, and under said boiler to its front end, and at their front ends communicating with a breeching for carrying the smoke, &c., from said flues to a chimney,  
 95 said boiler being provided with a water supply pipe, and with a water delivery pipe extending from the top of said boiler to a boiler, or to the boilers, of said lower plane, each boiler of said lower plane being provided  
 100 with a series of tubes extending longitudinally from end to end thereof, and with a boiler wall upon two sides thereof, extending from the front to the rear of the furnace, and having also a boiler front, a bridge wall, and  
 105 grate bars extending from said front to the bridge wall, and forming thereby, a fire or combustion chamber, under each boiler of said lower plane, a flue extending from said chamber toward the rear end of the furnace and  
 110 communicating with a series of tubes of the boiler over said flue, a breeching at the front end of said boiler for conducting the products of combustion from said tubes to the aforesaid flue which is arranged under the boiler  
 115 of the upper plane, and a steam delivery pipe extending from the boiler, or boilers, of said lower plane, substantially as set forth.

3. The combination in a boiler furnace setting, of a nest of boilers of approximately a  
 120 uniform length, arranged parallel with each other in horizontal planes of different elevation, one boiler of the nest lying in the upper plane, and one upon each side thereof in a diagonal direction, lying in the lower plane,  
 125 the boiler of said upper plane having a series of flues extending from end to end thereof and communicating at their front ends with a breeching for conducting the products of combustion from said flues to a chimney, and  
 130 at their rear ends communicating with a flue extending longitudinally with, and under said boiler to its front end, said boiler being provided with a water supply pipe, and with a



water delivery pipe extending from the top  
of said boiler to each boiler of said lower  
plane, each boiler of said lower plane being  
provided with a series of tubes extending lon-  
5 gitudinally from end to end thereof, a boiler  
wall upon two sides of each boiler extending  
from the front to the rear of the furnace, and  
having also, a boiler front, a bridge wall, and  
grate bars extending from said front to the  
10 bridge wall, and forming thereby, a fire or  
combustion chamber, under each boiler of  
said lower plane, a flue extending from said  
chamber toward the rear end of the furnace  
and communicating with the series of tubes  
15 of the boiler over said flue, a breeching at the  
front end of each of said boilers for conduct-  
ing the products of combustion from said  
tubes to the aforesaid flue which is arranged  
under the boiler of said upper plane, and a  
20 steam delivery pipe extending from each  
boiler in said lower plane, substantially as de-  
scribed.

4. The combination in a boiler furnace set-  
ting, of a nest of boilers of approximately a  
25 uniform length, arranged parallel with each  
other in horizontal planes of different eleva-  
tion, one boiler of the nest lying in the upper  
plane, and one upon each side thereof in a  
diagonal direction, lying in the lower plane,  
30 the boiler of said upper plane having a series  
of flues extending from one end thereof to the  
other, and communicating at their front ends  
with a breeching for conducting the products  
of combustion from said flues to a chimney,

and at their rear ends communicating with a 35  
flue extending longitudinally with, and under  
said boiler to its front end, said last named  
flue being divided by a vertical partition  
which is arranged under said boiler, and ex-  
tends from near the rear end of said boiler to 40  
the front of its breeching at the front end  
thereof, said boiler being provided with a wa-  
ter supply pipe, and with a water delivery  
pipe extending from the top of said boiler to  
each boiler of said lower plane, each of said 45  
latter boilers being provided with a series of  
tubes extending longitudinally from end to  
end thereof, a boiler wall upon two sides of  
each boiler extending from the front to the  
rear of the furnace, and having also a boiler 50  
front, a bridge wall, and grate bars extending  
from said front to the bridge wall, and form-  
ing thereby, a fire or combustion chamber,  
under each boiler of said lower plane, a flue  
extending from said chamber toward the rear 55  
end of the furnace and communicating with  
the series of tubes of the boiler over said flue,  
a breeching at the front end of each boiler for  
conducting the products of combustion from  
the tubes thereof to one division of the di- 60  
vided flue which is arranged under the boiler  
of the aforesaid upper plane, and a steam  
delivery pipe extending from each boiler in  
said lower plane, substantially as set forth.

CHRISTIAN A. ANDERSON.

Witnesses:

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