

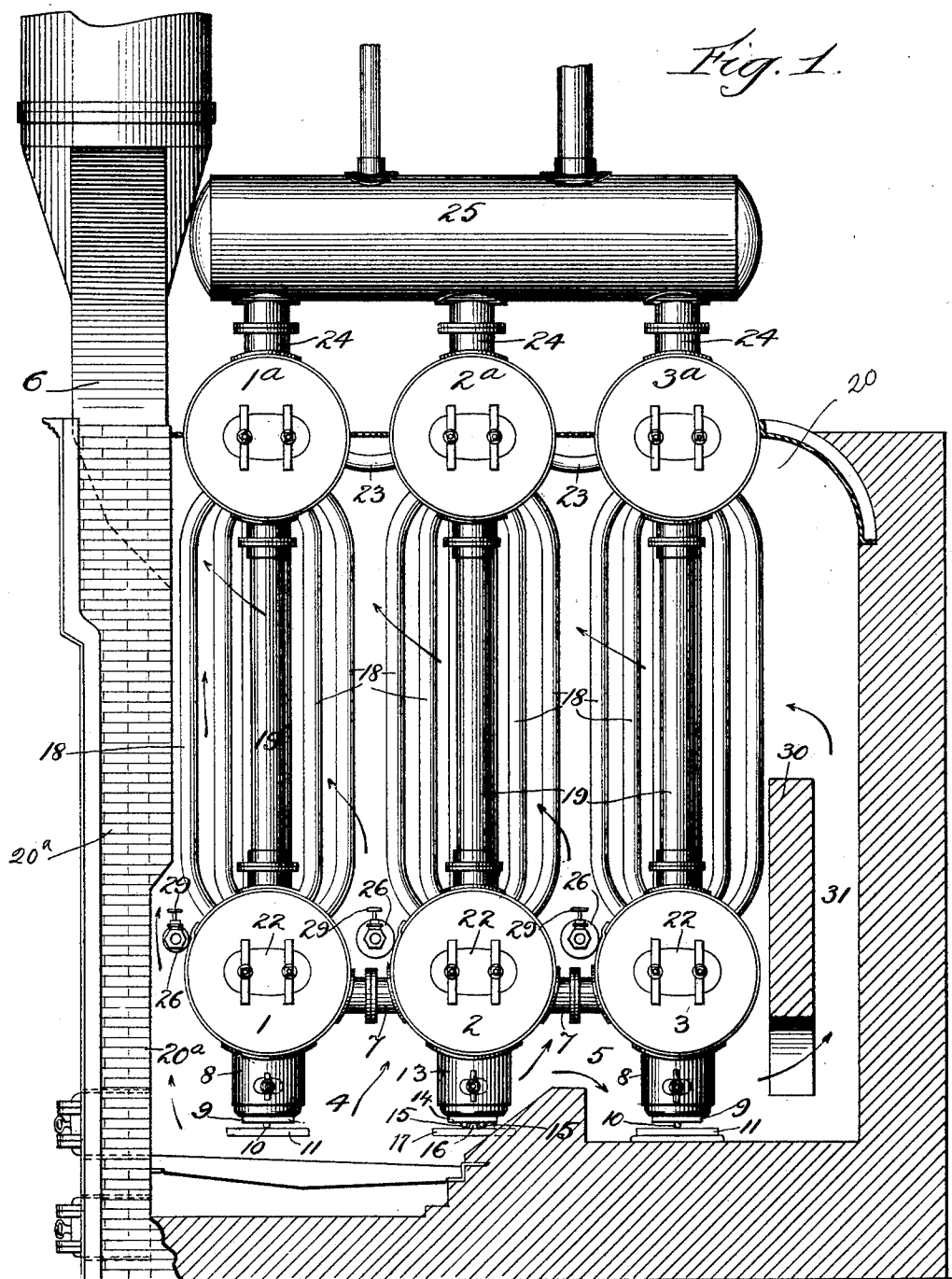
(No Model.)

2 Sheets—Sheet 1.

J. F. WAKEFIELD.
STEAM BOILER.

No. 586,677.

Patented July 20, 1897.



Witnesses
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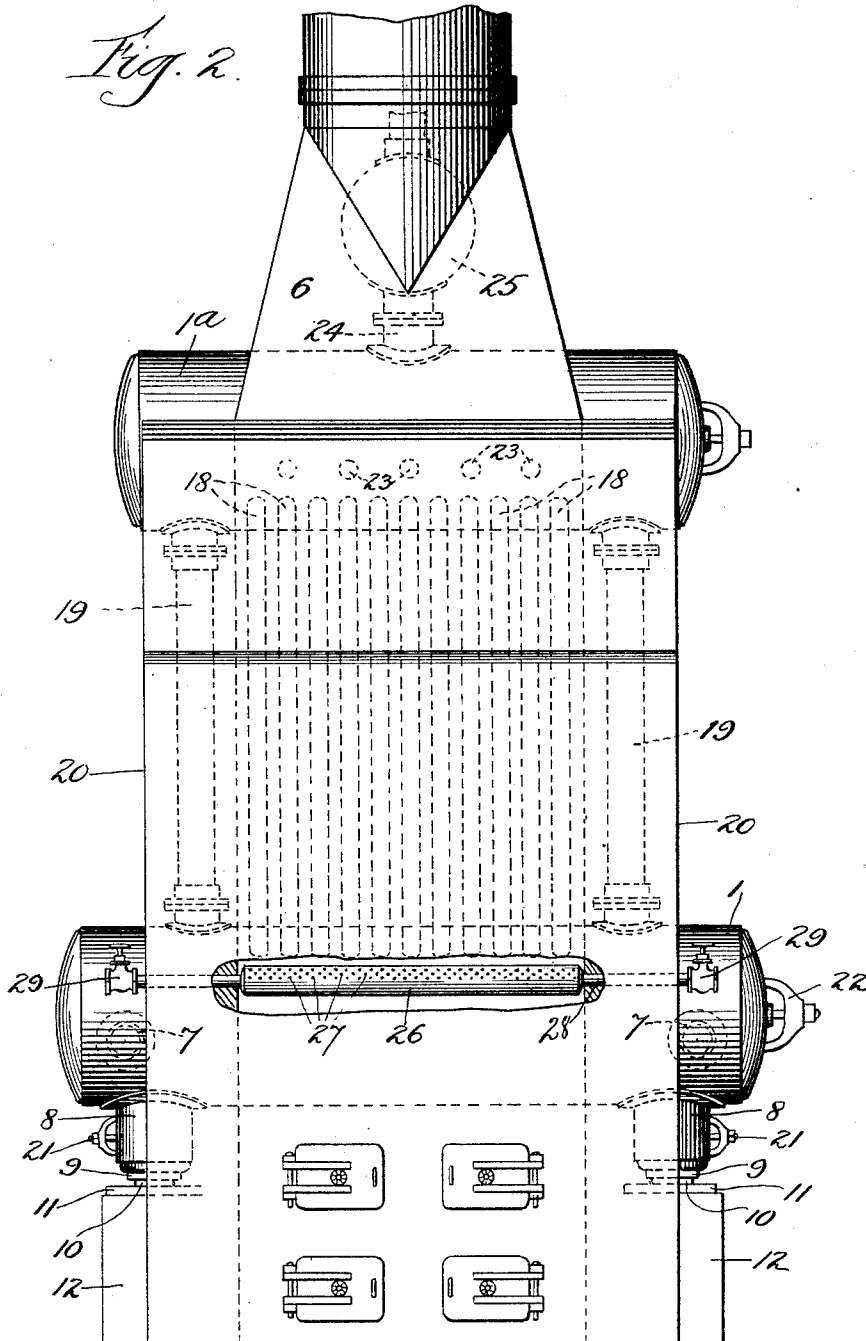
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UNITED STATES PATENT OFFICE.

JOHN F. WAKEFIELD, OF GREEN BAY, WISCONSIN.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 586,677, dated July 20, 1897.

Application filed January 7, 1897. Serial No. 618,249. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. WAKEFIELD, a citizen of the United States, residing at Green Bay, in the county of Brown and State of Wisconsin, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a full, clear, and exact specification.

My invention relates more particularly to that type of steam-boilers in which the steam and water space is composed of a number of drums or shells connected together by smaller pipes or passages exposed to the direct action of the heat and being disposed with a view to inducing circulation.

My improvements have more especial reference to the means for causing positive and energetic circulation and for directing the heat uniformly against all parts of the steam-generating pipes or passages.

One of the objects of my invention is to improve the arrangement and combination of the pipes or passages, whereby more positive and energetic circulation will be induced and the sediment will be deposited at accessible points, whereby it may be readily removed.

Another object of my invention is to so arrange the drums as to make the same serve as deflectors or shields for directing the heat against the more remote tubes or pipes and thus at the same time heating the water in the drums and accelerating the generation of steam.

A further object of my invention is to provide improved chambers or passages for partly bridging the spaces between the drums and to accelerate combustion by air admitted therethrough, while such air also keeps the said chambers cool and prevents them from burning out; and a still further object of my invention is to provide for the expansion and contraction of the parts without strain or injury to the joints.

With these ends in view my invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects hereinafter appearing are attained, all as fully described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a side ele-

vation of my improved boiler, the masonry being broken away to show the interior of the furnace; and Fig. 2 is a front view thereof with the masonry partly broken away, disclosing certain interior portions.

In carrying out my invention I employ a number of drums or shells 1 2 3, which may be of a cylindrical or any other suitable form and which are supported transversely across the combustion-chamber 4 and flameway 5 of the furnace.

Any suitable or desired number of the drums 1 2 3 may be employed, but the number is dependent upon the length of the furnace, and they are so disposed with reference to each other and to the combustion-chamber and flameway as to form a passage under them for the products of combustion and thus prevent all of the products of combustion or heat from escaping directly upward to the uptake 6, arranged at the forward side of the furnace, without equal distribution thereof under and between all of the drums, the space between the drums being therefore proportioned to the volume of heat capable of being produced by the furnace. These drums 1 2 3 preferably extend through the side walls of the furnace and are connected together by necks 7 at each end, and which necks are preferably located outside of the furnace, as indicated in Fig. 2.

The drums might be supported by the masonry where they pass through the walls, but in order that they may readily go and come with reference to each other when expanding and contracting under variations in temperature at least two of them—the end ones—are provided with a sliding or antifriction support. This may be accomplished in various ways that will readily suggest themselves to the mechanic, but I prefer to provide the bottom of each mud-drum 8 with a plate 9, which is supported by antifriction-roller 10 upon a plate 11, the latter being supported upon an abutment 12 on each side of the furnace. The mud-drums 13 of the intermediate drum or shell 2 are provided with plates 14, each having a pair of lugs 15, which engage over either side of a ridge or rib 16, formed on a plate 17, supported upon the abutments 12, thus holding the central drum in a fixed position and preventing it from moving out of

place and allowing the entire series to creep away from their supports.

Arranged at the top of the furnace and over the drums 1 2 3, respectively, is a series of drums 1^a 2^a 3^a, preferably equal in number to the drums 1 2 3, and each connected to the drum immediately below it by a series of steam-generating tubes 18, the upper and lower ends of such tubes being curved inwardly, as indicated in Fig. 1, in order that their upper ends may be tapped into the upper drum as near the bottom thereof as possible and their lower ends into the lower drum as near the top as possible without crowding against the inner tubes of each series. Each pair of upper and lower drums or shells is also connected together at each end by a stand-pipe 19, which is preferably of considerably larger diameter than the tubes 18 and is arranged within the masonry 20, as clearly shown in Fig. 2, so that such pipes 19 will be shielded from the direct action of the heat, and consequently will be much cooler than the tubes 18 and will afford free passages at the ends of the drums for the downward circulation of the water, the upward circulation being of course induced by the impingement of the heat against the tubes 18, which carry the water upward into the upper series of drums, and in throwing it in both directions toward the ends of the drums induces the cooler water in the pipes 19 to descend and carry with it the sediment and other impurities thrown up by the ascending currents in the tubes 18. In order that the sediment thus descending in the pipes 19 may be caught in the lower drums and prevented from again rising through the tubes 18, the mud-drums 8 13 are arranged one under each of the pipes 19 and are also located on the exterior of the masonry, where access may be had thereto through suitable manholes 21, the ends of the drums or shells 1 1^a, &c., being also provided with manholes 22 for the introduction of a scraping instrument for pushing any sediment that may settle between the drums 8 13 in either direction into one of such mud-drums. The pipes 19 are sufficiently stout to sustain the upper series of drums.

The drums 1^a 2^a 3^a are also connected together at short intervals with tubes 23, while supported transversely across them and connected thereto by necks 24 is the steam-drum 25.

In order that the spaces between the drums of the lower series may be more nearly closed and the combustion at these points accelerated by the introduction of air, I locate in each of such spaces, above the necks 7, a transverse air pipe or chamber 26, which is provided on its upper side and the side adjacent to the fire-box 4 with a series of perforations 27, which discharge the air into the rising current of the products of combustion and thus intensify the heat on the lower ends of the tubes 18. One of these chambers or pipes 26 is also located between the end

drum and the front wall 20^a of the masonry. These pipes or chambers 26 are supported in their described positions by means of pipes 28, passing through the side walls 20 and tapped or otherwise removably secured in the ends of the chambers or pipes 26, and are provided at their outer ends with cocks 29 for regulating the admission of air. The pipes 26 being thus supported by the pipes 28 and being of not greater length than the distance between the side walls 20, it will be seen that when the pipes 26 are burned out or it is desired to remove them for any other cause the pipes 28 may be unscrewed and the pipes 26 thus permitted to drop down into the fire-box 4, whence they may be removed.

As shown in Fig. 1 of the drawings, the air-pipes 26 are preferably arranged nearer to one of the drums than to the other, the wider space being between the side of the pipe having the perforations 27 and the adjacent drum, so that the bulk of the heat and products of combustion will be compelled to pass the side of the pipe 26 from which the air discharges. The purpose of this arrangement is to protect the seam of the rear shell. By thus disposing the drums 1 2 3 and the air-pipes 26 it will be seen that the space over the fire-box 4 and the flameway 5 is closed to such an extent as to compel a requisite proportion of the heat and products of combustion to pass rearwardly through the flameway 5 for heating the rear one of the drums and the tubes 18, connected thereto, and in order that this heat may be compelled to impinge the tubes 18, connecting the rear pair of drums substantially throughout their entire height, I arrange at the rear side of the furnace a deflector or wall 30, so as to form an upwardly-extending passage 31. This deflector or wall is in the form of an arch, as appears in Fig. 1, and is arranged in close propinquity to the rear side of the rear drum 3, so that the products of combustion will be compelled to pass under the arch and thence upwardly through the passage 31 and impinge the rear series of tubes 18 in their course to the uptake 6.

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

1. The combination with a furnace, of a series of drums arranged transversely across said furnace and having contracted spaces between them, a second series of drums arranged over said first series, pipes connecting said upper and lower drums together, a partition or deflector arranged between the rear wall of the furnace and the rear one of said drums and having a passage under it, and an uptake arranged at the opposite end of said furnace whereby the heat and products of combustion will be compelled to pass under said first series of drums and to said uptake via the space between said partition and rear wall of the furnace, substantially as set forth.

2. The combination with a furnace, of a series of drums arranged transversely across said furnace and having contracted spaces between them, perforated air passages or chambers located between said drums, a second series of drums located over said first series, tubes connecting said upper drums with the lower ones, a deflector or partition arranged contiguous to the rear one of said drums and forming the passage 31 extending upwardly to the upper portions of said tubes, and an uptake arranged at a point remote from said partition, substantially as set forth.

3. The combination with a furnace, of a series of drums arranged transversely across said furnace, perforated air-chambers arranged between said drums and nearer to one drum than to the other, the perforations being located upon the side adjacent to the farther drum, a second series of drums located above said first series, and tubes connecting the two series of drums together, substantially as set forth.

4. The combination with a furnace, of a series of drums arranged transversely across said furnace, the perforated air-pipes 26 and the pipes 28 extending through the walls of the furnace and removably supporting said pipes 26, substantially as set forth.

5. The combination with a furnace, of a series of drums arranged transversely across said furnace, the necks 7 arranged on the exterior of said furnace and connecting said drums together, the perforated air-pipes 26 arranged in said furnace between said drums and being of less length than the distance between said necks 7, and the supporting-pipes 28 removably secured to said pipes 26, substantially as set forth.

6. The combination with a furnace, of a drum extending across said furnace, a second drum arranged over said first drum, a series of tubes connecting said drums to-

gether, and pipes located in the masonry of the furnace and connecting the ends of said drums together and supporting the upper drum, substantially as set forth.

7. The combination with a furnace, of a drum extending across said furnace and having a mud-drum at the end thereof, a second drum located over said first drum and being connected thereto by tubes arranged within the furnace, and a pipe shielded from the direct action of the heat and connecting said drums together at a point substantially over said mud-drum, substantially as set forth.

8. The combination with a furnace, of a drum extending across said furnace and having its end protruding therefrom, a mud-drum depending from said protruding end, a second drum extending across the furnace over and above said first drum and being connected thereto by tubes located within the furnace, and a pipe connecting said upper drum with said lower drum and being located at a point substantially over said mud-drum, substantially as set forth.

9. The combination with a furnace, of a series of drums extending thereacross and being connected together, the intermediate drum of said series being fixed against movement, and antifriction devices supporting the other of said drums, substantially as set forth.

10. The combination with a furnace, of the abutment-walls 12, a series of drums extending across said furnace and having the mud-drums arranged over said abutment-walls, the plates 11 17, the plates 9 14 secured to the bottoms of said drums, the antifriction-rollers 10, the rib 16 and lugs 15, substantially as and for the purpose set forth.

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Witnesses:

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