

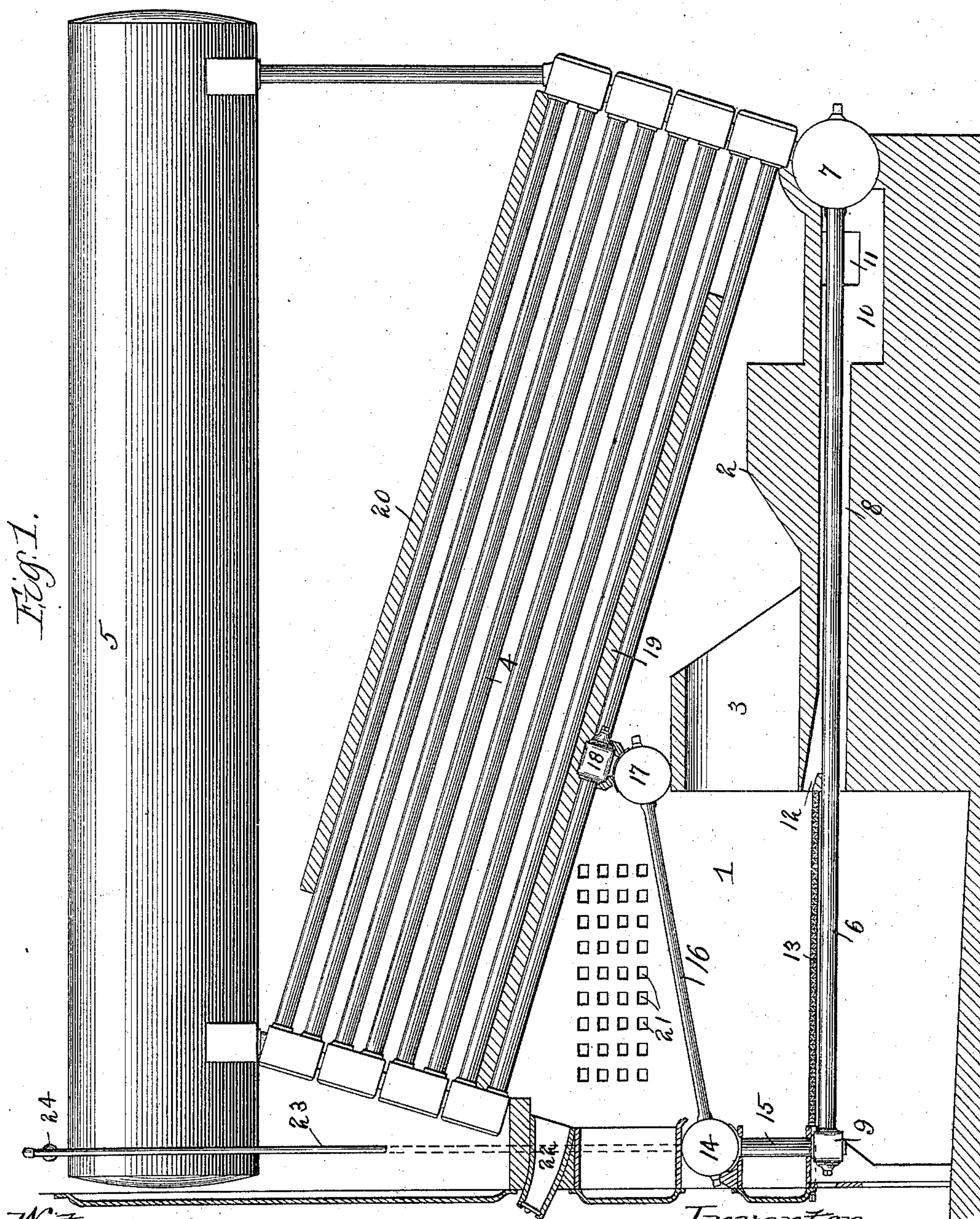
(No Model.)

2 Sheets—Sheet 1.

J. A. BALDWIN.
DOWNDRAFT FURNACE.

No. 575,200.

Patented Jan. 12, 1897.



Witnesses
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(No Model.)

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Fig. 3.

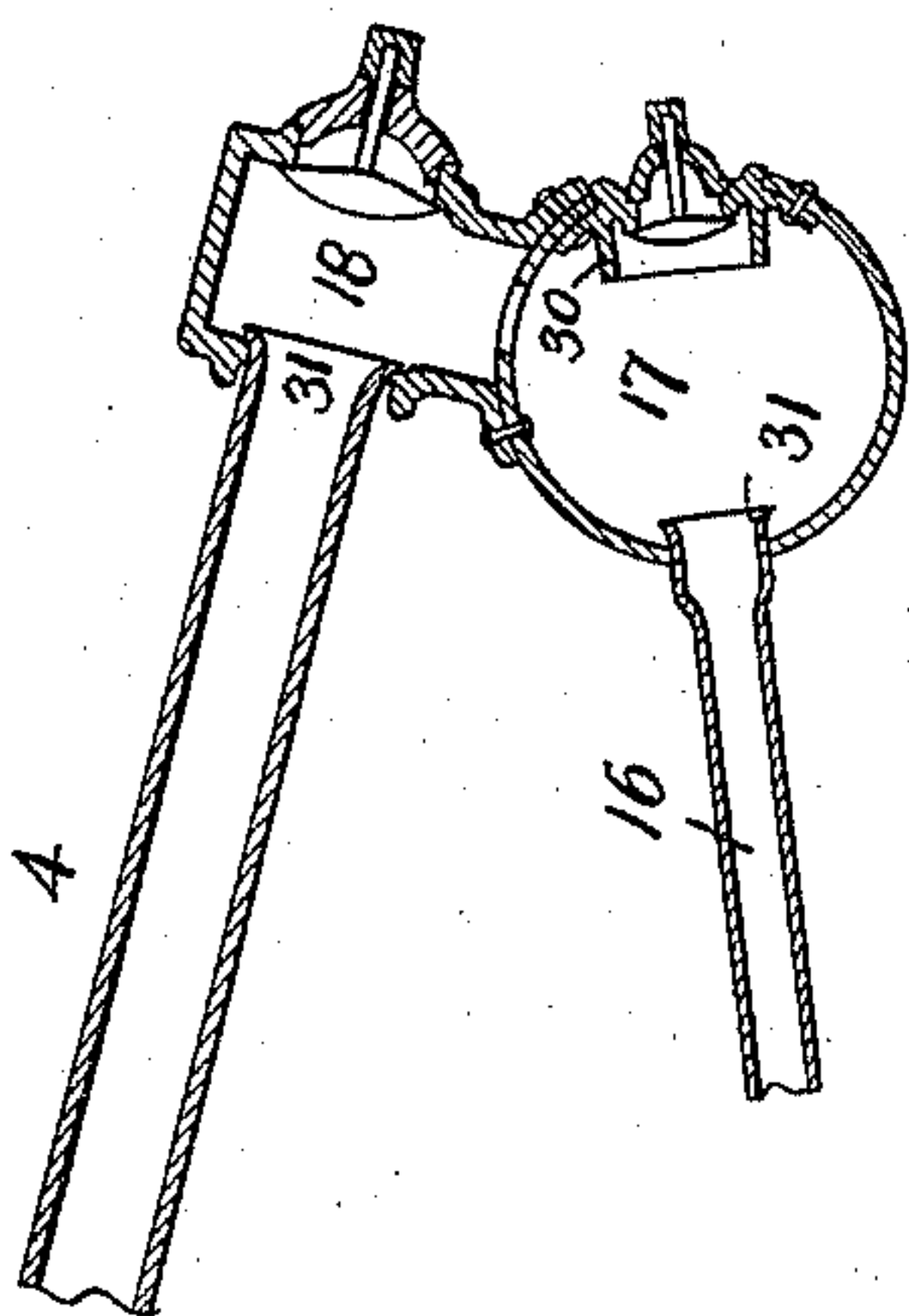
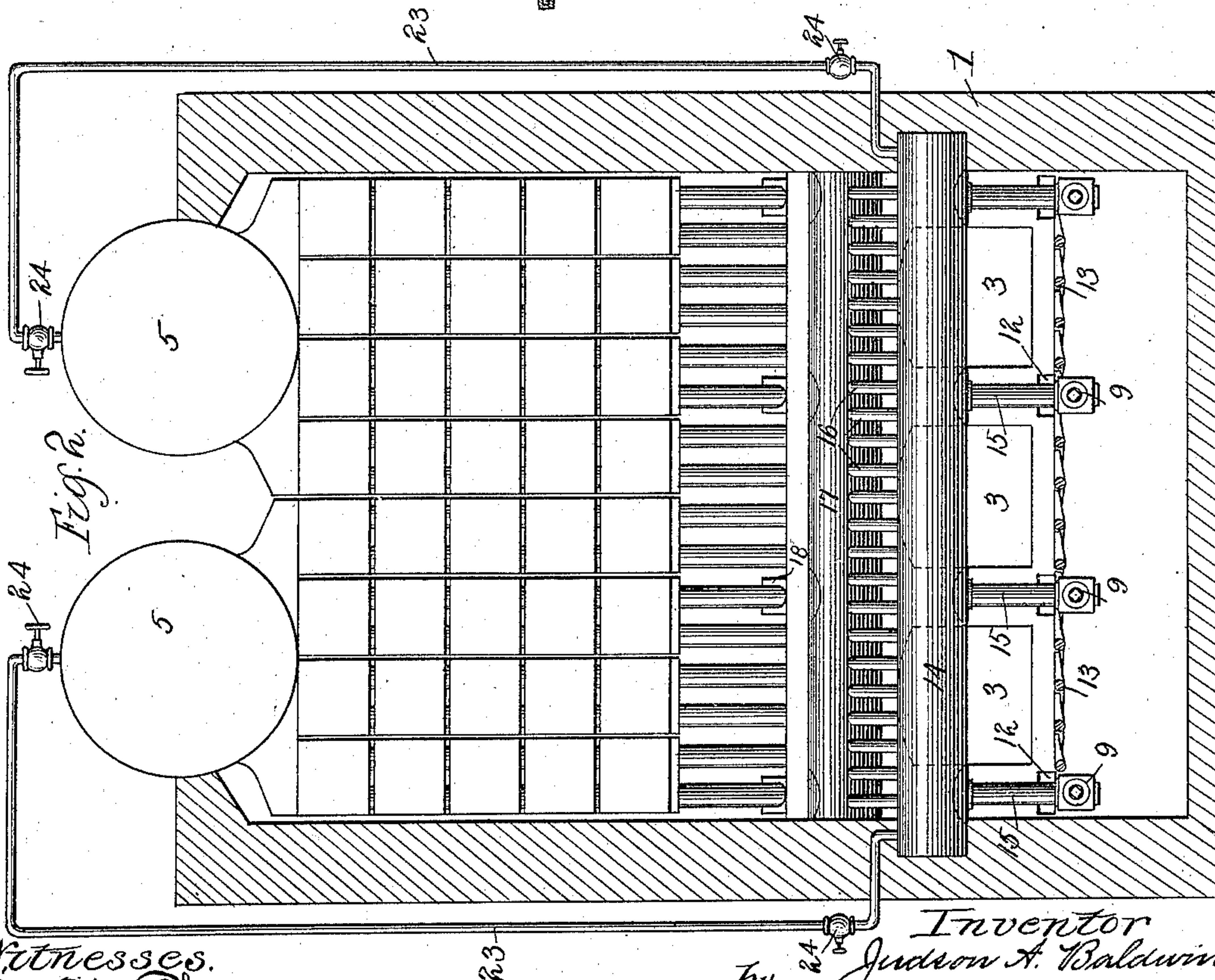
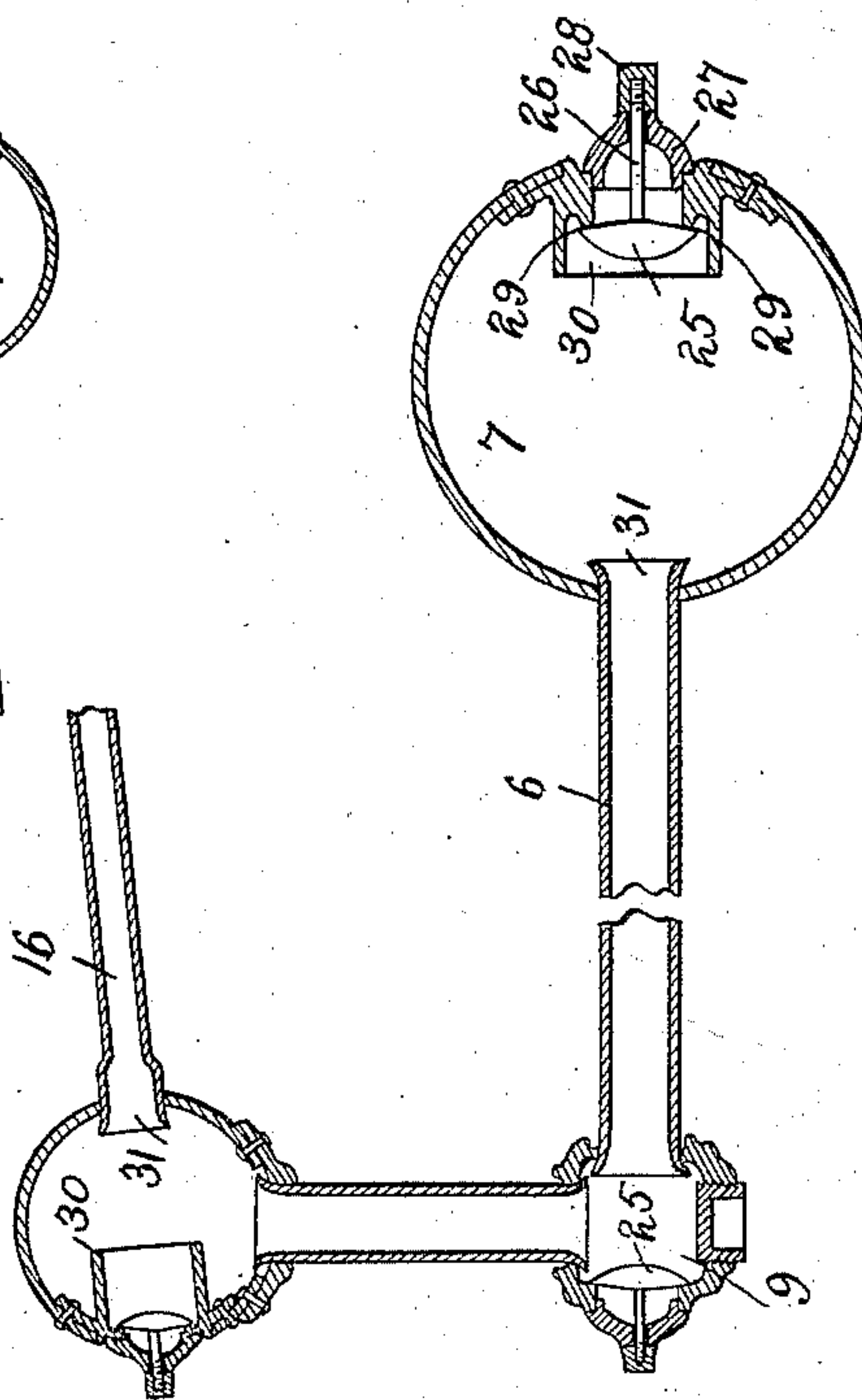


Fig. 4.



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UNITED STATES PATENT OFFICE.

JUDSON A. BALDWIN, OF CHICAGO, ILLINOIS, ASSIGNOR TO GEORGE W. HALE, OF SAME PLACE.

DOWNDRAFT-FURNACE.

SPECIFICATION forming part of Letters Patent No. 575,200, dated January 12, 1897.

Application filed March 16, 1896. Serial No. 583,366. (No model.)

To all whom it may concern:

Be it known that I, JUDSON A. BALDWIN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Downdraft-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My present invention relates to certain new and useful improvements in downdraft-furnaces and of the type employing a series of circulating pipes and drums, as illustrated and described in Letters Patent granted to me, No. 470,171, dated March 8, 1892, and No. 518,576, dated April 17, 1894; but it will be understood that the improvements herein described are not limited in their application to the particular type of furnace referred to in the above-mentioned patents.

One of the primary objects of this invention is to provide means for preventing the accumulation of steam in the grate-tubes and the drums connected therewith and maintain them at all times full of water in a solid condition.

Another object of the invention is to maintain a circulation of air around the lower water-tubes to keep these tubes cool and maintain a better circulation of the water therein and admit the air, which is heated by contact with the tubes, into the combustion-chamber in front of the bridge-wall at the principal point of combustion.

A further object of the invention is to secure the tubes in the drums by expanding their ends in the drums.

With these and other ends in view the invention consists in the peculiar construction and arrangement of parts hereinafter described in connection with the accompanying drawings, referring to which—

Figure 1 is a sectional view of my improved furnace applied under a steam-generator. Fig. 2 is a transverse sectional view taken on a line just behind the front of the furnace. Fig. 3 is a sectional view showing the manner of securing the water-tubes in the drums, and Fig. 4 is a detail view of one of the caps.

In the drawings, 1 designates the setting

of a downdraft-furnace under a boiler or steam-generator, and 2 the usual bridge-wall, in front of which is an arch 3, adapted to hold the heat and promote combustion. Circulating-pipes 4 are supported above the bridge-wall, and one or more upper boiler-drums 5 are arranged above the circulating-tubes in a manner well known in the art. In the drawings the furnace is shown under a steam-generator, but it is adapted for use in a similar manner under a boiler.

The water-tubes 6 are connected at their rear ends to a mud-drum 7, and they pass through channels 8 in the lower part of the bridge-wall to the front of the furnace, where they are connected to the headers 9. These channels 8 are large enough to permit the free circulation of air entirely around each tube 6, and a chamber 10 is provided at the rear end of the bridge-wall, which communicates with said channels 8 and also through openings 11 to the outside of the furnace, whereby fresh air is admitted to the chamber 10 and to the channels 8 and a circulation maintained around the tubes 6 from the rear to the front of the chamber. The forward ends of the channels 8 are inclined upwardly, as shown at 12, so that the circulation of air is directed to the principal point of combustion in the furnace directly in front of the arch 3, whereby fresh air is supplied and the combustion at this point greatly increased. Dumping ash-plates 13 are arranged above the tubes 6 and may be operated in a manner well known in the art.

A front furnace-drum 14 is supported in the front of the chamber, and it is connected to the headers 9 and tubes 6 by vertical tubes 15. The grate is composed of a number of tubes 16, which are connected to the drum 14 and another drum 17. This drum 17 is provided with chambers 18 on its upper side adapted to receive the ends of some of the circulating-tubes 4 in the lower series thereof. Tiling 19 and 20 are provided in order to maintain a circulation of the heated air and products of combustion through the circulating-tubes, from the rear to the front thereof, and air-ducts 21 and an air-course 22 are provided to afford a downdraft through the water-tube grate and the fuel thereon.

The water circulates from the tubes 6, through the tubes 15, into the drum 14, through the water-tube grate 16 to the drum 17, and into the circulating-tubes 4, and in order to prevent the formation and accumulation of steam in the drum 14, which would have a tendency to destroy the solidity of the water flowing through the tubes and drums, I connect this drum 14 with the upper part of a boiler or the upper boiler-drums 5 of steam-generators by means of the pipes 23, which are provided with suitable cocks 24. These pipes allow the steam or air which may be formed in the furnace-drum 14 to pass upward and into the upper boiler-drums 5, and therefore the drum 14 is always maintained full of water. If steam is allowed to accumulate, the water-level in this drum 14 will fall considerably, and the upper portion of the drum is therefore liable to be burned out by reason of the intense heat; but by the use of these pipes 23 the steam immediately ascends to the upper boiler-drums 5, and the furnace-drum is allowed to remain full of water.

In order to secure the ends of the water-tubes in the drums in the most advantageous manner, I provide for expanding the ends of said tubes after they have been suitably entered in openings provided in the drums. Any form of expander adapted for the purpose may be employed, and in order that it may be inserted in the drum I provide openings in the sides of the drums opposite to the tubes entered therein, which openings are closed by means of the caps 25, provided with stems 26, which project through the plates 27, and they are secured by means of nuts 28. These caps are of substantially the shape shown in Fig. 4 of the drawings, and they are adapted to be seated against the shoulders 29 within the drums, which shoulders are so arranged that the caps may be turned into a position to be removed from the drums when the said caps are disengaged from the shoulders.

It will be observed by reference to the particular construction shown in Fig. 3 of the drawings that the shoulders 29 in the drums are formed on castings 30, secured to the drums within the same in a suitable manner; but it is obvious that the shoulders may be otherwise formed, if desired.

In arranging the tubes in place the ends thereof are inserted in openings provided for them in the drums, and then the expanders are inserted in the drums through the opposite openings and the tubes expanded. The ends of the tubes having been properly expanded, as indicated at 31, the expanders are withdrawn and the caps 25 inserted and secured in place by means of the plates 27 and nuts 28.

The advantages of the several points of construction herein pointed out and illustrated will be obvious to those skilled in the art, and they are particularly important in promoting the combustion in the combustion-chamber

and providing for a perfect circulation of the water in the various tubes without danger of steam accumulating therein and interfering with the circulation. The general features of the furnace, with the exception of those herein described and claimed as my improvements, are substantially the same as those of furnaces of this type now in use, and it will therefore not be necessary to go into a detailed description thereof, the drawings and description herein being sufficient to properly show the application of my invention.

I am aware that changes in the form and proportion of parts and details of construction of my invention may be made without departing from the spirit and without sacrificing the advantages thereof, and I would therefore have it understood that I reserve the right to make all such changes as fairly fall within the scope and spirit of my invention.

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

1. In a downdraft-furnace, the combination with a boiler or steam-generator and a system of circulating water-tubes feeding upwardly, of a drum located in the front part of the furnace, the water-tubes connected therewith, and connections intermediate of said drum and the top of said boiler or generator to permit the escape of steam or air from the top of the drum to the top of said boiler or generator above the water-line therein, substantially as described.

2. In a downdraft-furnace, the combination with a boiler or steam-generator and a system of circulating water-tubes feeding upwardly, of a drum located in front of the combustion-chamber and extending transversely across the chamber, the water-tubes connected to said drum, and pipes connected at or about the ends of said drum to the top thereof and extending up to and opening into the top of said boiler or generator above the water-line therein, substantially as described.

3. In a downdraft-furnace, the combination with a boiler or steam-generator and a system of circulating water-tubes, of means for cooling a portion of the lower water-tubes and supplying an upward draft of heated air to the combustion-chamber, substantially as described.

4. In a downdraft-furnace, the combination with a boiler or steam-generator and a system of circulating water-tubes, of a bridge-wall, an arch in advance of said bridge-wall, and means for maintaining a circulation of air around a portion of the lower water-tubes to cool the same and supplying an upward draft of heated air to the combustion-chamber immediately in front of said arch, substantially as described.

5. In a downdraft-furnace, the combination with a boiler or steam-generator and a system of circulating water-tubes, of a bridge-wall, an arch in advance of said bridge-wall, and

air-channels formed around the water-tubes below the bridge-wall and arch, substantially as described.

6. In a downdraft-furnace, the combination
5 with a boiler or steam-generator and a system of circulating water-tubes, of a bridge-wall, an arch in advance of said bridge-wall, the lower water-tubes passing beneath the bridge-wall and arch, air-channels formed around
10 said water-tubes, and a chamber communicating with said air-channels and provided with openings in the side of the furnace, substantially as described.

7. In a downdraft-furnace, the combination
15 with a boiler or steam-generator, a bridge-wall and an arch in advance of said bridge-wall, of a system of circulating water-tubes, the lower water-tubes passing beneath the

bridge-wall and arch and extending to the front of the furnace, dumping ash-plates arranged above the forward portions of said
20 lower water-tubes, an air-chamber around the rear portions of said lower water-tubes and provided with openings in the side of the furnace, and air-channels around the inter-
25 mediate portions of the said water-tubes communicating with the said air-chamber and adapted to supply an upward draft of heated air above the rear end of the said dumping ash-plates and immediately in front of the
30 arch, substantially as described.

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