

No. 616,565.

Patented Dec. 27, 1898.

A. A. M. E. D'ABOVILLE.

WATER TUBE BOILER.

(Application filed Sept. 17, 1897.)

(No Model.)

2 Sheets—Sheet 1.

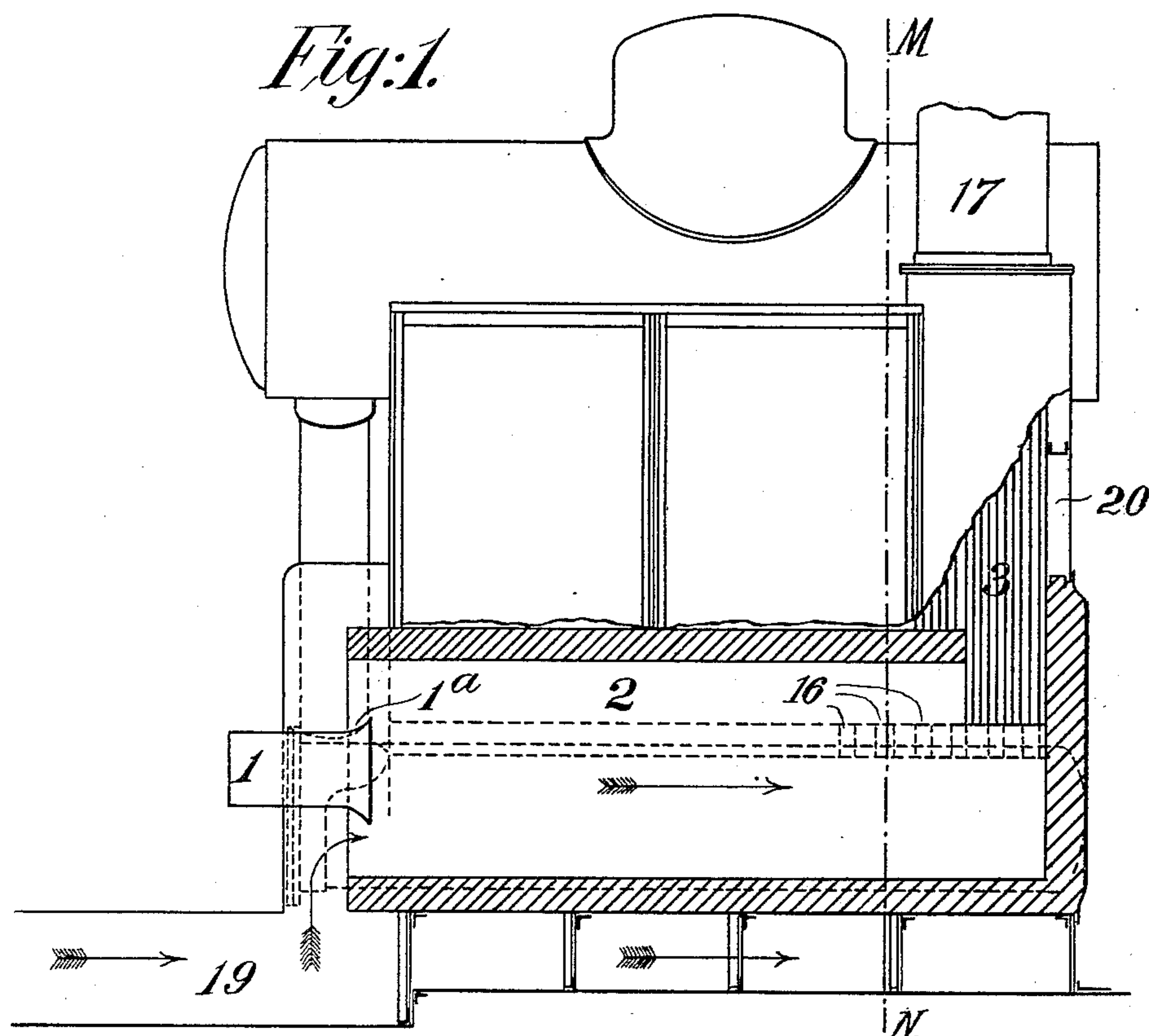
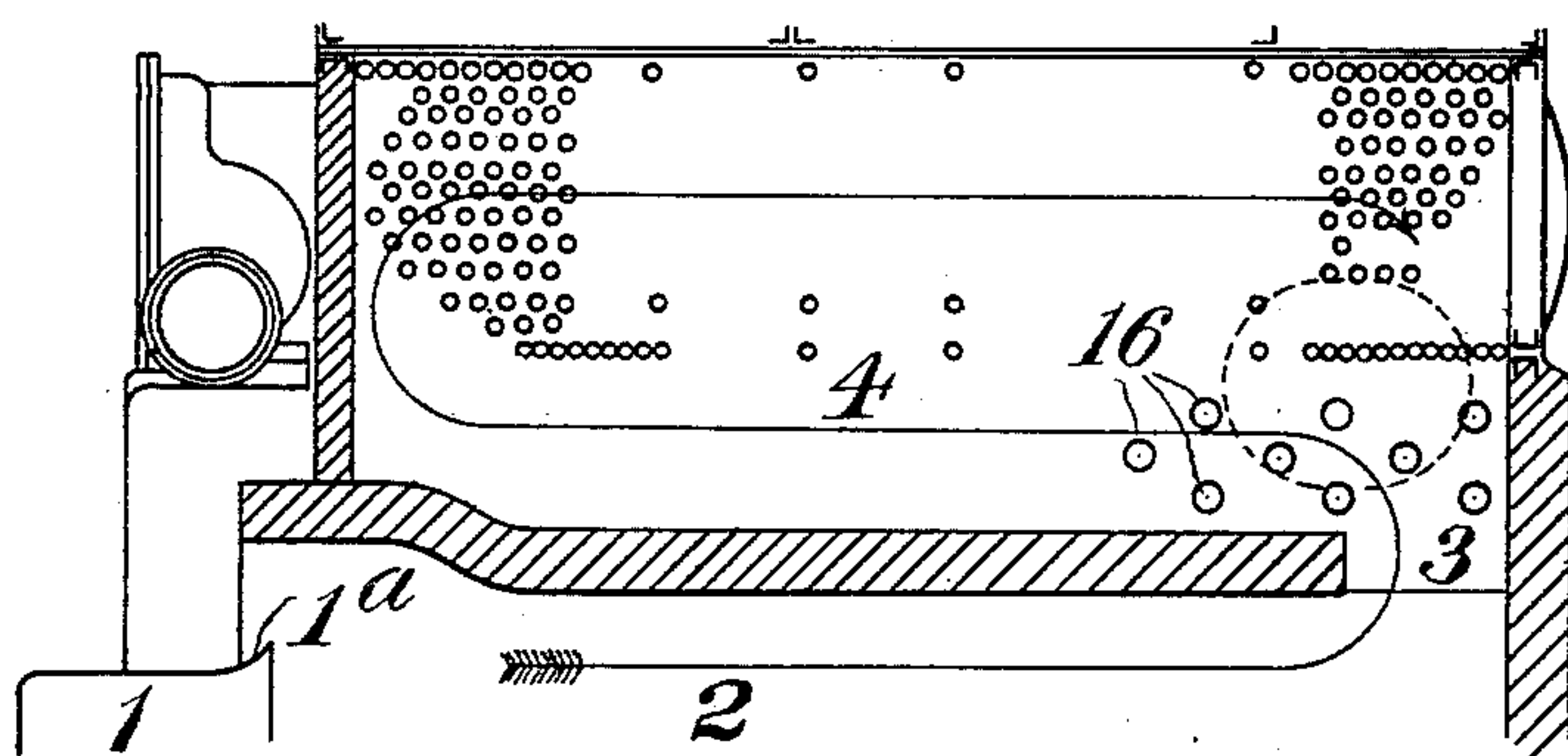


Fig: 2.



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Fig. 3.

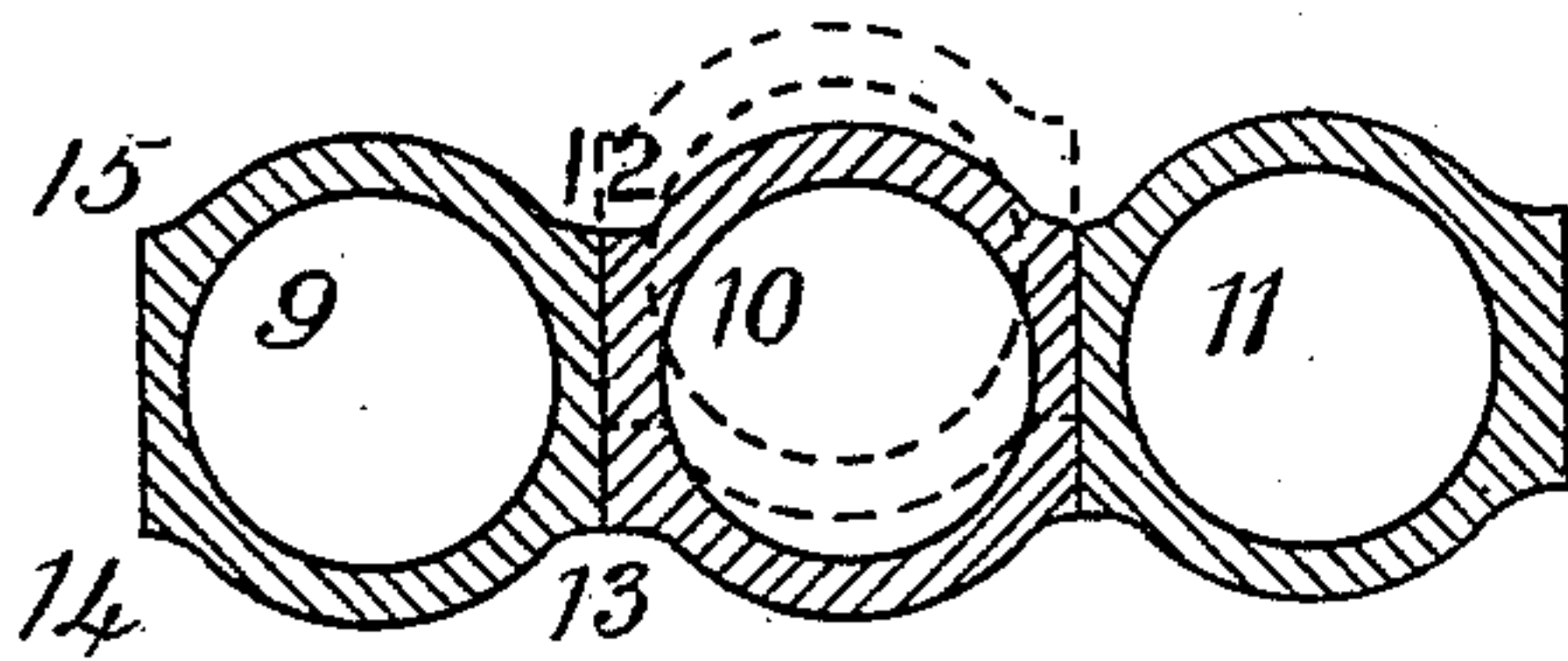
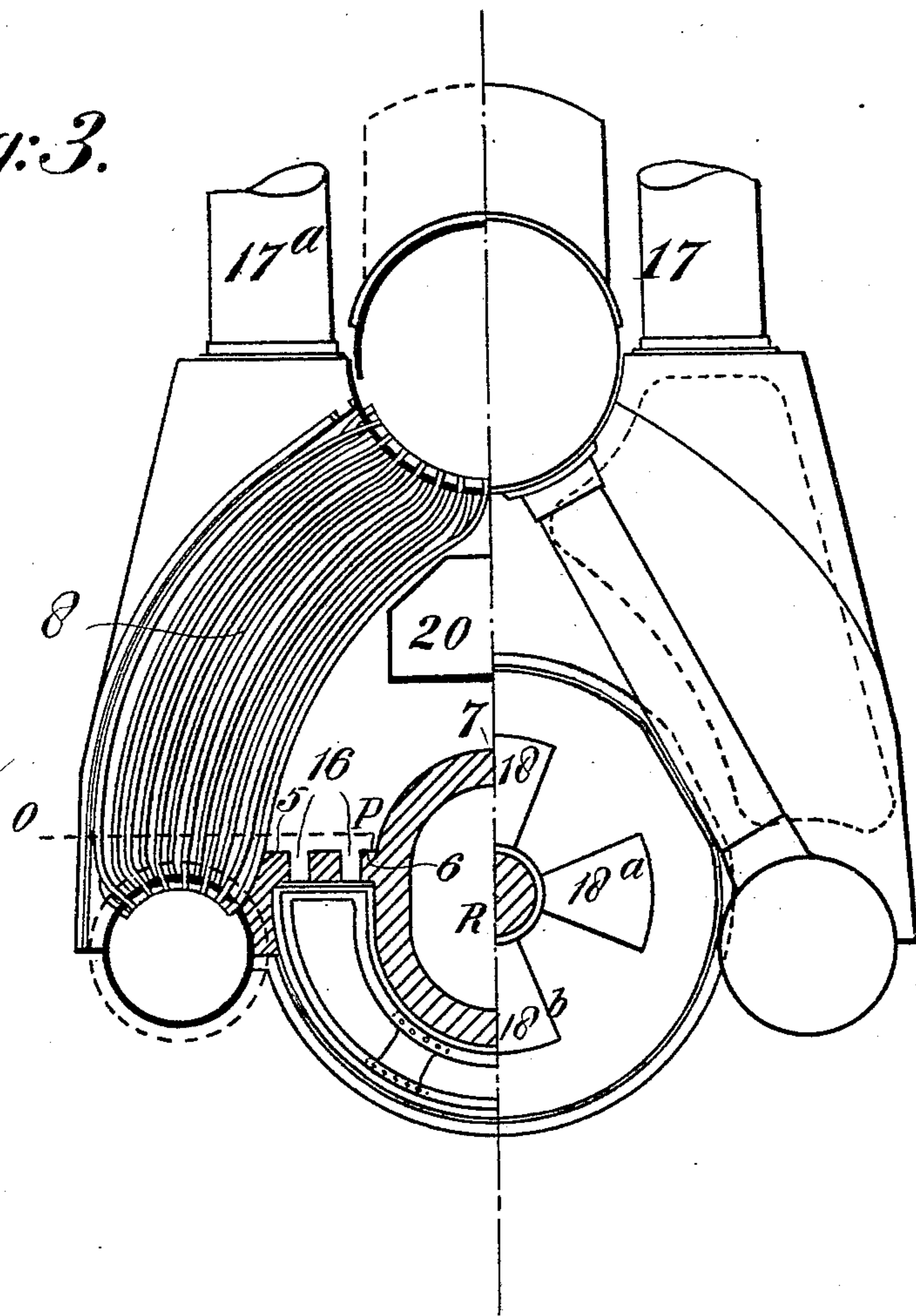


Fig. 4.

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UNITED STATES PATENT OFFICE.

AUGUSTIN ANATOLE MARIE ELIE D'ABOVILLE, OF CHERBOURG, FRANCE.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 616,565, dated December 27, 1898.

Application filed September 17, 1897. Serial No. 652,083. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTIN ANATOLE MARIE ELIE D'ABOVILLE, gentleman, of Cherbourg, in the Republic of France, have invented a new and useful Improvement in Water-Tube Boilers, (for which I have made application in foreign countries as follows: French Patent No. 264,221, filed on the 19th of February, 1897; British Patent No. 14,686, filed on the 17th of June, 1897; Italian Patent No. 45,088, filed on the 18th of June, 1897, and German Patent No. 99,876, filed August 22, 1898,) of which the following is a specification.

My invention relates to a water-tube boiler for use with liquid fuel. This boiler belongs to the type of boilers having small water-tubes with reversal of the flame in which the current of hot gases traverses the tube system horizontally and in the direction of the depth of the furnace. It is distinguished from similar constructions already known by this special arrangement, which while avoiding an excessive length of boiler permits of the attainment as completely as possible of the combustion of the gases before their introduction among the boiler-tubes.

Referring to the accompanying drawings, Figure 1 is a vertical section through the axis of the boiler. Fig. 2 is a semisection (longitudinal) through the boiler, following the dotted line O P Q R of Fig. 3. Fig. 3 represents on the left side a half-section (transverse) on the line M N of Fig. 1, and on the right side shows the semi-elevation of the front of the boiler. Fig. 4 shows a transverse section of three combined adjacent tubes.

The piece marked 1 indicates the position of the pulverizer, the jet or jets from which are directed along the axis of the cylindrical muffle of refractory fire-brick 2 or the like, which extends to the back of the boiler. This muffle forms the furnace, strictly speaking. The air necessary for the combustion is supplied at its front end. The heated gases escape at the opposite end through the opening 3 in the combustion chamber 4. This combustion-chamber is limited at its lower part by the base of refractory material 5 6 7, and at its ends by the front and back plates of the boiler, and at its upper part and sides by an

arch of joined tubes. This arch of tubes is interrupted at the front part by the suppression of several of the said tubes, and thus permits the gases to reach the tube system 8. In order to secure the tightness of these partitions or arches formed of joined tubes notwithstanding the displacement which may cause deformations of the tubes along the line of their axis, I give these tubes the special shape clearly shown in Fig. 4 of the drawings, which figure represents in transverse section three adjacent tubes 9, 10, and 11, forming the part of a partition formed according to my invention, the dotted tube-section indicating the displacement of the middle tube 10. I give these tubes such an external shape that each of them is in contact with the adjacent tubes over a relatively considerable flat surface 12 13, so that the displacement of a tube in the plane perpendicular to that of the partition can take place without affecting the tightness of the partition. This will be clearly understood by reference to the accompanying drawings, Fig. 4. In consequence of this special shape the displacement of one tube with relation to the others does not destroy the contact of the adjacent tubes, provided, of course, that this displacement remains within certain limits. The tubes are reduced to the cylindrical form at their ends in any suitable manner, such as by the removal of the projections 12 13 14 15. No modification of the usual method of attachment is then necessary. It is obvious that other constructional forms than that represented are possible with these tubes and that the essential principle of this device consists simply in providing the said tubes with plane surfaces on their opposite sides, which surfaces in the partition or arch are placed more or less perpendicularly to the plane of the said arch. The fire-brick base 5 6 7 through its radiation opposes the refrigerating action of the tube-arch upon the current of heated gases. On the other hand, the openings 16, placed close to the exit of the muffle, give supplementary supplies of air previously heated by contact with the muffle. These supplies intermingle with the gases and complete the combustion. After this point the said gases are introduced into the tube sys-

tem 8, which is devised to utilize their heat. They finally escape through the chimneys 17 17^a, placed behind. Between their entrance and their exit from the boiler the gases have
 5 to pass through this length three times, the said passages being respectively through the furnace, through the combustion-chamber, and through the boiler system, which finally collects the caloric produced. In the furnace
 10 the combination of the oxygen and of the combustible is effected by means of a surrounding inclosure of refractory material at a very high temperature, a condition extremely favorable to perfect combustion. The return
 15 and expansion of the heated gases during their passage into the combustion-chamber and the supplementary supplies of air in the direction followed by the current of gases in the said chamber aid in effecting the complete
 20 combustion of the gases and their thorough combination. The heated receiver finally has the form already known as that giving the best result for boilers provided with small water-tubes. Certain details require special
 25 attention. The boiler may act by means of natural draft or forced draft. In the first case the openings 18 18^a 18^b are uncovered by the removal of a damper. The air is drawn in by the pulverizer 1, which then acts as an
 30 aspirator. In the case of forced draft the same openings 18 18^a 18^b are closed and the air is supplied by an apparatus the tube 19 of which is closed below the floor of the stove-hole. In order to prevent the current of air
 35 extinguishing the jets of the pulverizer, this apparatus is provided with a protecting-shield 1^a, slightly trumpet-shaped. The door 20, placed at the hinder end, gives access to

the combustion-chamber and permits repairs being effected in the muffle. 40

What I claim is—

1. In a water-tube boiler with liquid fuel, a furnace-chamber of refractory material extending the whole length of the boiler, a combustion-chamber surrounding the said furnace-chamber, a series of flat-sided absolutely contiguous water-tubes forming the arch of the said combustion-chamber, a refractory heat-retaining floor to the said combustion-chamber, and means for admitting
 45 supplies of air to the said combustion-chamber. 50

2. In a water-tube boiler with liquid fuel, a combustion-chamber having a floor of refractory heat-retaining material, an arched
 55 cover formed of absolutely contiguous water-tubes having their adjacent sides flat their non-adjacent sides curved, and their ends cylindrical, and ports for the supply of heated air to the combustion products in the said
 60 chamber. 65

3. In a water-tube boiler with liquid fuel, the combination of the refractory muffle 2, the combustion-chamber 4, the refractory heat-retaining base 5, 6, 7 with air-inlets 16,
 65 the arched cover of absolutely contiguous flat-sided water-tubes 9, 10, 11, and the tube system 8, substantially as described.

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

AUGUSTIN ANATOLE MARIE ELIE D'ABOVILLE.

Witnesses:

ALEXANDRE CANTIRSAM,
 FRANÇOIS NICOL.