

No. 879,623.

PATENTED FEB. 18, 1908.

H. H. FREEMAN.
SMELTING FURNACE FOR COPPER AND OTHER ORES.

APPLICATION FILED OCT. 11, 1906.

2 SHEETS—SHEET 1.

FIG. 1

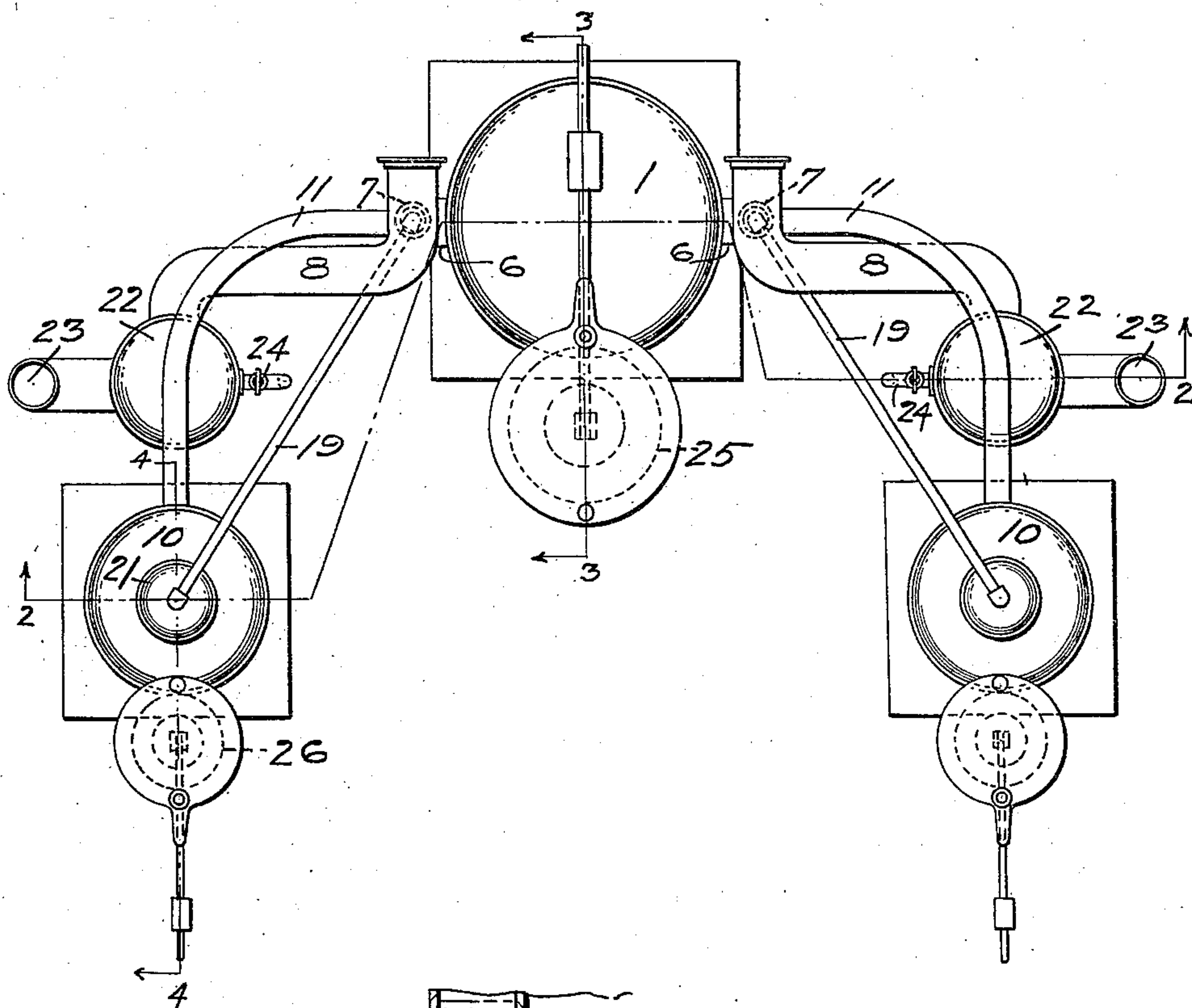


FIG. 5

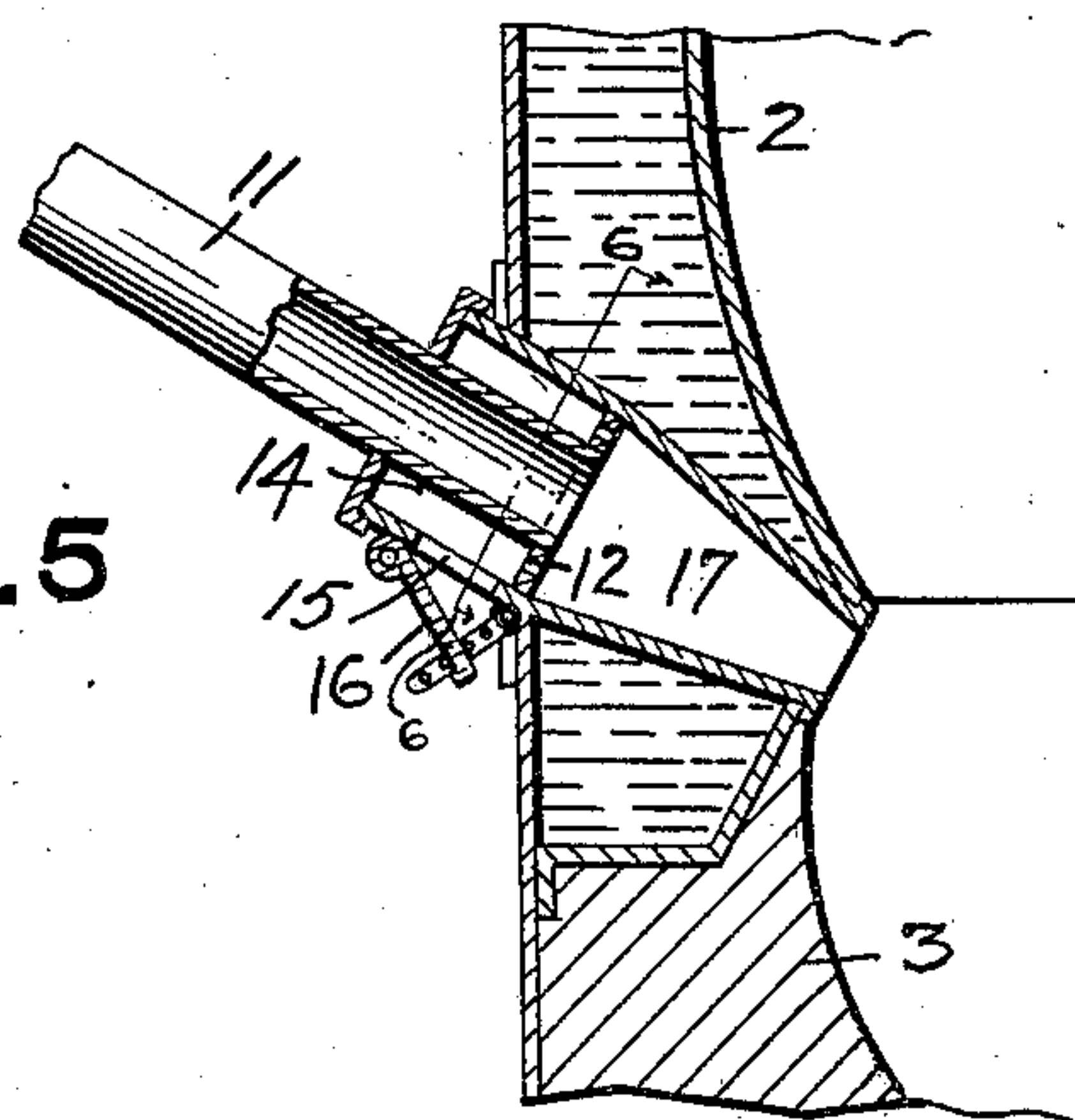
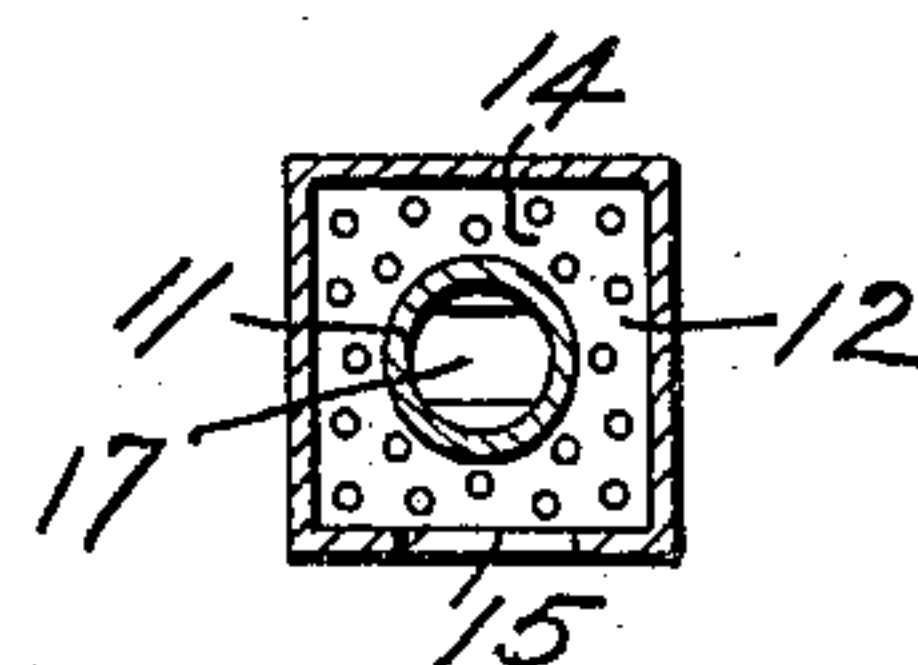


FIG. 6



WITNESSES.

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2 SHEETS—SHEET 2.

FIG. 3

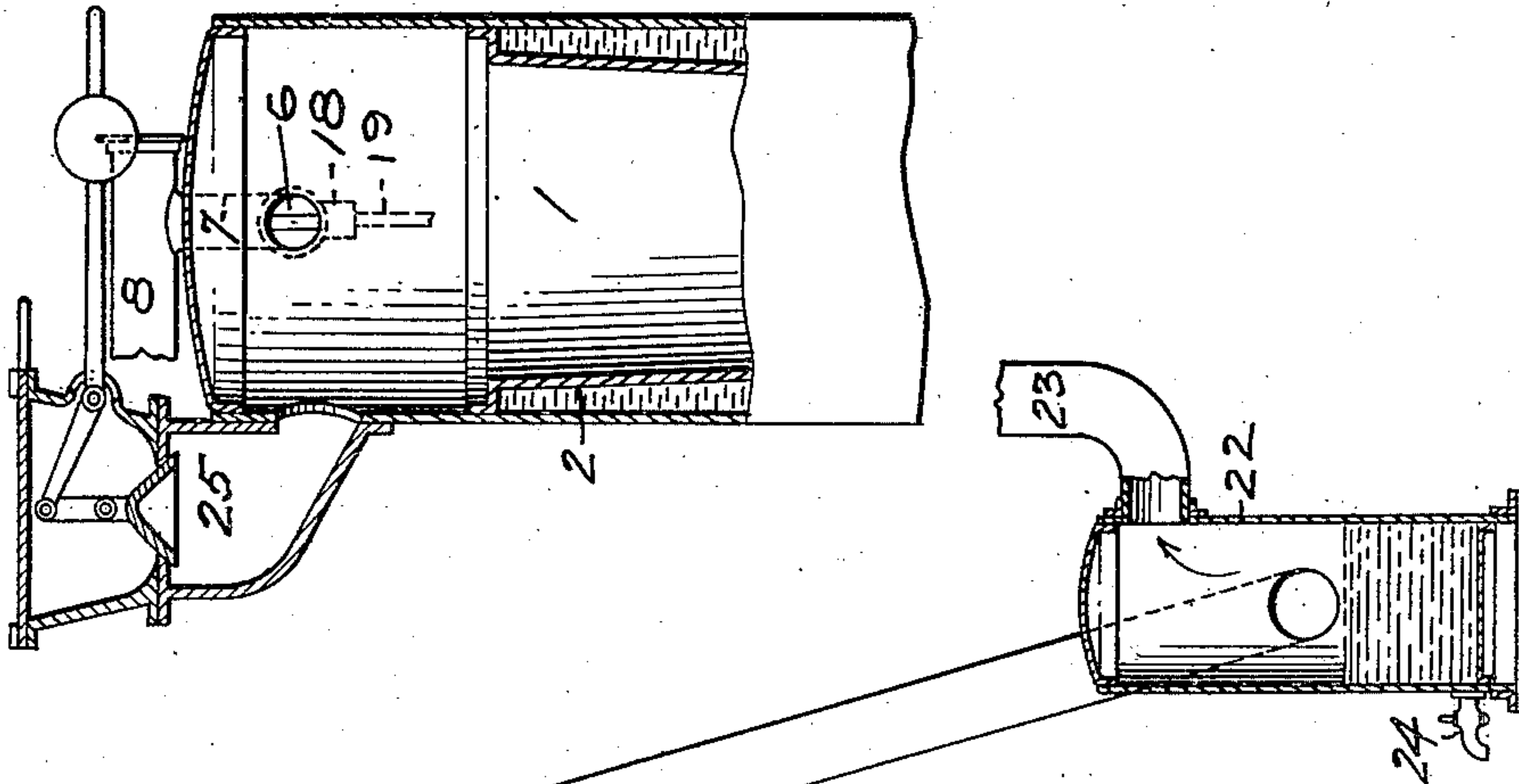


FIG. 2

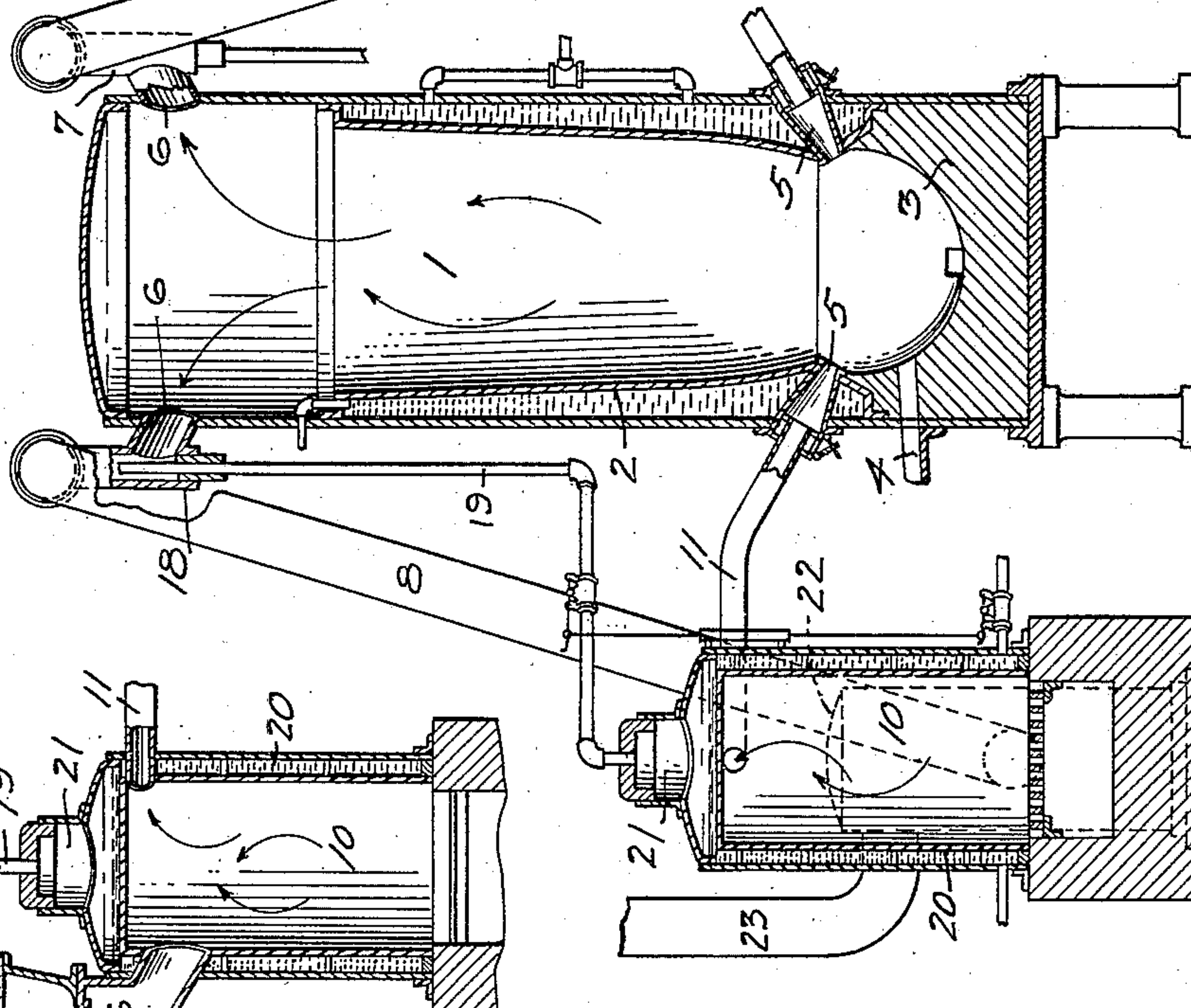
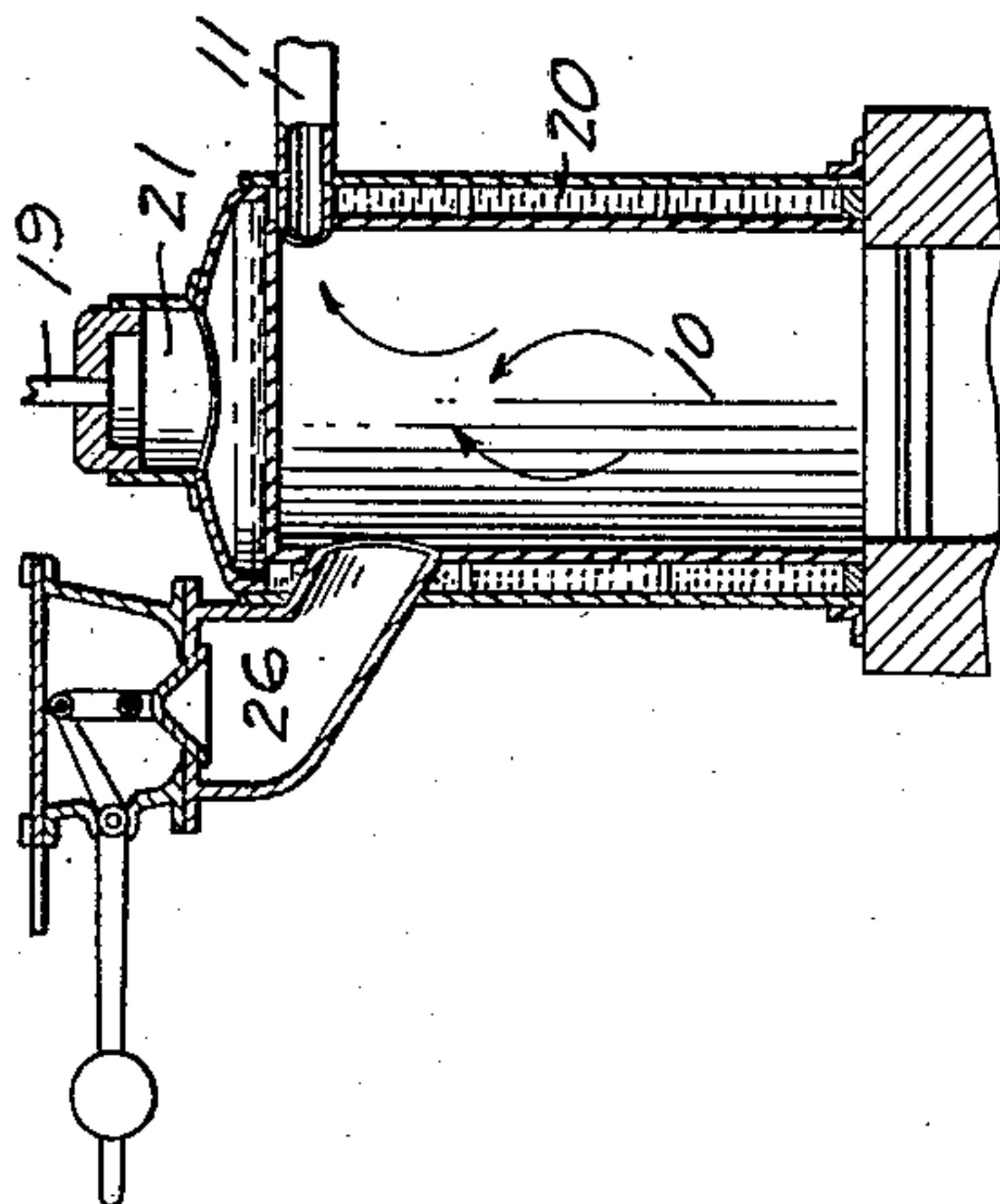


FIG. 4



WITNESSES.

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UNITED STATES PATENT OFFICE.

HENRY H. FREEMAN, OF WILKINSBURG, PENNSYLVANIA.

SMELTING-FURNACE FOR COPPER AND OTHER ORES.

No. 879,623.

Specification of Letters Patent.

Patented Feb. 18, 1908.

Application filed October 11, 1906. Serial No. 338,494.

To all whom it may concern:

Be it known that I, HENRY H. FREEMAN, a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have
5 invented a new and useful Improvement in Smelting-Furnaces for Copper and other Ores; and I do hereby declare the following to be a full, clear, and exact description thereof.

10 This invention relates to apparatus for reducing ores, and more especially copper, zinc, silver, lead and other of the more precious ores.

15 One of the objects of the invention is to save or recover the metal which becomes volatilized in the smelting process and which ordinarily is wasted.

20 Another object is to provide apparatus which is economical of operation, simple in construction and which is portable, and one having a non-oxidizing flame.

The invention comprises the arrangement and combination of parts hereinafter described and claimed.

25 In the accompanying drawings Figure 1 is a plan view of my apparatus; Fig. 2 is a vertical section thereof on the line 2—2, Fig. 1; Fig. 3 is a vertical section of the upper part of the smelter on the line 3—3, Fig. 1;
30 Fig. 4 is a vertical section through the gas producer and steam generator on the line 4—4 Fig. 1; Fig. 5 is a sectional view of the twyer or burner on an enlarged scale; and Fig. 6 is a section on the line 6—6, Fig. 5.

35 My invention may be applied to a smelting furnace or reducer of any known type, and in the drawings this has been shown as one type of copper smelting furnace, the same comprising a suitable smelting chamber 1
40 having a water cooled wall 2 and a refractory hearth 3 provided with a tap opening 4. At the hearth are provided one or more twyers or burners 5, these being of general wedge shape as indicated. At the top of the
45 smelting chamber are one or more draft openings 6 connected by means of vertical pipe sections 7 to the down-comers 8.

50 With my invention the fuel is in the form of gas supplied by means of a gas producer 10 of any preferred suitable type, this producer having connected thereto the gas main 11 leading to a twyer 5. Preferably two or more such producers are used, one connected to each twyer. The gas pipe 11 pro-

jects some distance into the twyer and ends 55 at a perforated plate 12. The outer end of the twyer is considerably larger than the gas pipe in order to leave an air chamber 14 having an opening 15 to the atmosphere which can be regulated by means of a valve 60 16 so as to vary the amount of air supplied to the furnace. The gas and air meet and are mixed in the twyer chamber 17, thus producing a very hot flame which enters the reducing chamber and produces a non-oxi- 65 dizing flame to reduce the ores in the well understood manner.

The gas is not supplied under pressure but is drawn in by suction produced through the outlet opening 6 at the top of the smelter. 70 This is conveniently accomplished by providing an injector 18 in each vertical pipe section 7, said injectors preferably having connected thereto a steam pipe 19 coming from any suitable steam generator but pref- 75 erably and for economical purposes a generator formed by providing a water jacket 20 around the gas producer 10, or stack 1, and having at its upper end the steam collecting space 21. In this manner the waste heat 80 of the gas producer supplies the necessary steam for producing the suction or draft in the smelter. Compressed air may be used in said injector if desired.

In the reduction of the ores of copper, sil- 85 ver, lead, zinc and similar metals having a low melting point, a certain percentage of the metal is volatilized and passes out through the exhaust openings of the stack and is lost. In order to recover such vola- 90 tilized metals the down-comers 8 are led to a suitable condensing and collecting chamber such as shown at 22, which in turn has a connection 23 leading to the usual stack, not shown, and having at its bottom any suitable 95 connection such as shown at 24 for drawing off the water of condensation. The steam from the injector 18 necessarily reduces the temperature of the gases coming from the stack to approximately the temperature of 100 the steam, or at least sufficiently to condense all or most of the volatilized metal. In any event the passage of the gases and steam through the long down-comers 8 is sufficient to reduce the temperature to the point of 105 condensation of practically all of the volatilized metal, and also a large proportion of the steam itself. The water of condensa-

tion and the condensed metal accumulates in the bottom of the chamber 22 from which it can be removed from time to time.

The smelting furnace is provided with a suitable feeding hopper 25 and the gas producer with a similar hopper 26. Suitable valves are also provided in the several connections and all other necessary appurtenances will also be provided.

10 The apparatus described is simple of construction and quite readily portable. The gas producer has been shown as mounted on a masonry foundation, but is readily removable. This apparatus is very economical, as
15 a single device not only supplies the fuel but also the necessary medium for producing a draft through the smelter. The most important feature, however, is the recovery of the volatilized metal due to the mingling of
20 the steam with the waste gases and the collection of the condensed products in a suitable chamber.

What I claim is:

1. Ore reducing apparatus comprising in
25 combination, a smelting furnace, a gas producer, connections from the producer to the hearth of the smelting furnace for supplying gas thereto at the normal pressure of the producer, a steam generator associated with
30 and utilizing the waste heat from said producer, an injector connected to the upper

end of the smelter for producing suction in the smelting chamber, and a steam connection from the generator to said injector.

2. Ore reducing apparatus comprising in 35 combination, a smelting furnace, a gas producer, connections from said producer to the hearth of the smelting furnace for supplying gas thereto under the normal pressure of the producer, a steam generator formed by a 40 water jacket around said producer, an injector connected to the upper end of the smelting furnace for producing suction therein, and a steam connection from the generator to said injector.

3. Ore reducing apparatus comprising in 45 combination a smelting furnace, a gas producer, twyers at the hearth of the furnace comprising a gas pipe having connection to the gas producer and an air inlet and mixer, 50 a steam generator associated with and utilizing the waste heat from said producer, an injector connected to the upper end of the smelting chamber for producing suction therein, and a steam connection from the 55 generator to said injector.

In testimony whereof, I the said HENRY H. FREEMAN have hereunto set my hand.

HENRY H. FREEMAN.

Witnesses:

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