

No. 726,432.

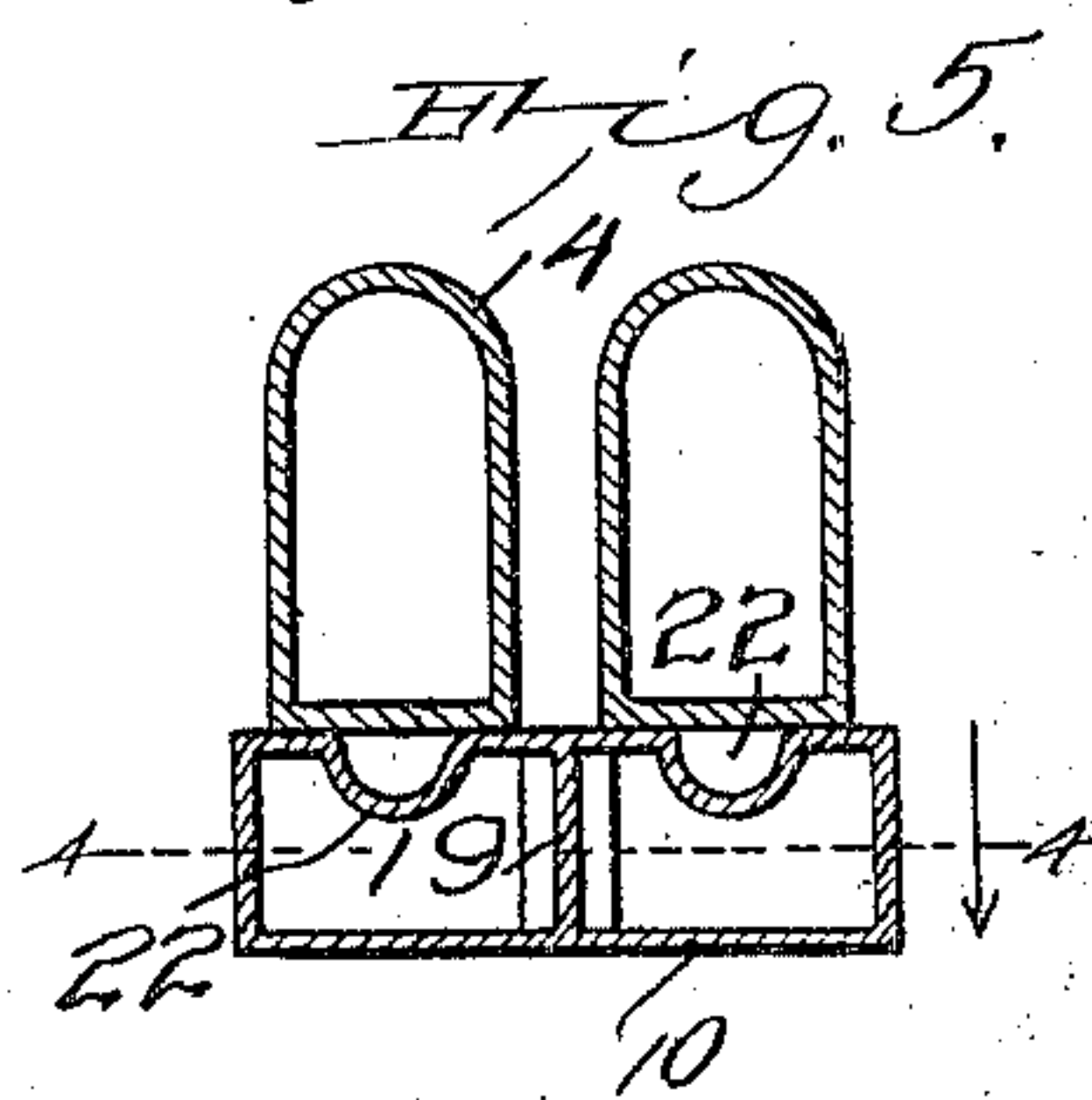
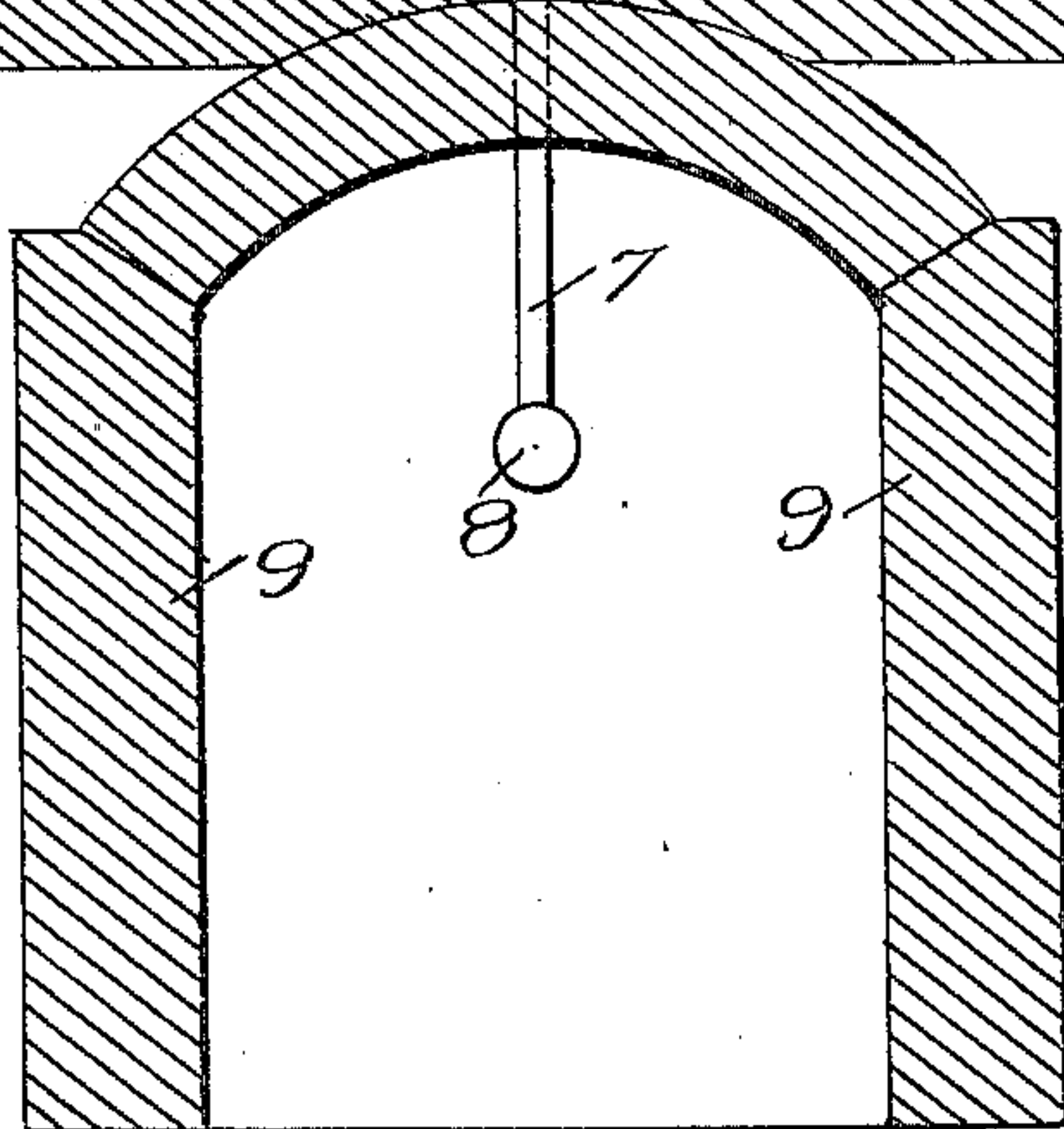
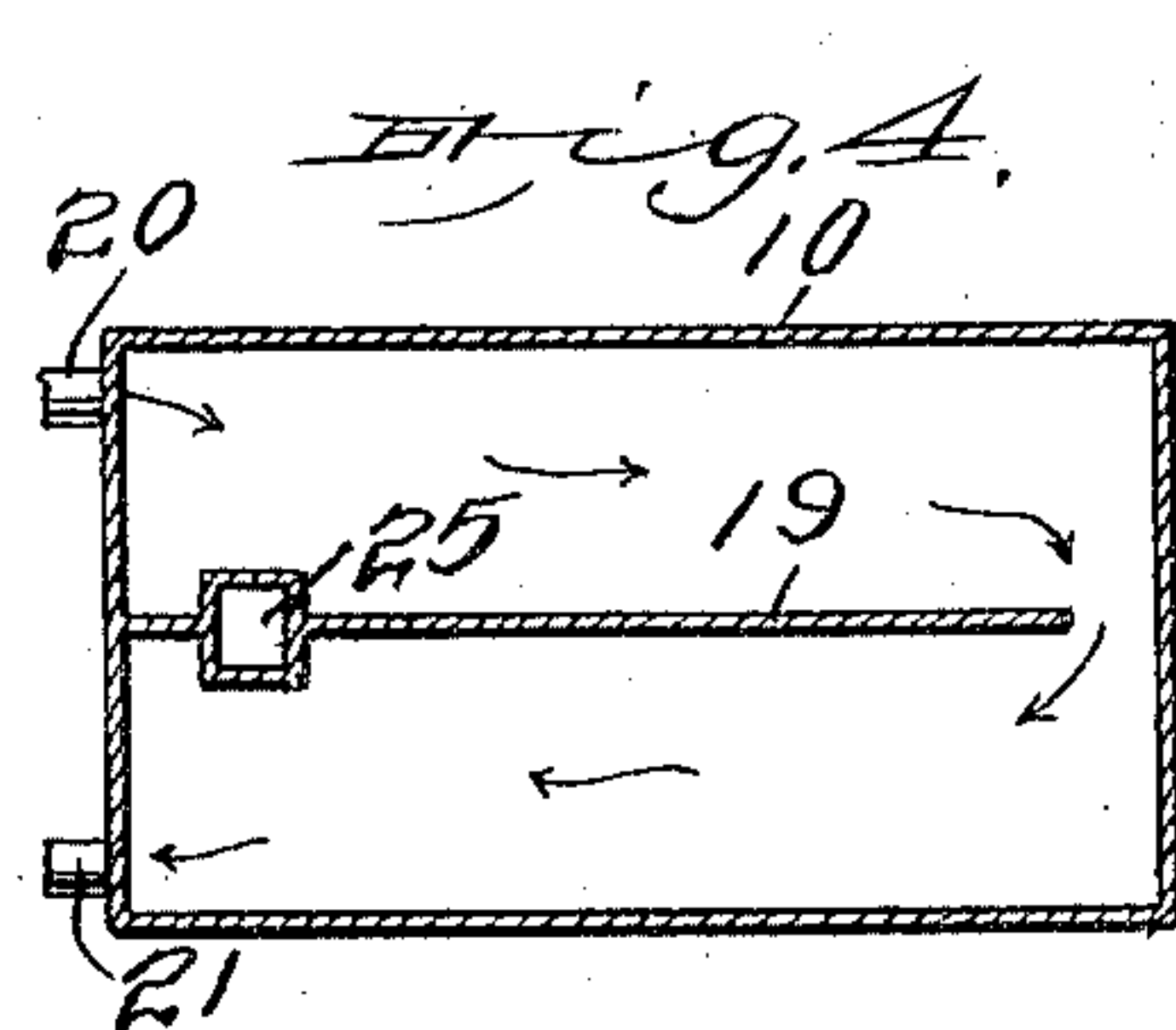
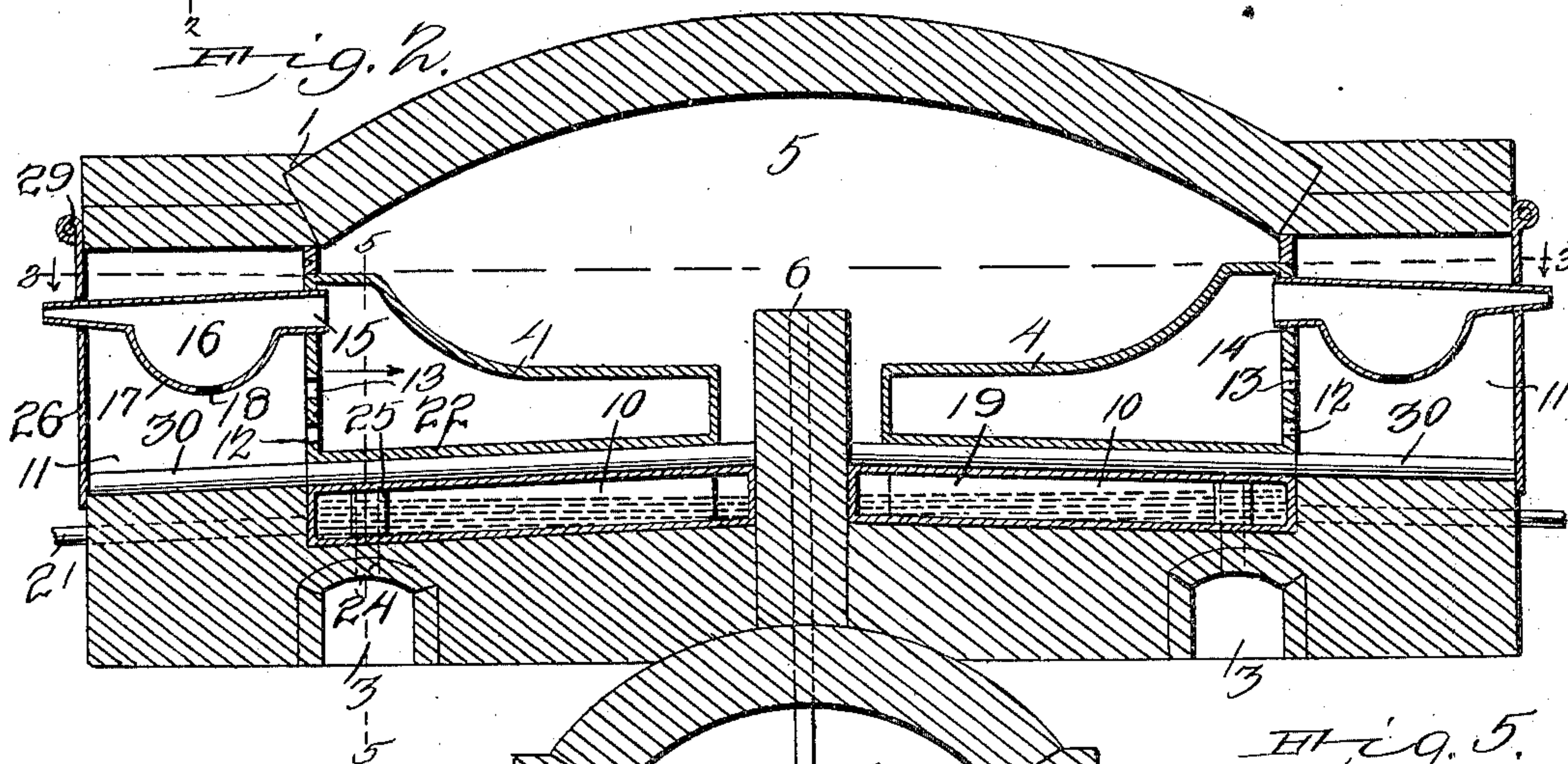
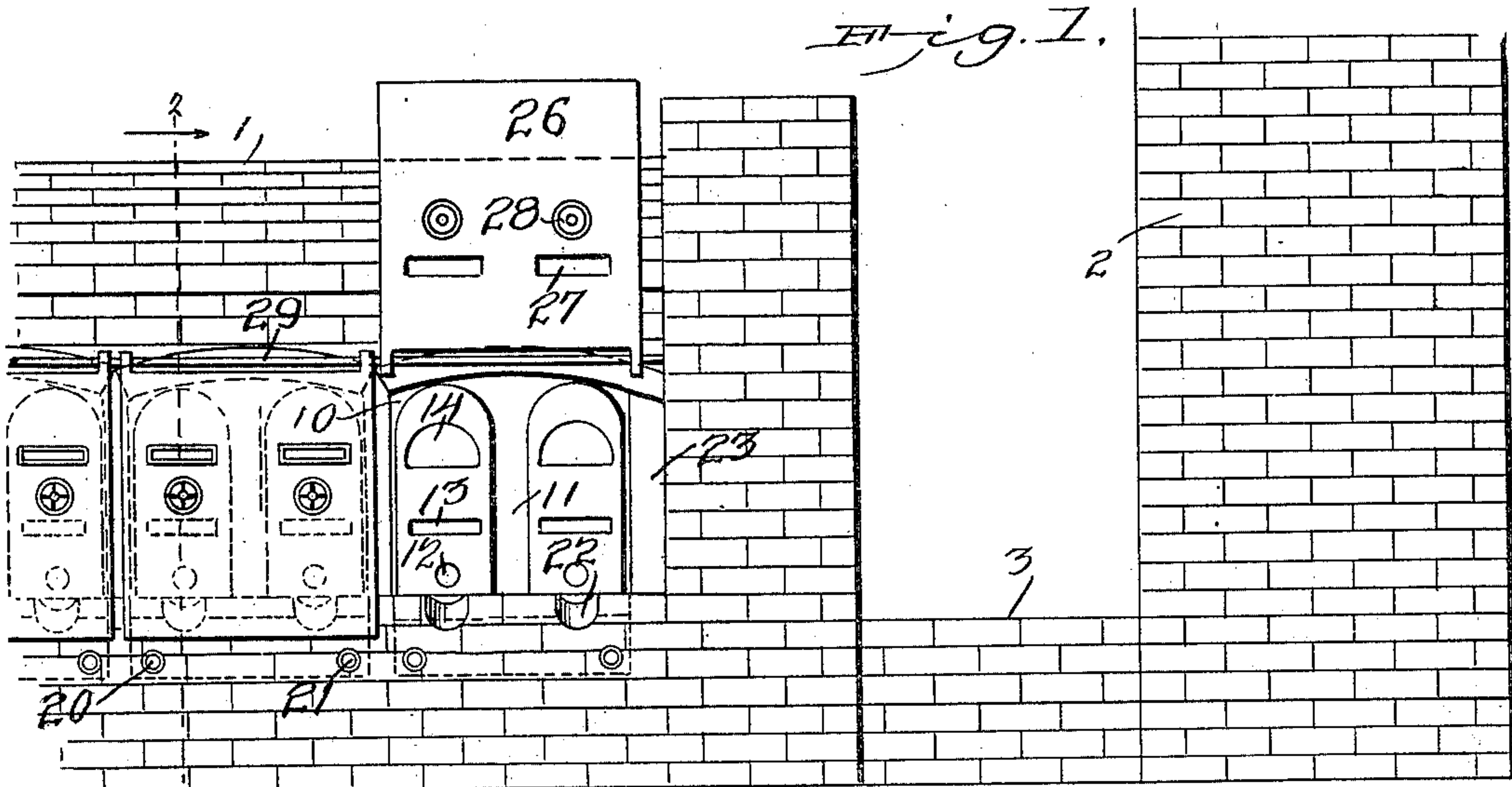
PATENTED APR. 28, 1903.

T. JONES.  
APPARATUS FOR REFINING ZINC SPELTER.

APPLICATION FILED JULY 25, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:  
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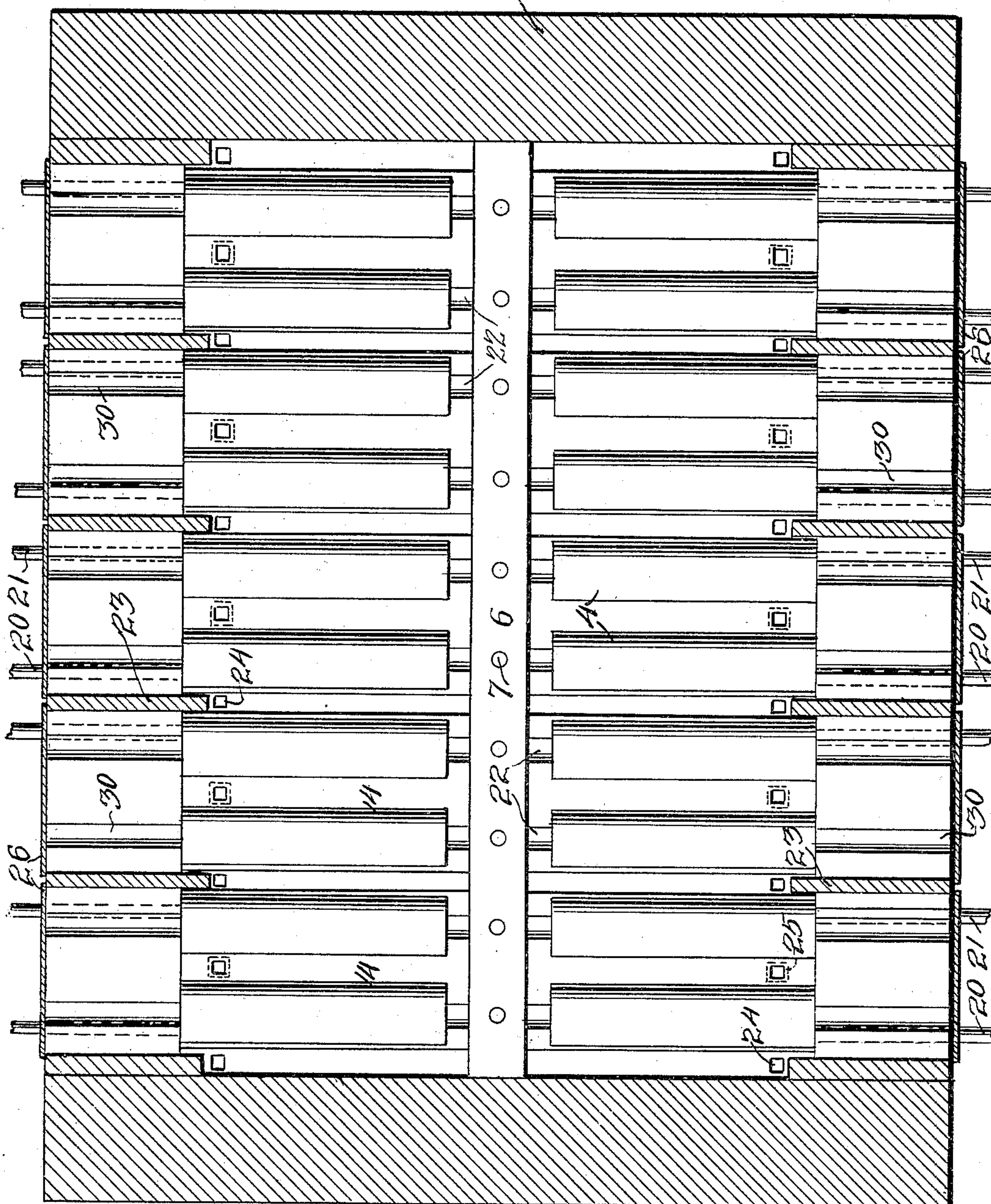
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## APPARATUS FOR REFINING ZINC SPELTER.

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Witnesses:  
E. J. Newman  
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# UNITED STATES PATENT OFFICE.

THOMAS JONES, OF IOLA, KANSAS, ASSIGNOR OF ONE-HALF TO NELSON F. ACERS, OF IOLA, KANSAS.

## APPARATUS FOR REFINING ZINC SPELTER.

SPECIFICATION forming part of Letters Patent No. 726,432, dated April 28, 1903.

Application filed July 25, 1902. Serial No. 116,967. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS JONES, a citizen of the United States, residing at Iola, in the county of Allen and State of Kansas, have  
5 invented a new and useful Apparatus for Refining Zinc Spelter, of which the following is a specification.

This invention relates to an apparatus for refining zinc spelter.

10 The object of the invention is in a simple, ready, thoroughly feasible and practical manner to refine ordinary commercial zinc in such manner as to free it from lead or other impurities, to effect reduction of refractory zinc  
15 ores for the same purpose, practically to eliminate danger of destruction of the muffles, and to prevent loss of the charge should a muffle crack or break.

20 With these and other objects in view, as will appear as the nature of the invention is better understood, the same consists, generally stated, in an apparatus provided with a novel arrangement of muffles and condensers adapted to effect thorough elimination of lead  
25 and other metals and impurities from commercial zinc, thereby to convert the same into a high-grade product, or, without any change in the arrangement of the parts, to effect reduction of refractory zinc ores carrying a  
30 high percentage of lead, iron, and other minerals and the recovery of a larger percentage of zinc of a higher grade or purity and with less waste than can be effected with apparatus in general use.

35 The invention consists, further, in the provision of means to regulate the temperature of the bottom of the muffles to prevent the fusion of iron and other substances combined with the ore, thus to obviate destruction of  
40 the muffles, or, in other words, to keep the temperature of the muffles at such a degree as that while the zinc will be volatilized and conserved volatilization of iron or any other metals or impurities in the ore will positively  
45 be prevented.

The invention consists, further, in the provision of means to regulate the temperature of the condensers to effect production of the highest grade of spelter.

50 The invention consists, finally, in the novel construction and combination of parts of an

apparatus for refining zinc spelter and reducing refractory zinc ores, as will be hereinafter fully described and claimed.

In the accompanying drawings, forming a  
55 part of this specification, and in which like numerals of reference indicate corresponding parts in the several views, there is illustrated one form of embodiment of the invention capable of carrying the same into practical op-  
60 eration, it being understood that the elements therein exhibited may be varied or changed as to shape, proportion, and exact manner of assemblage without departing from the spirit thereof, and in these drawings—

65 Figure 1 is a view in front elevation of a portion of an apparatus embodying the essential features of this invention. Fig. 2 is a view in vertical longitudinal section taken on the line 2 2, Fig. 1, and looking in the di-  
70 rection of the arrow thereon. Fig. 3 is a view in horizontal section taken on the line 3 3, Fig. 1, and looking in the direction of the arrow thereon. Fig. 4 is a view in horizontal section taken on the line 4 4, Fig. 5. Fig. 5  
75 is a view in vertical transverse section taken on the line 5 5, Fig. 2, and looking in the direction of the arrow thereon.

Referring to the drawings, 1 designates, generally, the masonry of a furnace, 2 the  
80 smoke-stack, and 3 the flues connecting the furnace with the smoke-stack. In this instance the structure is shown as provided with twenty muffles 4, arranged back to back and disposed within a common furnace-cham-  
85 ber 5; but it is to be understood that the invention is not to be limited to this number, as it may be increased or diminished and still be within the scope of the invention. The furnace-chamber is provided with a centrally-  
90 arranged fire-brick wall 6, which projects a short distance above the inner ends of the muffles and is spaced therefrom to permit escape of the products of combustion to the  
95 flues 3, and in this wall are arranged a plurality of pipes 7 for supplying fuel to the chamber, which fuel may be either coal-gas, natural gas, or crude petroleum and is supplied thereto through a feed-pipe 8, connect-  
100 ing with the source of supply, the pipe 8 and the lower portions of the pipes 7 being disposed in an archway 9, arranged beneath the



furnace. While it is generally preferred to employ gaseous or liquid fuel, it is to be understood that the procedure may be carried out by the employment of coal by a slight change in the construction of the apparatus, and as this will be obvious and is of no vital importance detailed illustration thereof is omitted.

The muffles 4, which may be constructed in any preferred form and of any material best suited to the purpose, rest in pairs upon water-boshes 10, supported upon the base of the furnace in a slightly-inclined position, the direction of inclination being toward the side walls of the furnace, this inclination of the water-boshes causing a like outward and downward incline of the muffles, for a purpose that will presently appear. The outer ends of the muffles are housed or secured in a boxing or casing 11, set some distance back from the side walls, as clearly shown in Fig. 2, and the said ends of the muffles are furnished each, preferably in line with its bottom, with a tap-hole 12, provided for the purpose of permitting drawing off of lead or the removal of other metals or impurities which accumulate within the muffles, the tap-hole when the furnace is in operation being properly luted, and at a point approximately midway of the height of the outer ends of the muffles there is provided in each a slot or mouth 13, through which the metal to be refined, either in the shape of spelter in slabs of suitable size or in the shape of ore or in molten condition, is supplied to the muffles, the mouth being also luted when the furnace is in operation.

At a point near the upper portion of the front of each muffle there is provided an opening 14, in this instance shown as having a straight bottom, vertical sides, and a curved top; but this precise shape is not essential and may be varied, if desired. The openings 14 are designed for the reception of the inner open ends 15 of the condensers 16, the outer reduced ends of which project beyond the side walls of the furnace and are open to permit free escape of gases and fumes. As herein shown, each condenser is provided with a straight top and end portions and an intermediate downwardly-bellied portion 17, this latter for the purpose of affording increased capacity; but it is to be understood that the invention is not to be limited to the precise construction of condenser shown, as various other forms may be employed and still be within the scope of the invention. The under side of the belly portion of each condenser is provided with a tap-hole 18, through which the spelter may be removed, this tap-hole being luted when the apparatus is in operation.

The water-boshes 10 are rectangular box-like structures and may be constructed of cast or boiler iron and are of a width somewhat greater than a pair of muffles, as clearly shown in Fig. 5, and upon the top of the wa-

ter-boshes the bottoms of the muffles directly bear. Each water-bosh is divided throughout a greater portion of its length into chambers by a septum or partition 19, and with each of the chambers connects a pipe 20 and 21, respectively, the pipe 20 being a water-inlet pipe and the pipe 21 a water-outlet pipe. By the provision of a septum it will be seen by reference to Fig. 4 that the water is allowed to circulate throughout the entire area of the water-bosh before its escape, thereby keeping the said top cool, as also the bottoms of the superposed muffles. The top of each water-bosh is formed or provided with two channels 22, preferably semicircular in cross-section, as clearly shown in Fig. 5, and when the furnace is in operation these channels may be luted with wet clay, and this latter may be perforated with one or more orifices to regulate or control the temperature of the muffles. By the provision of the channels 22 should a muffle crack or break its charge or contents will be automatically discharged to the outside of the furnace-walls, and thus be saved instead of being discharged within the furnace and thus lost, the outward discharge of the metal being effected by the incline of the water-boshes. These channels also operate to regulate the heat within the furnace, as it will be apparent that by opening or closing them a greater or less amount of outside air may be supplied to the furnace. Under some conditions the amount of cool air supplied beneath the muffles through the channels 22 will be sufficient to keep the bottoms of the muffles at the desired temperature; but where exceedingly-high temperature is necessary to effect proper smelting of the contents of the muffles it will be necessary to allow water to circulate through the water-boshes to effect the above result. The muffles, as before stated, are in this instance arranged in pairs, separated by vertical partitions 23, which constitute the sides of the boxings or casings, to which reference has been made, and adjacent to the outer ends of the muffles in the floor of the furnace are arranged ducts 24, which communicate with the flues leading to the stacks, those ducts located between the pairs of muffles, or rather every other muffle, being disposed to register with flues or passages 25, connecting the tops and bottoms of the water-boshes adjacent to their outer ends, and by this arrangement interference with the free outtake of the products of combustion is obviated. By the arrangement of the muffles and by the provision of the water-boshes and the channels therein as described, the bottoms of the muffles are kept at such a degree of temperature as positively to prevent the volatilization of lead or other impurities that accumulate on the said bottoms and that volatilize at a temperature slightly above that of zinc, the objectionable materials present being shielded from the greater heat at the top and sides of the muffles by the covering of molten zinc. The channels



may be made of any desired size and, as above pointed out, may be opened or closed or only partly opened or closed in the operation of the furnace, as necessity may require, thereby giving the operator full control of the apparatus in the work of smelting or refining, so that the large surface of metal exposed in the muffles to be volatilized into pure zinc may be subjected to a greater heat than would ordinarily be employed, thereby expediting in a pronounced manner the volatilization of the zinc without danger of other metals and impurities in the ore or spelter becoming mingled or incorporated therewith. If the natural currents of external air be not sufficient to keep the muffle-bottoms at the desired temperature, air under any desired pressure may be forced thereunder by any suitable mechanism adapted to the purpose. A salient and all-important advantage arising from the employment of the water-boshes is that when used for smelting ores the bottoms of the muffles will be kept at a temperature below that of the fusion-point of iron, so that any of this metal contained within the ore will in a positive and thoroughly-effective manner be prevented from attacking and destroying the muffles.

In order to regulate the temperature of the condensers to the proper degree for the production of high-grade spelter, shutters 26 are provided, as clearly shown in Fig. 1, wherein one of them is opened, which shutters close the mouth of the boxing, as shown in Fig. 2, and are provided with openings 27 for the reception of the outer ends of the condensers and with registers or dampers 28, by which to control admission of air beneath the condensers and also to the boxing, and thus to the channels 22. These doors or shutters are by preference constructed of sheet iron and are in this instance suspended from a bar 29, secured to the front of the boxings, preferably along their arch-lines. In order that in the event of cracking of a muffle its contents shall be discharged without the furnace, the upper face of the base within the boxings or casings is provided with channels 30, which register with and constitute a continuation of the channels 22 of the water-boshes.

Briefly, to sum up, the salient features of this invention are the water-boshes provided with the air-channels for keeping the temperature of the bottoms of the muffles below that of the fusion-point of iron, thus rendering it feasible by driving an intense heat over the top and around the sides of the muffles rapidly and effectively to volatilize the zinc contained in the refractory ore or spelter and conserve it without inclusion of any foreign substance, thereby to present commercially-pure zinc; further, in the tilting of the muffles and of the water-boshes downward toward the sides of the furnace, thus in the event of the destruction of a muffle to save its charge; further, in the provision of a muffle provided at its outer end with an opening

for the reception of the rear end of a condenser with a feed-opening and with a tap-hole, and finally in the provision of registers or dampers to regulate the temperature of the condensers. The provision of the fire-brick wall 6 is also of importance, inasmuch as under the operation of the apparatus it will become highly heated, practically to the point of incandescence, and will thus operate to heat the gas or volatilize the oil when the latter is used for fuel, thereby assisting combustion.

It will be obvious that in carrying the invention into practical operation the underlying features above defined may be carried into effect in other ways than that shown, and for this reason it is to be understood that the invention is not to be limited to the precise construction and arrangement of parts illustrated.

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

1. In an apparatus of the character specified, the combination with a muffle, of a water-bosh disposed beneath the same.
2. In an apparatus of the character specified, the combination with a muffle, of a water-bosh disposed beneath the same and provided with an air-duct extending throughout its length.
3. In an apparatus of the character specified, the combination with a muffle, of a water-bosh disposed beneath the same and inclined downward toward the walls of the apparatus.
4. In an apparatus of the character specified, the combination with a muffle, of a water-bosh disposed beneath the same and inclined downward toward the walls of the apparatus and provided in its top with an air-duct.
5. In an apparatus of the character specified, a muffle having its bottom inclined toward the outer walls of the apparatus, and a similarly-inclined water-bosh disposed beneath the muffle and provided in its top with an air duct or channel.
6. In an apparatus of the character specified, the combination of a muffle, and a condenser communicating therewith, of means for controlling the admission of air beneath the condenser.
7. In an apparatus of the character specified, the combination with a muffle, and a condenser communicating therewith, of means for controlling the admission of air beneath the condenser and also the temperature of the bottom of the muffle.
8. In an apparatus of the character specified, a muffle, and a condenser communicating therewith, in combination with means for supplying air beneath the muffle and with means for controlling the admission of air beneath the condenser.
9. In an apparatus of the character specified, the combination with a furnace-cham-



ber housing a plurality of muffles disposed end to end and water-boshes arranged beneath the muffles, of fuel-supply means arranged between the rear ends of the muffles.

5 10. In an apparatus of the character specified, the combination with a furnace-chamber housing a plurality of muffles having their rear ends opposed and water-boshes arranged beneath the muffles, of fuel-supply means  
10 disposed between the said ends of the muffles and means disposed near the forward ends of the muffles for carrying off the gases and unconsumed products of combustion.

15 11. In an apparatus of the character specified, the combination with a furnace-chamber housing a plurality of muffles, the rear ends of which are opposed and water-boshes disposed beneath the muffles, of a fire-brick wall disposed between the said ends of the  
20 muffles and against which the muffles bear and fuel-supply pipes arranged within the wall.

25 12. In an apparatus of the character specified, a furnace having its base provided with flues and ducts communicating therewith, of

a water-bosh supported upon the base and having a passage registering with the said ducts.

13. In an apparatus of the character specified, the combination with a muffle, of a water-bosh provided with a septum for effecting circulation of water throughout its entire area. 30

14. In an apparatus of the character specified, the combination with a muffle, of a water-bosh disposed beneath the same and provided in its top with a channel, and a boxing housing the forward end of the muffle and having its bottom provided with a channel registering with that of the water-bosh and  
35 operating to conduct the molten metal without the furnace in case of breakage of the muffle. 40

In testimony that I claim the foregoing as my own I have hereto affixed my signature in  
45 the presence of two witnesses.

THOMAS JONES.

Witnesses:

NELSON F. ACERS,  
HARRY THOMPSON.