April 29, 1969 R. A. SOMMER 3,441,261

CONSTANT LEVEL HOLDING FURNACES

Filed March 11, 1966 Sheet 1 of 2

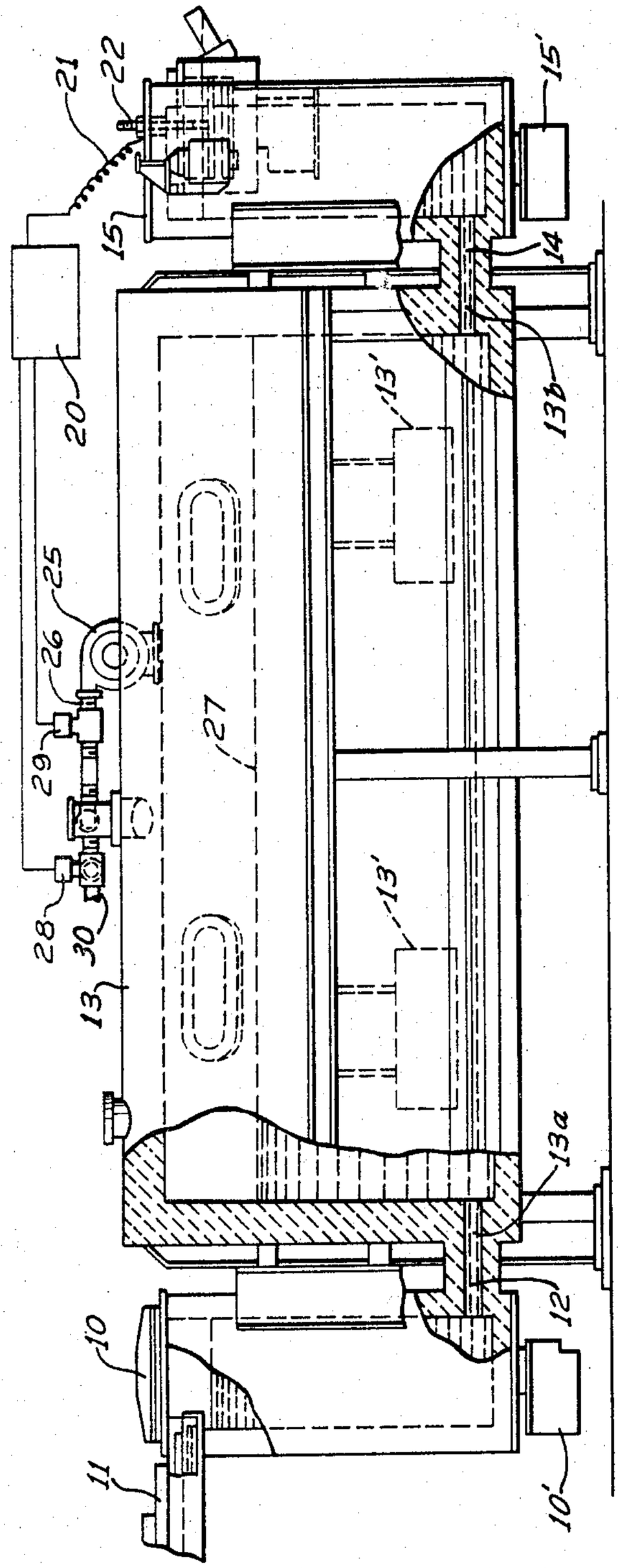


Fig. 1.

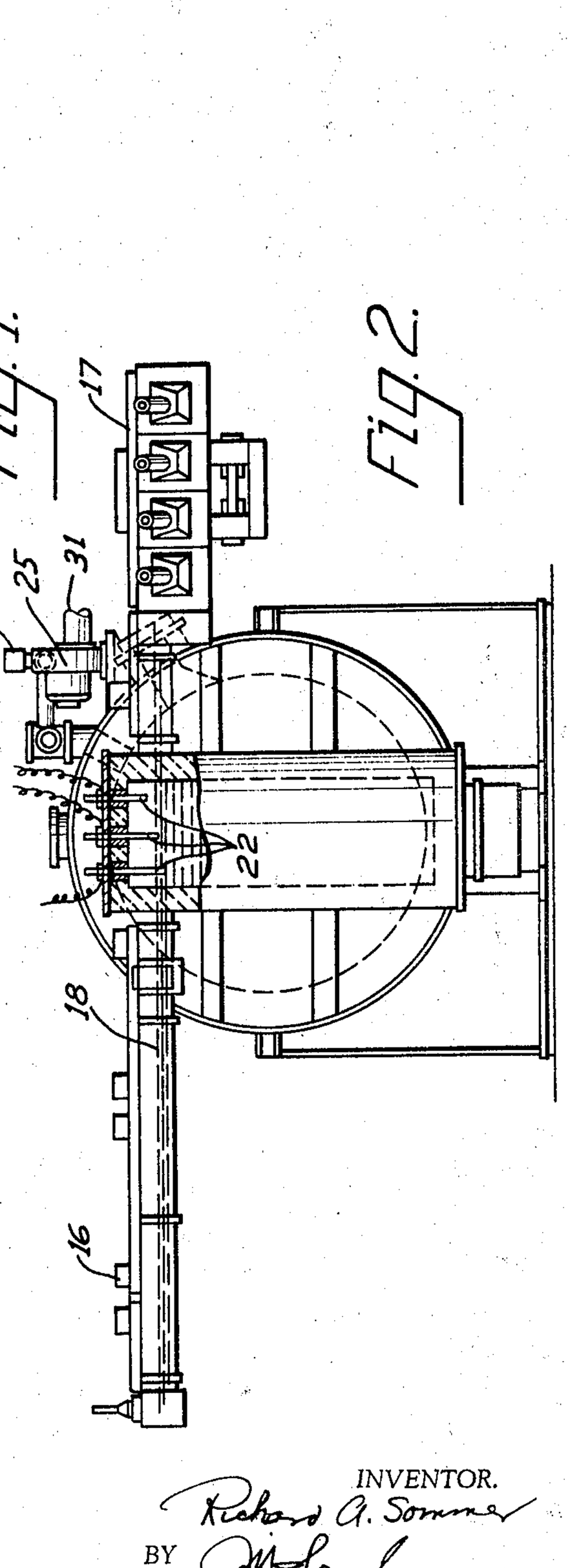


Fig. 2.

INVENTOR.
Richard A. Sommer
BY
ATTORNEY.

April 29, 1969 R. A. SOMMER 3,441,261

CONSTANT LEVEL HOLDING FURNACES

Filed March 11, 1966 Sheet 2 of 2

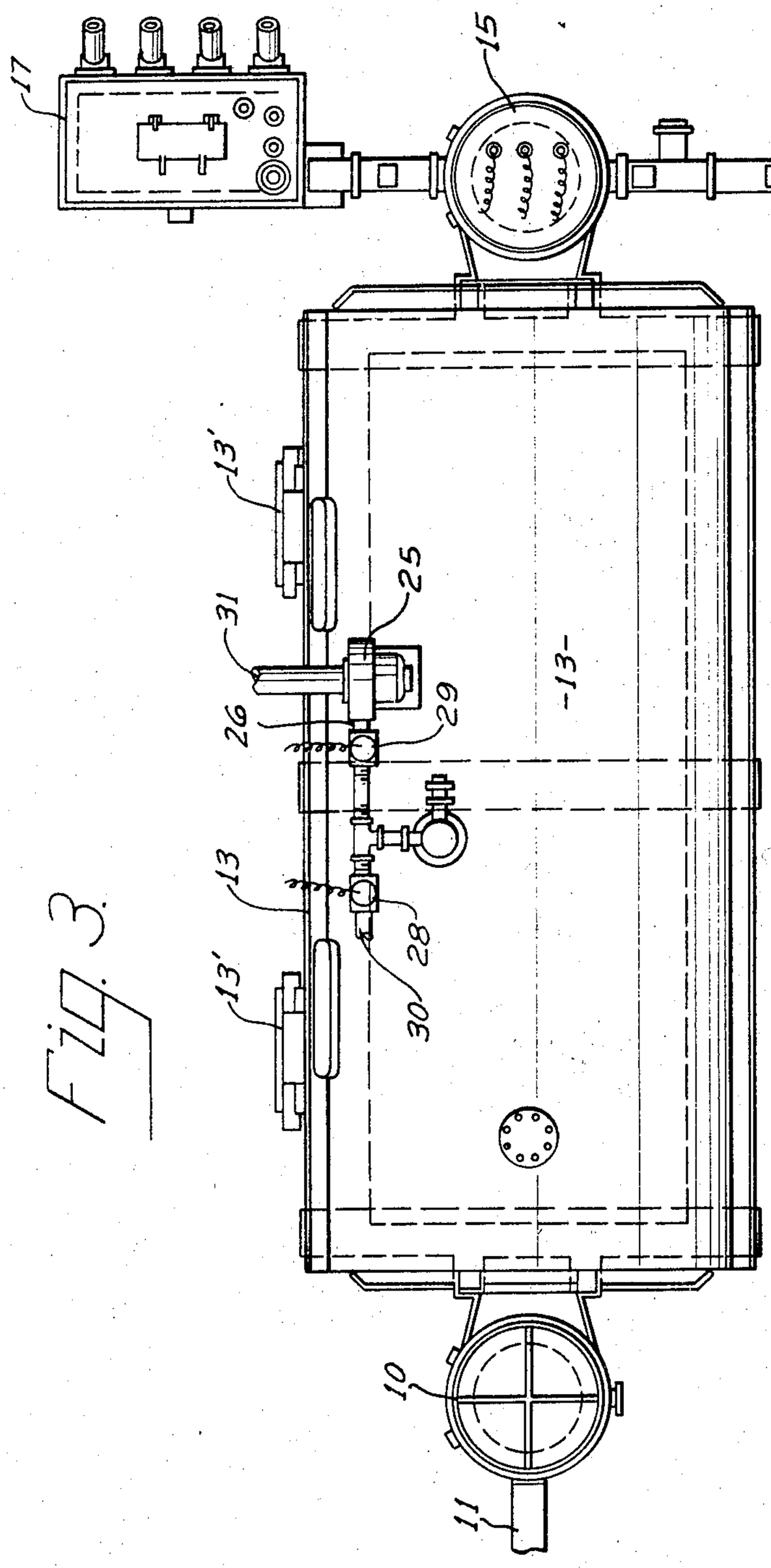


Fig. 3

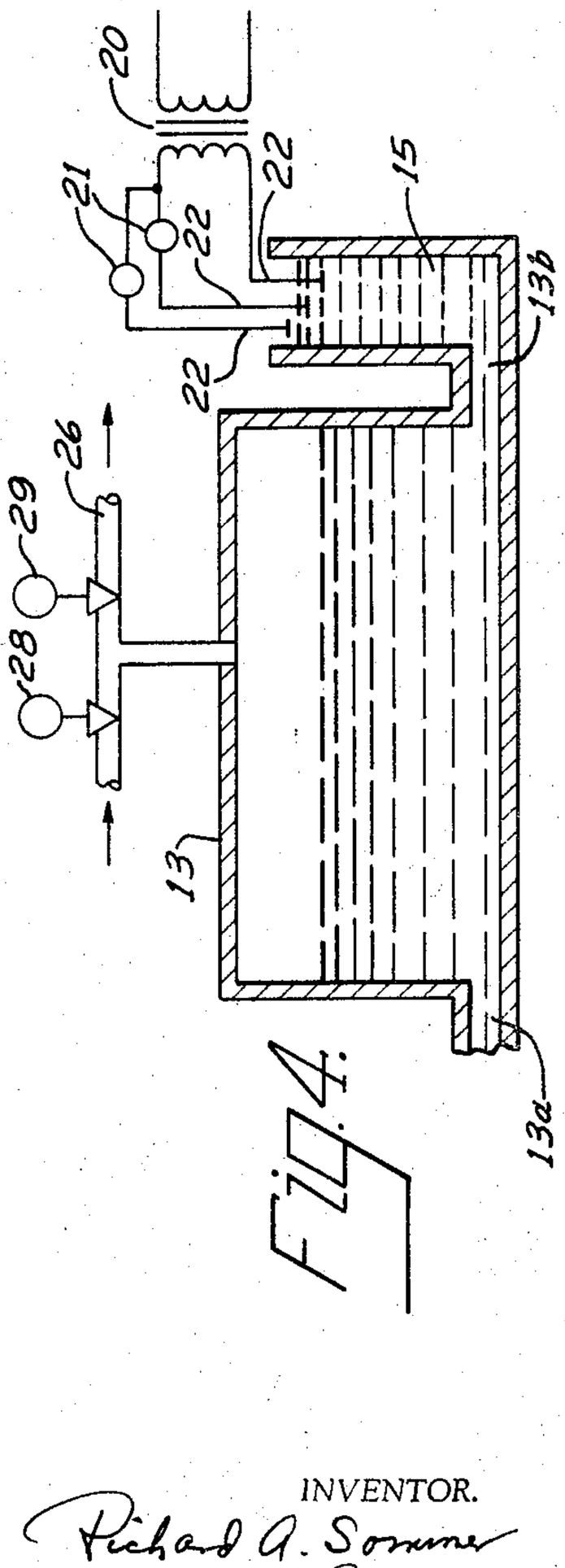


Fig. 4.

INVENTOR.
Richard A. Sommer
BY
ATTORNEY.

United States Patent Office

3,441,261

Patented Apr. 29, 1969

3,441,261

CONSTANT LEVEL HOLDING FURNACES

Richard A. Sommer, Warren, Ohio, assignor to Ajax Magnethermic Corporation, Warren, Ohio, a corporation of Ohio

Filed Mar. 11, 1966, Ser. No. 533,610

Int. Cl. C21b *11/00;* B22c *19/04*

U.S. Cl. 266—33 5 Claims

ABSTRACT OF THE DISCLOSURE

A constant metal level supply device including a furnace, a discharge reservoir, mold pouring means, one or more feeding troughs connecting the reservoir and pouring means, variable pressure means associated with the furnace, and control means associated with the pressure means to maintain a constant supply level of metal in the feeding troughs.

This invention relates to an improved apparatus for supplying pouring molten metal to a pouring device or devices and relates more particularly to improved holding and discharge vessels for molten metal, whereby a constant supply of molten metal for pouring equipment is ensured at all times at a discharge point to supply demands alternatively or simultaneously presented by various pouring units, etc., drawing therefrom. The apparatus involves the employment of a holding furnace storing large variable amounts of molten metal, continuously supplying molten metal to said discharge vessel as demands are made upon it, and maintaining a substantially uniform working level of metal therein.

A large holding furnace of the induction type which can store large variable amounts of molten metal, without tilting or tapping, is used in the apparatus of the invention and said furnace is connected to a reservoir or exit furnace, which reservoir preferably has induction heating means associated therewith, said reservoir stores a constant amount of heated molten metal and continuously supplies over long periods of time one or more pieces of pouring equipment drawing from the same variable or similar amounts of metal. The said reservoir is so designed that intermittent large demands from certain pouring equipment associated therewith does not effect the supply to other pouring equipment associated therewith.

The discharge reservoir signals to the holding furnace its needs as the demands are made upon it according to the invention and pressure on the molten metal in the holding furnace is increased or decreased accordingly to supply the proper amount of molten metal to the reservoir to maintain a substantially uniform working level of metal therein. The reservoir is so designed as to constitute a supply source of metal for the casting equipment or pouring furnaces, etc., proportioned to the amount of molten melt required to supply demands placed on it by the pouring equipment.

If molten metal is to be supplied to the equipment without interrupting the operation of the pouring equipment, an entrance induction heated furnace can be utilized. The level of molten metal in said entrance and exit furnace will be approximately the same and the pressure exerted on the metal in the holding furnace will maintain a level therein lower than the metal in such entrance and exit furnaces.

The preferred apparatus of my invention, although I do not wish to be restricted to a limited construction as to particular details thereof, involves the provision of a constant metal level supply for a pouring device or devices which includes a large molten metal holding furnace, a reservoir adjacent a discharge point for metal supplied

thereto by the holding furnace, controlled steady variable pressure means exerting pressure upon the molten metal in the holding furnace to maintain a constant supply level in the molten metal discharge vessel or reservoir.

With a vast amount of metal in a large holding furnace and a plurality of demand pourers, it would be difficult to operate the prior art holding furnace having an inclined discharge conduit dispensing therefrom, such as that shown in U.S. Patent No. 2,936,326, dated May 10, 1960, or similar structures.

In the present construction, the discharge furnace or exit reservoir has a predetermined height of molten metal therein at all times, as demands are made upon the same, and this is sensed and communicated to control means wherefor pressure exerted on the molten metal in the holding furnace is varied to maintain a substantially constant supply level of metal in the discharge furnace, etc.

It is thus a principal object of my invention to provide improved storage for quantities of molten metal and to provide in conjunction therewith an auxiliary relatively smaller molten metal storage unit having discharge or delivery means adapted to supply, as required, demands of metal by pouring units associated therewith and to ensure a constant supply of molten metal for such needs.

A further object of this invention is to provide apparatus of the type referred to which is adapted for use with a holding furnace of great capacity, with less down time required for refill and with considerably longer operating time.

A still further object of this invention is to provide apparatus for constantly supplying a plurality of pouring devices with molten metal from a common source and without interruption because of differences in the supply demand of the separate pourers.

Another object of this invention is to provide apparatus of the type referred to which will be efficient in operation, wherein demands are met, "freezing" of the metal in transit is prevented and continuous operation is assured.

Other objects of this invention and the invention itself will become more readily apparent by reference to the accompanying description, claims, and appended drawings, in which drawings:

FIGURE 1 is a front view of the improved apparatus of my invention, parts thereof being broken away and shown in section.

FIGURE 2 is an end view of the apparatus of my invention with portions thereof being broken away and other portions in cross-section for clarification; said view illustrating the runners and pouring units supplied by the exit furnace of FIGURE 1;

FIGURE 3 is a top plan view of the apparatus shown in FIGURES 1 and 2;

FIGURE 4 is a diagrammatic view of the control means of the invention.

Referring now to the drawings, in all of which like parts are designated by like reference characters, it will be seen that the apparatus employed in the present invention comprises an entrance furnace, or reservoir **10**, preferably supplied by a runner, as indicated at **11**, from a melting furnace remotely located thereto (not shown). The said reservoir **10**, through a conduit **12** located adjacent the bottom thereof, supplies molten metal supplied to it by the said melting furnace to a holding furnace **13** of relatively large size; said holding furnace supplies molten metal stored therein to an exit furnace or reservoir **15**, through a conduit **14** located adjacent the bottom thereof. The furnace or reservoir **15** is adapted to provide molten metal to feed a pouring device or devices, such as designated at **16** and **17**, as called upon, which device or devices communicate with the exit furnace or reservoir **15** as by runners **18** or the like.

While the drawings indicate that the pouring devices **16**, **17** associated with the apparatus of this invention are such as to be able to supply either large individual molds, as shown at **16**, or to supply pouring furnaces having a plurality of discharge orifices as shown at **17**, it will be obvious that other type pourers etc. could be used in lieu thereof.

It will be noted that the holding furnace **13** is disclosed as a sealed drum with aligned inlet and outlet apertures **13***a*, **13***b* respectively, said apertures opening into the conduit **12**, **14**, of reservoirs **10** and **15** respectively.

By means of suitable controls **20**, **21** the pressure within the holding hearth **13** is varied to maintain the metal level in the exit hearth or furnace **15** at a substantially constant heighth so that flow into the casting equipment, or pouring equipment, associated therewith is maintained at the desired rate.

The exit hearth or furnace **15** is designed so that intermittent large demands from casting equipment will not, save in a slight degree, affect the level and, hence, the supply to other equipment associated therewith. The inlet hearth **10** is shown having a vertical heighth higher than the exit hearth **15** so that a metal head can be established therein to force metal into the holding chamber. Generally, however, the level of metal in the inlet hearth, or furnace **10**, and the outlet hearth, or furnace **15**, is approximately and substantially the same. Sensing means **22** for sensing the level of metal in the exit hearth **15** are shown in the preferred embodiment of my invention illustrated herein and said means are employed to sense and signal through control means **20**, **21** pressure means shown at **25** provided for the control of pressure within the holding furnace on the molten metal. The probes or sensing devices **22**, as shown in FIGURE 2, are disposed at such a level melt determined within the reservoir or exit discharge furnace **15** so that the holding furnace pressure means is signalled at any time the level in the reservoir **15** exceeds a normal predetermined level or falls below such level. Three probes or sensing devices are preferably utilized as shown and the tips of said sensors or probes are within close limits so that at all operative times a substantially constant supply of molten metal is available at the discharge reservoir **15**. The sensing devices, as hereinafter more fully described, activate the pressure means located adjacent the holding furnace **13** through the control means **20**, **21** and **22**. The pressure means employed in the form herein comprises a centrifugal air blower **25** attached to the holding furnace **13** and has a conduit **26** connected to the hearth of the furnace at a point above the level **27** of the molten metal. Two solenoid operated valves **28** and **29**, respectively, are used to regulate the pressure of the air delivered by the blower **25**. The valves **28** and **29** are switched in such a way that one of them is opened when the other is closed. The valve **28** is connected to the open air by a tube **30**. As shown in FIGURE 2 of the drawings, intake air is supplied to the blower by conduit means indicated at **31**. Although, in the foregoing it has been mentioned that air is used, there may be used any suitable gas.

Hence, as metal is drawn from the exit reservoir **15**, by means of the automatic increase of pressure on the metal in the holding furnace as dictated by the draws or demands, additional metal is constantly supplied to the reservoir **15** thus constantly replenishing the supply of molten metal therein and holding a determined desired level for filling draw demands upon it. The pressure is automatically decreased by the signalling of sensors to the controls and to the pressure means when the volume in the holding furnace is increased sufficiently by a supply from the inlet furnace or reservoir **10**, wherefore a substantially constant level of molten metal is maintained in the exit reservoir at all times.

It is contemplated that the furnace units **10**, **13** and **15** are all preferably heated, as by induction heaters **10'**, **13'**, and **15'** and it is preferred that the covered runners shown at **18** in FIGURES 2 and 3 be heated as well. It is also to be noted that atmospheric pressure exists in both the exit an inlet hearths or furnaces, thus, equalizing the levels of both hearths so that the same are approximately equal. Only the relatively large melting or holding furnace **13** with a relatively small but sufficiently sized reservoir **15** and associated equipment are essential to the practice of this invention. As stated, the so-called holding furnace **13**, as illustrated, could be a melting as well as a holding furnace and, hence, the reservoir **10** dispensed with. The reservoir **10**, if provided with induction heating of sufficient power could be utilized to melt the metal supply for the holding furnace.

It will be apparent to those skilled in the art that the novel principles of the invention disclosed herein in connection with specific embodiments will suggest various other modifications and applications of the same, and it is to be understood that the various changes may be made without, however, departing from the spirit of the invention and the scope of the appended claims.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent is as follows:

1. A constant metal level supply device for pouring means which comprises a furnace adapted to contain a large supply of molten metal, a discharge reservoir, one or more feeding troughs or runners connecting said discharge reservoir to said pouring means of various or similar demands, interconnecting means between said furnace and said reservoir through which said furnace supplies molten metal to said discharge reservoir, variable pressure means associated with said furnace adapted to exert pressure on molten metal in said furnace whereby molten metal may be supplied to the reservoir and the molten metal in said reservoir maintained at a constant supply level above the lower limit of the said troughs or runners to supply molten metal on demand to said pouring means, control means associated with said pressure means and said reservoir adapted to control the said pressure means to maintain molten metal in the reservoir at the said constant supply level.

2. A constant level metal supply for pouring means, as claimed in claim **1**, including a molten metal entrance reservoir, intercommunicating means between said entrance reservoir and said furnace whereby metal may be introduced into said furnace during operation thereof.

3. A constant level metal supply for pouring means as claimed in claim **3**, wherein the entrance reservoir is a melting furnace.

4. A constant level metal supply for pouring means, as claimed in claim **1**, wherein the said furnace is a melting chamber.

5. A constant level molten metal supply for one or more molten metal pouring means as claimed in claim **1** wherein said discharge reservoir is open to the atmosphere.

References Cited

UNITED STATES PATENTS

1,817,340	8/1931	Barr	249—81 X
2,660,769	12/1953	Bennett	164—337 X
3,384,150	5/1968	Newsome	164—155
3,058,180	10/1962	Port et al.	164—156

J. SPENCER OVERHOLSER, *Primary Examiner.*

R. D. BALDWIN, *Assistant Examiner.*

U.S. Cl. X.R.

164—155, 337