Oct. 28, 1952 B. ALLERT 2,615,702

INDUSTRIAL BATH FURNACE

Filed Feb. 18, 1950 3 Sheets-Sheet 1

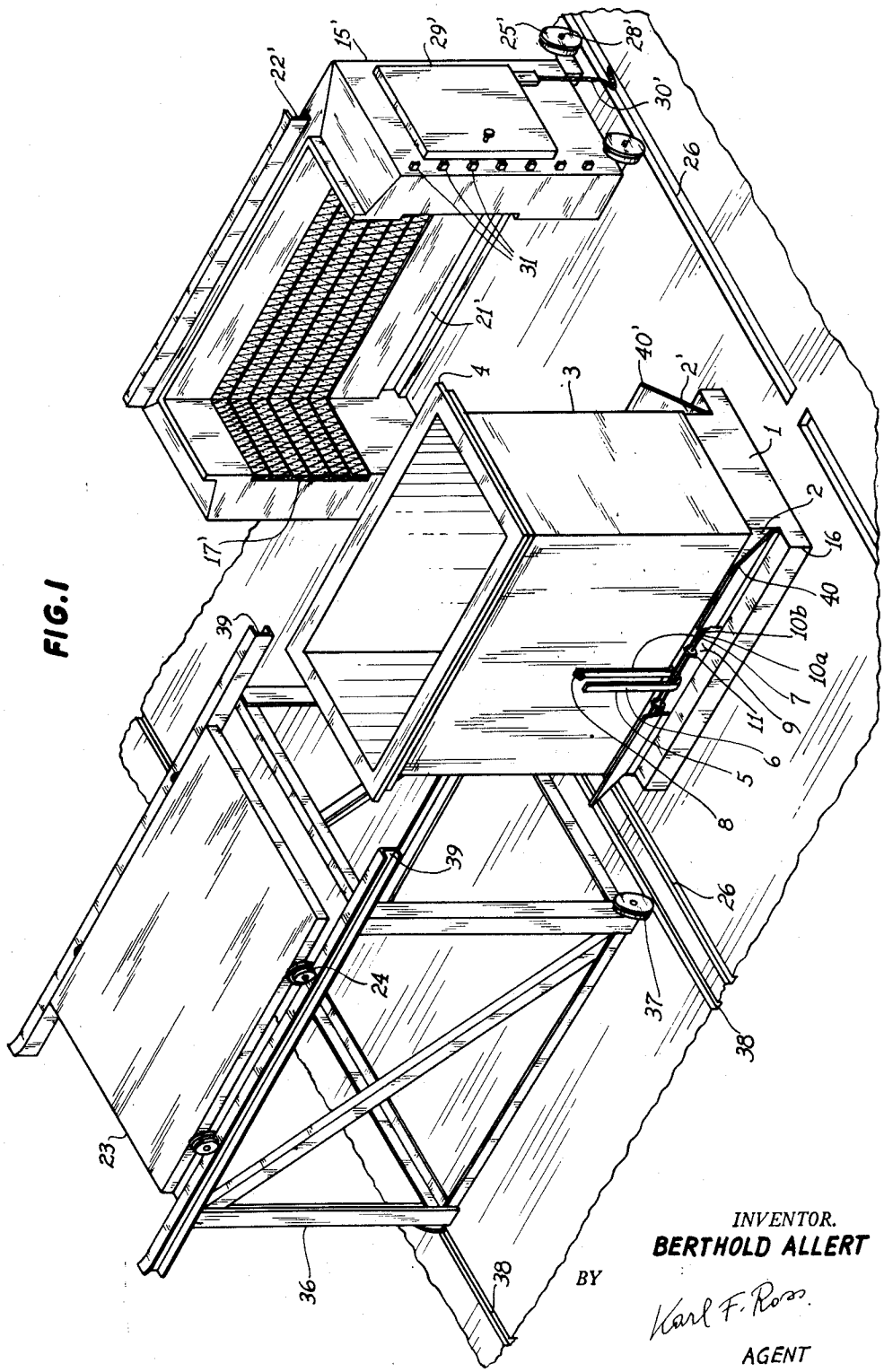


FIG. 1

INVENTOR.
BERTHOLD ALLERT

BY Karl F. Ross.

AGENT

Oct. 28, 1952 B. ALLERT 2,615,702

INDUSTRIAL BATH FURNACE

Filed Feb. 18, 1950 3 Sheets-Sheet 2

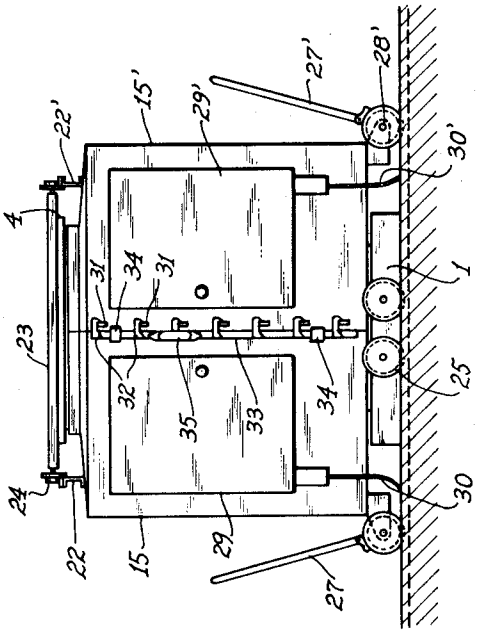


FIG. 3

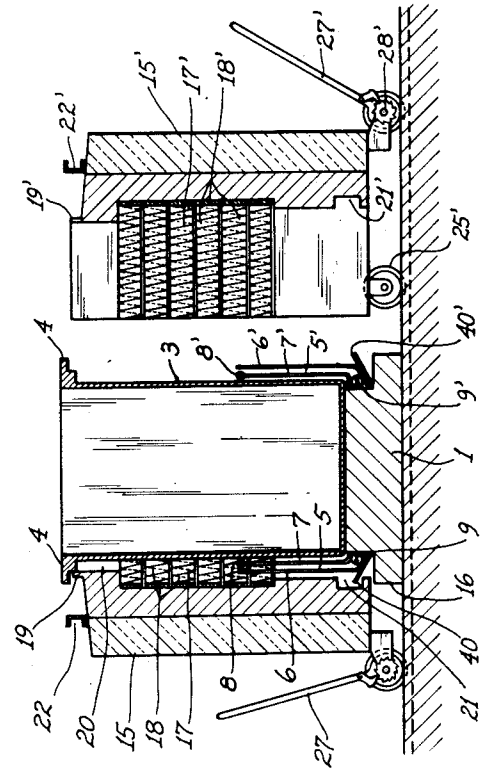


FIG. 2

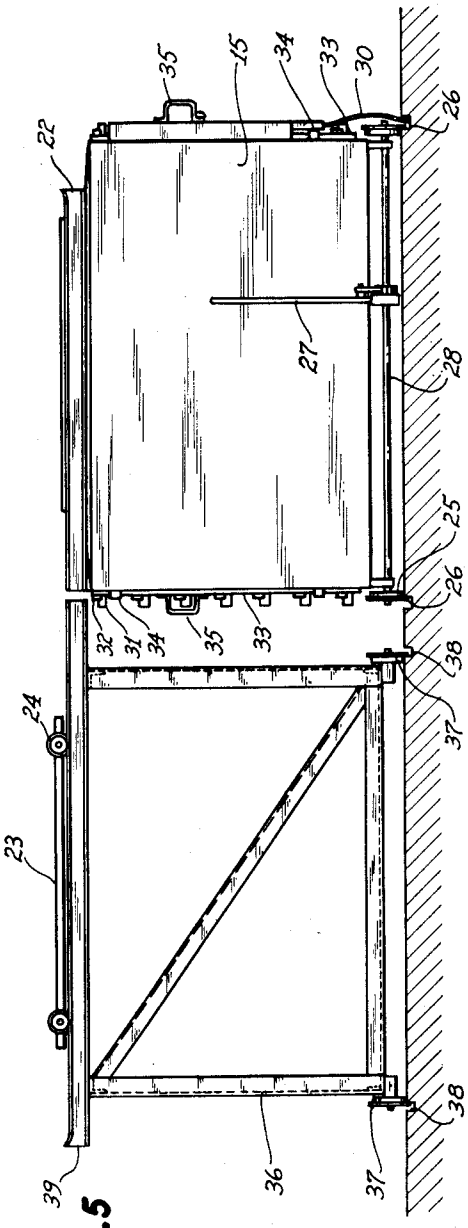


FIG. 5

INVENTOR.
BERTHOLD ALLERT
BY
Karl F. Ross
AGENT

Oct. 28, 1952 B. ALLERT 2,615,702

INDUSTRIAL BATH FURNACE

Filed Feb. 18, 1950 3 Sheets-Sheet 3

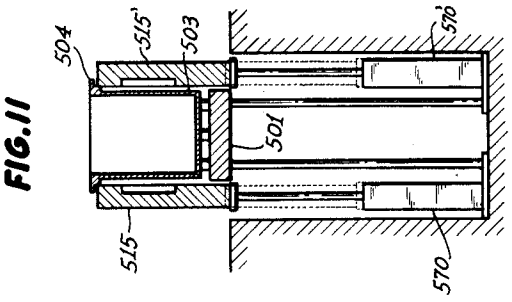


FIG. 11

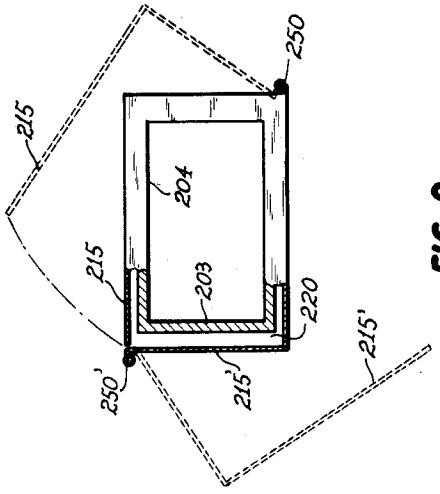


FIG. 8

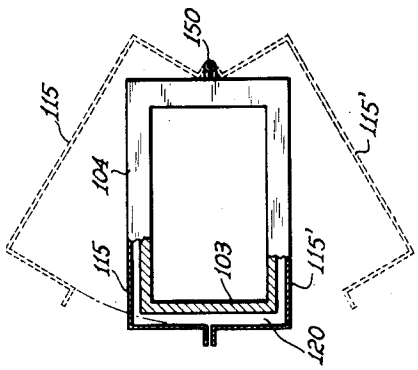


FIG. 7

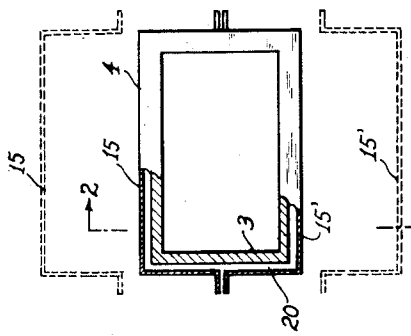


FIG. 6

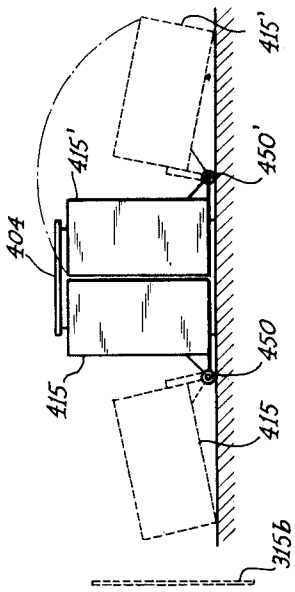


FIG. 10

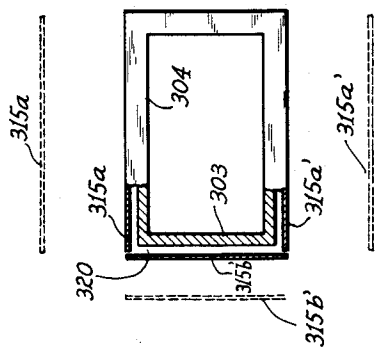


FIG. 9

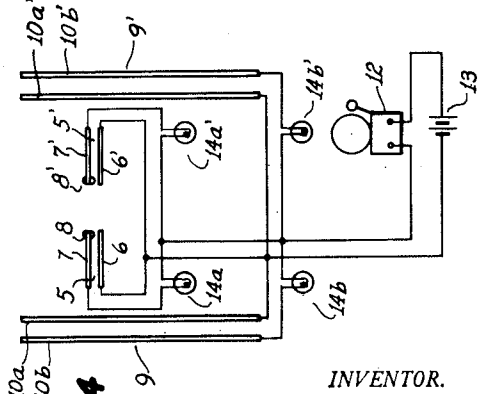


FIG. 4

INVENTOR.
BERTHOLD ALLERT
BY
Karl F. Ross
AGENT

Patented Oct. 28, 1952 2,615,702

UNITED STATES PATENT OFFICE

2,615,702

INDUSTRIAL BATH FURNACE

Berthold Allert, East St. Kilda, Victoria, Australia

Application February 18, 1950, Serial No. 144,892
In Australia December 1, 1945

15 Claims. (Cl. 263—11)

1

This invention relates to industrial bath furnaces having removable furnace walls, and more particularly to furnaces of the type disclosed in my co-pending application Ser. No. 650,777, filed February 28, 1946, now abandoned, of which the present application is a continuation-in-part.

Industrial bath furnaces heretofore in general use have been subject to damage and destruction due to failures of the bath walls, whereby the heating chamber and its heating elements become exposed to the molten metal. Common practice has been to ladle out the molten metal from the bath when such failures have been detected. This procedure can rarely be carried through in time to prevent costly damage or complete destruction of the installation; moreover, the intense heat radiated by the walls of the heating chamber tends to make such operations both difficult and dangerous. Although the provision of removable chamber walls has been resorted to in a few known constructions, their removal from the vicinity of the bath was generally a laborious and time consuming process, and the presence of a stationary framework, to which these removable wall portions were customarily attached, quite often impeded access to the danger point.

The principal object of this invention is to provide an improved industrial bath furnace of the character described wherein the above disadvantages are avoided.

Another object is to provide an industrial bath furnace in which the walls of the heating chamber are so completely removable as to give full access to the entire bath (or any portion thereof) with a minimum loss of time.

A further object is to provide an industrial bath furnace wherein the walls of the heating chamber, when operatively positioned, are structurally so related to the vat containing the bath as to lend additional support to the latter against the internal pressure of the bath contents.

Still another object is to provide, in an industrial bath furnace of the character described, means for rapidly moving away one or more of the walls of the heating chamber upon occurrence of an alarm signal indicating actual or impending failure.

A still further object is to provide, in an industrial bath furnace, means enabling inspections or even repairs of the heating elements to be conveniently carried out with little loss of productive time.

Yet another object is to provide, in a furnace of the removable wall type, a heating chamber of reduced dimensions for the purpose of minimizing power transfer losses and making the bath more rapidly responsive to temperature changes in the heating elements.

These and other objects and advantages will be apparent from the following description in

2

which reference is had to the accompanying drawing, illustrating certain embodiments of the invention, similar reference numerals denoting similar parts throughout the several views.

In the drawing:

Fig. 1 is a perspective view of an industrial bath furnace embodying the invention, showing the heating chamber thereof in open position with one wall portion fully removed;

Fig. 2 is a cross section, on the line 2—2 of Fig. 6, of the furnace illustrated in Fig. 1 wherein one wall portion is shown in operative and one in inoperative position;

Fig. 3 is an end elevation of the furnace in closed position;

Fig. 4 is a schematic diagram of a leakage alarm circuit associated with the furnace of Figs. 1–3;

Fig. 5 is a side elevation of the furnace shown in Figs. 1–3;

Fig. 6 is a top plan view showing, somewhat diagrammatically, the bath and the heating chamber of the furnace illustrated in the preceding figures;

Figs. 7, 8 and 9 are top views similar to Fig. 6 but showing other forms of furnaces according to the invention;

Fig. 10 is an end view somewhat similar to Fig. 3, representing a further embodiment; and

Fig. 11 is a cross section, somewhat similar to Fig. 2, of still another form of realization.

Referring now to Figs. 1–6 of the drawing in detail:

On a stationary base or hearth 1, provided with a pair of drainage channels 2 and 2', there is arranged the vat 3 containing a bath of, for example, molten metal. A flange 4 rims the upper portion of the vat.

As best seen in Figs. 1 and 2, leakage detectors 5, 5' and 9, 9' are mounted upon the base and are disposed along the long sides of the latter. Leakage detector 5 is of the contact type comprising a substantially rigid arm 6 and a resilient arm 7 provided with a contact point 8. Leakage detector 9 comprises two wires 10*a* and 10*b* separated by insulators 11. Detectors 5' and 9' are structurally identical with detectors 5 and 9, respectively.

Leads from the two pairs of detectors pass through the base 1 and are connected in the alarm circuit shown in Fig. 4. An alarm device 12, here shown schematically as a bell, is in series with a battery 13 and with each of the detectors which are in parallel with one another. Each detector circuit 5, 9 and 5', 9' is provided with a series connected signal lamp 14*a*, 14*a*' and 14*b*, 14*b*', respectively.

Two independent, separately movable furnace wall units 15, 15' encompass the vat when in operating position. A portion of the base 1 forms a ledge 16 which underlies both wall units. Re-

cesses 17, 17' in the wall units are designed to accommodate heating elements 18, 18', respectively. Flanges 19 and 19' abut the lower part of vat flange 4 and are overlapped by the upper portion of the latter. An annular heating chamber 20 is thus defined by the aforementioned flanges, wall units 15, 15', vat 3 and ledge 16. Additional recesses 21, 21' accommodate the edge portions of a pair of inclined strips 40, 40' which rise from the base 1 and form the drainage channels 2 and 2', respectively, these strips serving further to limit the effective volume of the heating chamber and to impede the escape of heated air therefrom.

Rails 22, 22' atop the wall units form a support for a bath lid 23 which is mounted on rollers 24. Furnace wall units 15, 15' are similarly mounted on rollers 25, 25' which are guided by floor grooves 26. Ratchet-and-lever drives are mounted on the shafts 28, 28' of the outermost rollers of wall units 15 and 15'; as shown, the levers 27, 27' carry pawls so oriented with respect to their associated ratchets that the wall units will be moved outwardly when these levers are swung back and forth on their shafts. The levers 27, 27' may be lifted from their shaft collars in order to disengage the pawls from the ratchets, thereby facilitating the return of the wall units into closed position.

The leads from the electric heating elements 18 and 18' terminate in respective terminal boxes 29 and 29'. Power from the mains is supplied over suitable switches and protective fuses (not shown) via flexible cables 30, 30' which pass through the floor grooves 26 and terminate in the boxes 29 and 29', respectively, these cables thus allowing for the free displacement of the wall units along the grooves 26 without disruption of the power supply.

Locking and sealing means for the two furnace wall units are provided in the form of lugs 31 cooperating with latches 32. The latches are rigidly mounted on a sliding bar 33 which moves vertically within sleeves 34. A handle 35 is mounted on the bar. Identical locking means are provided at the front and rear of the furnace chamber.

As shown in Figs. 1 and 5, a movable carriage 36 mounted on rollers 37, which are guided by floor grooves 38, supports the bath lid 23 when the latter is not in operating position. Rails 39, on which the bath lid moves, are adapted to be aligned with corresponding rails 22, 22' on the furnace wall units, in closely spaced relation thereto, when the heating chamber is closed.

The operation proceeds as follows:

Wall units 15 and 15' are rolled into the closed position shown in Fig. 3, after suitably disabling the ratchet-and-lever drives on shafts 28, 28' as previously described. The wall units are locked together by raising bar 33, allowing the latches 32 to slip over the lugs 31, and then moving the bar 33 back to normal position. Bath lid 23 may now be rolled off carriage 36 onto the furnace; this lid may be transparent or provided with a window for the purpose of permitting observation of the bath in operation.

Power is delivered from the mains through cables 30, 30' and terminal boxes 29, 29' to heating elements 18, 18'. Substantially all the heat produced is contained in heating chamber 20, which is foreshortened by the strips 40, 40' extending into the recesses 21, 21', and is transmitted to the bath through the walls of vat 3.

The flanges 19, 19' abut the vat and bear a portion of the stresses imparted to the latter by the bath contents, thus effectively reinforcing the vat against bulging. In the preferred embodiment being described, the bath is rectangular in shape and the generally U-shaped wall units are oriented to encompass the long sides of the vat where bulging is most likely to occur. By thus splitting the chamber in the plane bisecting the shorter sides of the rectangle, any such bulging will tend to increase the clearance between the vat and the arms of the U, thereby preventing binding of the wall units and the vat. Accordingly, with the arrangement disclosed, the furnace units will always be readily separable.

Any marked bulging of the vat, which generally precedes failure of its walls, will cause the vat wall to bear upon contact point 8 or 8', forcing the latter into contact with arm 6 or 6'. This closes the alarm circuit, energizing signal lamp 14*a* or 14*a'* and alarm device 12. In the event failure is first evidenced by leaks in the vat walls, wires 10*a* and 10*b* (or 10*a'* and 10*b'*) will be electrically connected by drops of molten metal from the bath. This will close the alarm circuit, energizing signal lamp 14*b* (or 14*b'*) and alarm device 12.

The operator, upon being warned by the alarm system, rolls back the bath lid 23 and unlocks the furnace. Noting the side on which failure has occurred, as indicated by the corresponding signal lamp, he then opens the appropriate power switch and rolls back the corresponding wall unit, using lever 27 or 27'. In case of urgency the lid 23 need not be rolled back, coming to rest atop the flange 4 after one or both wall units have been removed. Complete inspection may now be carried out and the necessary repairs effected. If required the vat may be removed, unimpeded by the wall units. The vat may be conveniently hooked underneath the flange 4 and tilted on one edge in order to allow a dolly or a set of rollers to be placed under the vat. A raised platform may then be positioned flush with the base and the vat transferred onto same.

The foregoing operations have been described with reference to manual control; the arrangement, however, may readily be modified or supplemented by providing some known type of servo-mechanism for the purpose of effecting the automatic removal of the various units and interruption of heating in the event of vat failure.

In the plan view of Fig. 6 the wall units 15, 15' have been diagrammatically represented by the portions thereof closest to the vat (which bear the flanges 19, 19' and the locking means 31—34). Part of the vat flange 4 is broken away to expose the heating chamber.

Figs. 7–11 show schematically various modes of furnace wall separation differing from that indicated in Fig. 6. Elements corresponding to parts previously described are similarly numbered with a characterizing hundreds digit preceding the original identification. For example, flange 4 appears as 104, 204, 304, 404 and 504, respectively.

In Fig. 7 the wall units 115, 115' are pivoted at hinges 150. The clearance between the vat and the wall units in this case must be sufficient to prevent the corners of the vat from interfering with the free outward swing of the wall units, as indicated by the dot-and-dash line.

Fig. 8 shows an arrangement wherein both wall units may swing outwardly without the possibility of blocking at the vat corners. The two wall units are pivoted at separate hinges 250, 250' and are independent of each other.

In Fig. 9 four separate wall units 315*a*, 315*a'*,

315b, 315b' are used. Other details are similar to those described above.

Fig. 10 shows wall units 415, 415' which swing about horizontal axles 450.

Fig. 11 illustrates an arrangement wherein the walls 515, 515' are displaceable vertically with respect to the vat 503. Jacks 570, 570', e. g. of the hydraulic type, are set in recesses beneath the surface of the shop floor and the walls may be lowered into the floor. It will be apparent that one may also use an analogous system wherein the vertically movable wall units are raised above the vat when it is desired to obtain access to the bath.

The embodiments of the invention herein shown and described are to be regarded as illustrative only and it is to be understood that the invention is susceptible to variations and adaptations within the spirit and scope of the subjoined claims.

I claim:

1. In an industrial bath furnace the combination, with a base and an open vat supported on said base, of a plurality of mutually complementary wall units independently movable relative to said base, each of said wall units having an upper portion abutting a corresponding top portion of said vat to form an annular heating chamber around the vat when the wall units are in a closed position adjoining said base, certain of said mutually abutting portions forming a flange all around said vat closing said chamber at its top, and heater means in said heating chamber.

2. The combination according to claim 1 wherein each of said wall units is horizontally displaceable.

3. The combination according to claim 1 wherein each of said wall units is swingable about a pivot.

4. The combination according to claim 1 wherein each of said wall units is vertically displaceable.

5. In an industrial bath furnace the combination, with a base and an open vat supported on said base, of a plurality of mutually complementary wall units independently movable relative to said base, said vat being provided with an annular flange near its top, each of said wall units having an upper portion abutting said flange to form an annular heating chamber around the vat when the wall units are in a closed position adjoining said base, said chamber being closed at its top by said flange, and heater means in said heating chamber.

6. The combination according to claim 5 wherein said base has a portion projecting beyond said vat and forming the lower boundary of said heating chamber.

7. The combination according to claim 6 wherein said projecting base portion forms a drainage channel.

8. The combination according to claim 7, comprising electric leakage indicator means in said drainage channel.

9. The combination according to claim 5 wherein said vat is rectangular, said wall units being two in number and being each of generally U-shaped configuration positioned to embrace a respective half of the vat.

10. The combination according to claim 9 wherein said wall units, when in contact with each other and with said vat, meet in a plane bisecting the shorter sides of the rectangle.

11. In an industrial bath furnace the combination, with a base and an open vat supported on said base, of a pair of independently movable chamber halves together forming an annular heating chamber around said vat when in a closed position adjoining said base, said vat being provided with a flange portion near its top abutting said chamber halves when in said closed position, said chamber being closed at its top by said flange, and heater means internally carried by each of said chamber halves.

12. The combination according to claim 11, comprising a pair of rails respectively positioned atop said chamber halves, and a bath lid adapted to be displaceably supported by said rails above said vat when said chamber halves are in said closed position.

13. The combination according to claim 12, comprising a support for said bath lid positioned adjacent said vat and provided with a second pair of rails respectively aligned with the first-mentioned rails when said chamber halves are in said closed position, thereby permitting the transfer of said bath lid from said chamber halves to said support and vice versa.

14. The combination according to claim 13, comprising first guide means permitting displacement of said chamber halves toward and away from said vat and second guide means permitting displacement of said support parallel to the path of displacement of said chamber halves.

15. In an industrial bath furnace the combination, with a base and an open vat supported on said base, of a plurality of independently movable wall units together forming an annular heating chamber around said vat when in a closed position, including a pair of wall units positioned opposite each other, heater means internally carried by at least certain of said wall units, a pair of parallel rails respectively positioned atop said opposite wall units, said rails being movable with respect to each other along with said wall units, and a bath lid adapted to be displaceably supported by said rails above said vat when said pair of wall units are in said closed position.

BERTHOLD ALLERT.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,073,912	Koch	Sept. 23, 1913
1,085,540	Case, Jr.	Jan. 27, 1914
1,107,478	Bayard	Aug. 18, 1914
1,354,286	De Bats	Sept. 28, 1920
1,370,215	Lebarthe	Mar. 1, 1921
2,015,699	Trainer et al.	Oct. 1, 1935
2,027,065	Sadtler	Jan. 7, 1936
2,098,813	Rosseau	Nov. 9, 1937
2,145,438	Thulin	Jan. 31, 1939

FOREIGN PATENTS

Number	Country	Date
328,576	Great Britain	Apr. 29, 1930