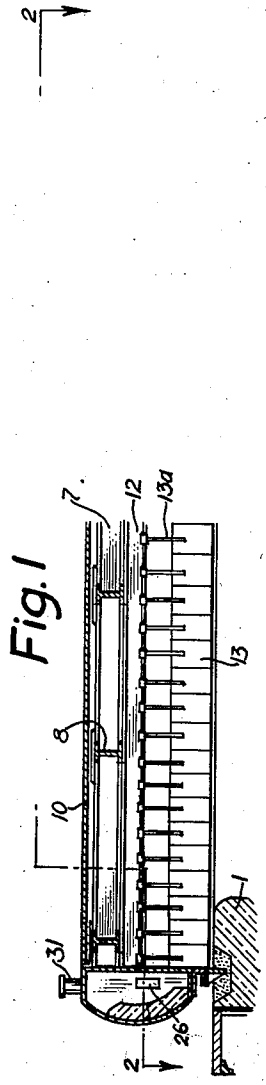
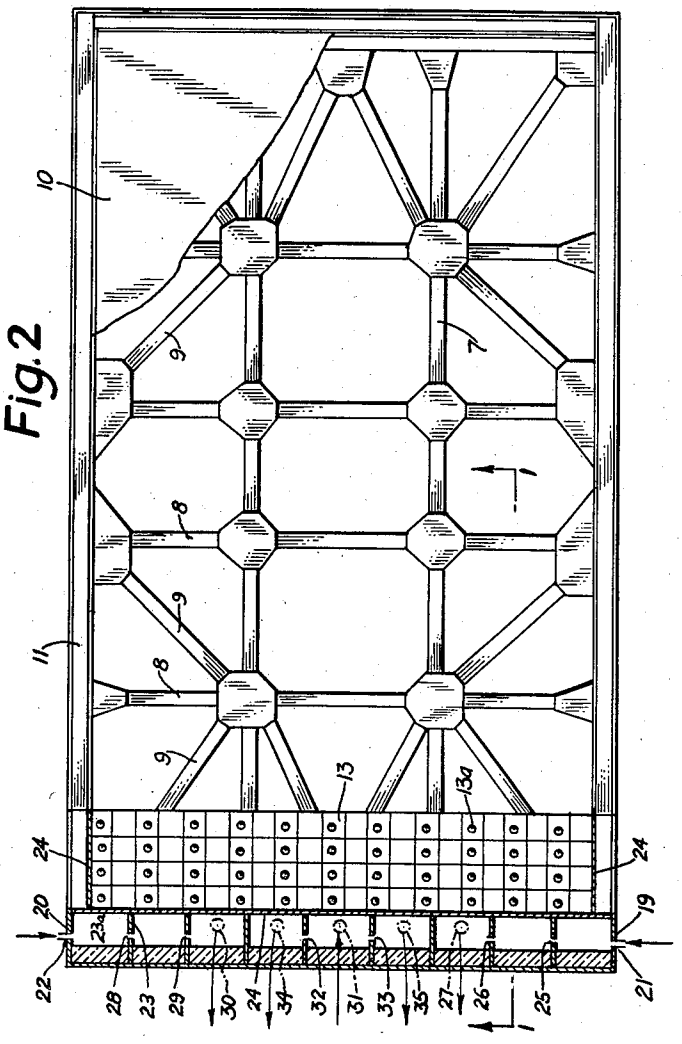
April 21, 1959 H. ROMER 2,882,844

COVER FOR INDUSTRIAL FURNACE

Filed Nov. 3, 1954 2 Sheets-Sheet 1





INVENTOR
HERMANN RÖMER

BY Toulmin & Toulmin

ATTORNEYS

April 21, 1959 H. ROMER 2,882,844

COVER FOR INDUSTRIAL FURNACE

Filed Nov. 3, 1954 2 Sheets-Sheet 2

Fig. 3

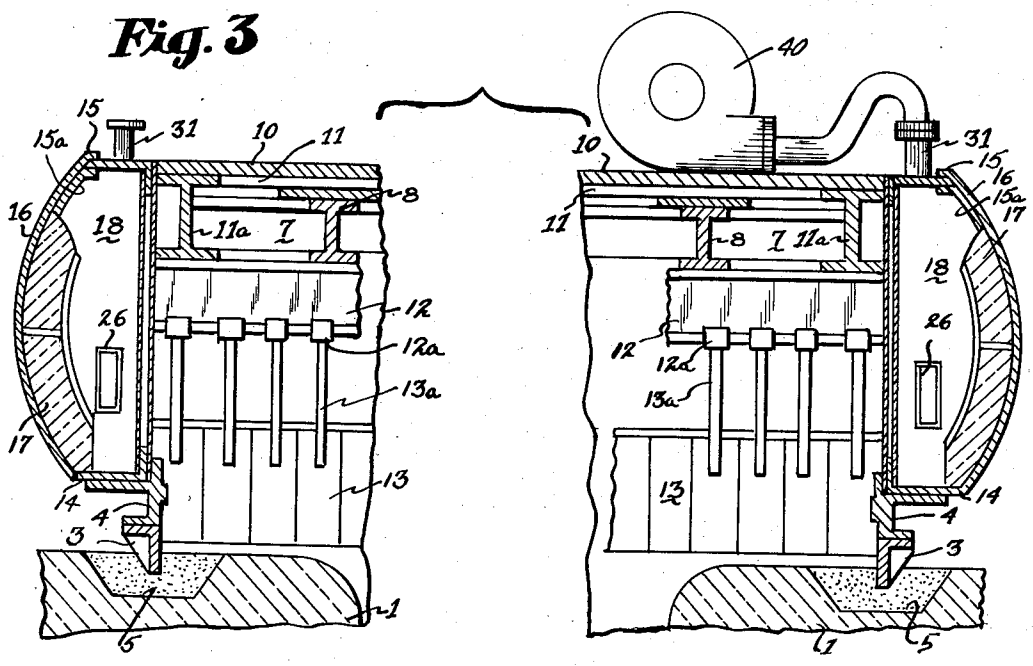
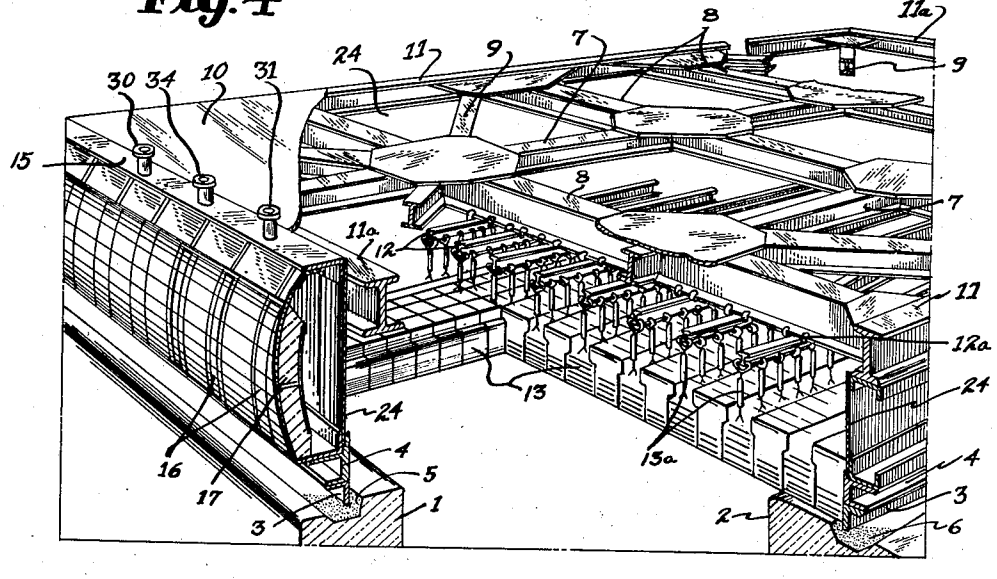


Fig. 4



INVENTOR.
HERMANN ROMER

BY
Toulmin & Toulmin
ATTORNEYS

United States Patent Office 2,882,844
Patented Apr. 21, 1959

2,882,844

COVER FOR INDUSTRIAL FURNACE

Hermann Römer, Dusseldorf-Rath, Germany

Application November 3, 1954, Serial No. 466,530
Claims priority, application Germany July 30, 1954
6 Claims. (Cl. 110—173)

In the running of industrial furnaces, particularly soaking pits, the openings in which are closed by movable covers, particularly sliding covers, the covers are pushed aside in order to remove the goods, e.g. ingots or slabs, but the nose of the cover still projects over the opening so that it is exposed to the direct radiation. In this position, therefore, intense heating of the nose of the cover takes place, which results in an extensive deformation of the cover and distortion. This leads to subsequent gas leakages with their known disadvantages, excessive stress on the packing strips and failure of the adjacent refractory bricks of the cover.

According to the invention, it is suggested that the nose of the cover should be provided with cooling, particularly air cooling and possibly also water cooling, by means of which the front portion of the cover, particularly the iron frame of the cover and the bricks held thereby are protected from excessive heating. The coolant, e.g. air, may conveniently be sucked in at the side by the cover, and conveyed through one or more hollow spaces or passages provided in the nose of the cover or immediately in front thereof, in such a manner that the whole of the front of the cover, particularly the iron frame gripping the cover, and also the nose shield forming the casing for the cooling bricks, are effectively cooled. The cooling air may conveniently be guided in such a manner that it is sucked or driven through the cooling passages by thermal flow. This thermal flow may also be reinforced or replaced by any desired means, e.g. by setting up vent pipes or by mechanical means such as blowers.

The casing of the cooling nose may conveniently be formed by individual ribs connected to the framework of the cover and interposed refractory insulating bricks which interlock with a groove-and-tongue joint. This casing structure may, to advantage, be so robustly constructed that it serves at the same time as a fender for any blows which may strike the casing during the removal of the ingots.

The air intake is through a passage which is provided in the side wall of the nose, and which passes obliquely through the nose. This passage may, if necessary, be subdivided in cross-section so as to form several passages to which the cooled compartment is allocated in groups. For example, the first three compartments may be supplied with cooling air by the first passage, the second three compartments by the second passage and the last three compartments by a third passage. As a result, overheating in the final groups of compartments is avoided.

The cooling device according to the invention may, if necessary, also be provided at two opposite ends of the cover for example if the cover is to be operated from two opposite sides by being pushed away from the opening first in one direction and then in the opposite direction.

In the accompanying drawing, one embodiment of the subject of the invention is illustrated by way of example.

Figure 1 shows a sectional view taken along plane 1—1 of Figure 2 of a cover for a soaking pit constructed according to the invention.

Figure 2 shows the cover seen from above, partially in section and partially in plan, in a section along the line 2—2 in Figure 1.

Figure 3 shows the front end-wall of the cover in a fragmentary view in a section taken in the same plane as Figure 1 through another embodiment of the cover according to the invention, comprising cooling means at opposite ends of the cover.

Figure 4 shows diagrammatically the cover on top of the furnace opening, a rectangular part of the cover being cut away, and the top cover plate removed therefrom, in order to show the inside structure of the cover.

In detail, the reference numerals 1 and 2 in the figures represent the furnace walls built of refractory brick. During operation, the upper opening of the furnace is closed by the cover illustrated, which engages in the sealing channels 5, 6 in the furnace walls, with the angle-irons 3, 4 which run all round it.

The cover structure consists of a peripheral metal wall 24, longitudinal members 7 and cross-members 8 which are connected by diagonal supports 9. Members 7, 8 and 9 are secured in a conventional manner to the internal surface of metal wall 24; this metal wall is mounted on the aforesaid angle irons 3 and 4. The area of the cover is sealed off with a sheet-metal plate 10, which is placed in a top frame consisting of longitudinal cross bars 11 and end bars 11*a* as illustrated in Figure 4, in which figure the cover plate 10 has been partially removed.

Underneath the cover plate 10, carrier rails 12 are provided which are connected to the cross members 8 by conventional fastening means 12*a*. From the carrier rails 12 shaped refractory bricks 13 are suspended in a manner known per se, by suspension hooks 13*a*.

At the front side of the cover an angle iron 14 is provided at the bottom and an angle iron 15 at the top of wall 24 to protrude therefrom and extend in transverse direction to the direction of movement of the cover, and an angular strip of sheet metal 15*a* which is welded or riveted to both the angle iron 15 and the arched metal strips 16. The latter are connected by welding to the bottom angle iron 14. Refractory bricks 17 or a tamping clay are arranged between the arched sheet metal strips 16 behind which a hollow space 18 is formed.

In the side walls of the cover nose, formed by metal panels 19, 20, feed pipes 21, 22 are provided which serve for the admission of cooling air or another gaseous or liquid coolant. In passing through the space 18, the air primarily cools the girders and walls bordering the hollow chamber on the cover side particularly the connecting cross plates 23 and the metal wall 24, as well as the shaped bricks 17 together with the sheet metal strips 16.

If the hollow space is sub-divided by the cross plates 23, as shown in Figure 2, a number of adjacent chambers 23*a* are obtained which are arranged in three groups as shown in the embodiment of Figure 2. The first group is supplied with cooling air through the feed pipe 21. The cooling air flows through conduits 25, 26 into the adjacent chambers and is then drawn off through the exhaust pipe 27.

The group of three chambers arranged at the opposite side of the cover nose is supplied with cooling air through feed pipe 22. The cooling air is then conducted through conduits such as orifices 28, 29 to the adjacent chambers and is finally drawn off through exhaust pipe 30.

The group of chambers arranged in the center of the cover nose is supplied with cooling air e.g. by a feed pipe 31 arranged above the cover nose. The cooling air enters through conduits 32 and 33 into the adjacent chambers and leaves them through exhaust pipes 34, 35.

If the cover can be removed from the furnace opening,

in two opposite directions, the end-face of the cover opposite to the nose described may conveniently be provided with a corresponding cooling device.

The device described can be modified in many ways within the framework of the essential characteristics. In particular the cover structure itself may be constructed in any desired manner to suit the particular requirements, and the dimensions and temperatures of the furnace. The cooled end-face, or the furnace end-faces provided with the cooling device, may also be constructed in the most varied manner within the framework of the essential idea. Thus instead of the thermal flow which causes the cooling in the example described, a blower 40 may also be provided which drives controllable amounts of cooling air through the cooling chamber or chambers in the nose of the cover. The brick lining of the nose of the cover, and the reinforcements holding the bricks may also be constructed in the most varied ways.

I claim:

1. In a soaking furnace having an opening in the horizontal top thereof, a cover for said opening being slidable horizontally so as to be removed at least partially from said opening, said cover comprising a steel construction framework, peripheral structural means forming the edges of said framework, a plurality of refractory bricks suspended from said framework, and air cooling means mounted exclusively on the front of that portion of said peripheral structural means which extends across the furnace opening when in partially withdrawn position and is, therefore, exposed to the heat of the furnace, so as to cool said peripheral structural means above said opening and the refractory bricks suspended therefrom and prevent deformation thereof, said cooling means comprising passage means for circulating air therethrough.

2. In a soaking furnace having an opening in the horizontal top thereof, a cover for said opening being slidable horizontally so as to be removed at least partially from said opening, said cover comprising a steel construction framework, peripheral structural means forming the edges of said framework, a plurality of refractory bricks suspended from said framework, and air cooling means mounted exclusively on the front of that portion of said peripheral structural means which extends across the furnace opening when in partially withdrawn position and is, therefore, exposed to the heat of the furnace, so as to cool said peripheral structural means above said opening and the refractory bricks suspended therefrom and prevent deformation thereof, said cooling means comprising passage means for circulating air therethrough, and means for blowing air through at least part of said passage means.

3. In a soaking furnace having an opening in the horizontal top thereof, a cover for said opening being slidable horizontally so as to be removed at least partially from said opening, said cover comprising a steel construction framework, peripheral structural means forming the edges of said framework, a plurality of refractory bricks suspended from said framework, and cooling means mounted on the front of that portion of said peripheral structural means which extends across the furnace and is, therefore, exposed to the heat of the furance, when said cover is partially removed from said opening, so as to cool said peripheral structural means above said opening and the refractory bricks suspended therefrom and prevent deformation thereof, said cooling means comprising passage means for circulating air therethrough, said cooling means comprising at least one cooling chamber extending traversely to the direction of removal of said cover from said opening over the entire width of the latter, vertical wall portions protruding from said peripheral structural means so as to form the sidewalls of said chamber, and a front wall of convex shape intermediate said vertical steel walls so as to form the front wall of said chamber, intermediate vertical walls subdividing said chamber into a plurality of compartments, coolant inlet means provided at least at one of said compartments, coolant outlet means provided at least at another one of said compartments, and passage means connecting each of said compartments with the adjacent ones so as to permit the circulation of a coolant therethrough.

4. In a soaking furnace having an opening in the horizontal top thereof, a cover for said opening being slidable horizontally so as to be removed at least partially from said opening, said cover comprising a steel construction framework, peripheral structural means forming the edges of said framework, a plurality of refractory bricks suspended from said framework, and air cooling means mounted on the front of that portion of said peripheral structural means which extends across the furnace and is, therefore, exposed to the heat of the furnace, when said cover is partially removed from said opening so as to cool said peripheral structural means above said opening and the refractory bricks suspended therefrom and prevent deformation thereof, said cooling means comprising passage means for circulating air therethrough, said cooling means comprising at least one cooling chamber extending traversely to the direction of removal of said cover from said opening over the entire width of the latter, vertical wall portions protruding from said peripheral structural means so as to form the sidewalls of said chamber, and a front wall of convex shape intermediate said vertical steel walls so as to form the front wall of said chamber, intermediate vertical walls subdividing said chamber into a plurality of compartments, air inlet means provided at least at one of said compartments, air outlet means provided at least at another one of said compartments, passage means connecting each of said compartments with the adjacent ones so as to permit the circulation of air therethrough, and means for blowing air through at least part of said passage means.

5. In a soaking furnace having a rectangular opening having a pair of longitudinal and a pair of transverse straight edges in the horizontal top thereof, a cover for said opening being slidable horizontally at right angle to one of said pairs of edges so as to uncover said opening at least partially, said cover comprising a steel construction framework, a peripheral vertical wall rectangularly enclosing said framework and comprising a pair of longitudinal and a pair of transverse wall portions forming the edges of said framework, a plurality of refractory bricks suspended from said framework, and air cooling means mounted on the face of at least one of those outside portions of said peripheral vertical wall which are located at right angle to the direction of removal of said cover from said opening, one of which portions extends across the furnace and is, therefore, exposed to the heat of the furnace, when said cover is partially removed from said opening, so as to cool said peripheral structural means above said opening and the refractory bricks suspended therefrom and prevent deformation thereof, said cooling means comprising passage means for circulating air therethrough, said cooling means comprising at least one cooling chamber extending traversely to the direction of removal of said cover from said opening over the entire width of the latter, vertical wall portions protruding from said peripheral structural means so as to form the sidewalls of said chamber, and a front wall of convex shape intermediate said vertical steel walls so as to form the front wall of said chamber, intermediate vertical walls subdividing said chamber into a plurality of compartments, air inlet means provided at least at one of said compartments, air outlet means provided at least at another one of said compartments, passage means connecting each of said compartments with the adjacent ones so as to permit the circulation of air therethrough, and means for blowing air through at least part of said passage means.

6. In a soaking furnace having a rectangular opening

having a pair of longitudinal and a pair of transverse straight edges in the horizontal top thereof, a cover for said opening being slidable horizontally at right angle to one of said pairs of edges so as to uncover said opening at least partially, said cover comprising a steel construction framework, a peripheral vertical wall rectangularly enclosing said framework and comprising a pair of longitudinal and a pair of transverse wall portions forming the edges of said framework, a plurality of refractory bricks suspended from said framework, and air cooling means mounted on the face of both outside portions of said peripheral vertical wall which are located at right angle to the direction of removal of said cover from said opening, one of which portions extends across the furnace and is, theerfore, exposed to the heat of the furnace, when said cover is partially removed from said opening, so as to cool said peripheral structural means above said opening and the refractory bricks suspended therefrom and prevent deformation thereof, said cooling means comprising passage means for circulating air therethrough, said cooling means comprising at least one cooling chamber extending traversely to the direction of removal of said cover from said opening over the entire width of the latter, vertical wall portions protruding from said peripheral structural means so as to form the sidewalls of said chamber, and a front wall of convex shape intermediate said vertical steel walls so as to form the front wall of said chamber, intermediate vertical walls subdividing said chamber into a plurality of compartments, air inlet means provided at least at one of said compartments, air outlet means provided at least at another one of said compartments, passage means connecting each of said compartments with the adjacent ones so as to permit the circulation of air therethrough, and means for blowing air through at least part of said passage means.

References Cited in the file of this patent

UNITED STATES PATENTS

253,235	Strickler	Feb. 7, 1882
1,398,900	Kennedy	Nov. 29, 1921
2,512,439	Richards	June 20, 1950