

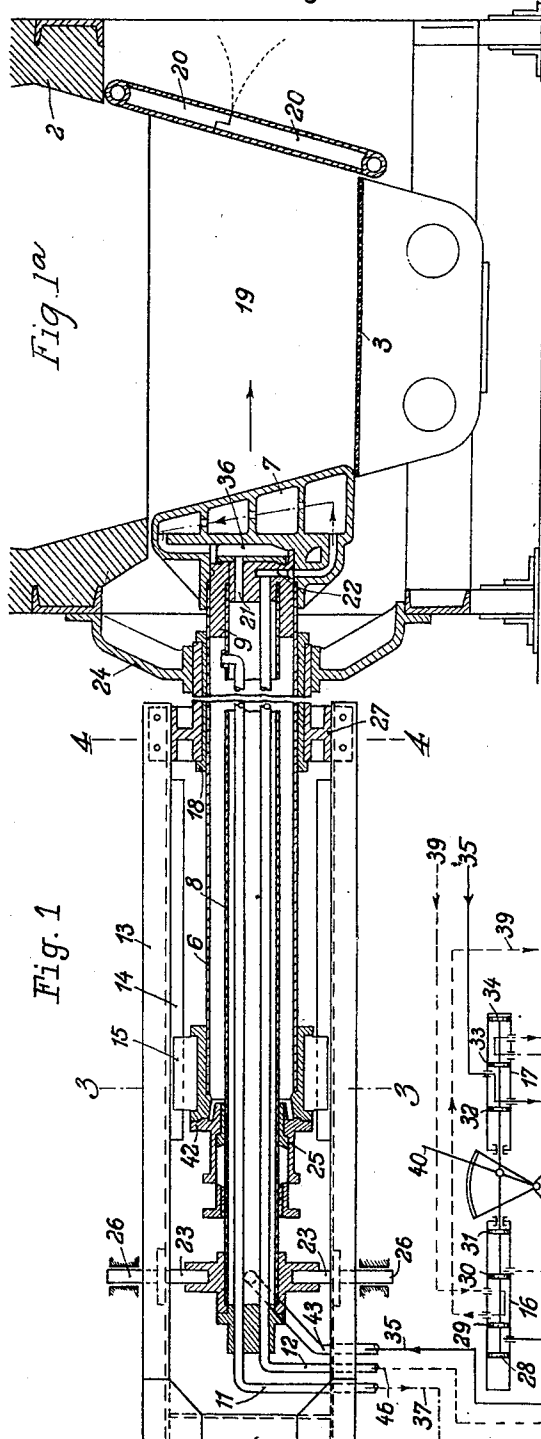
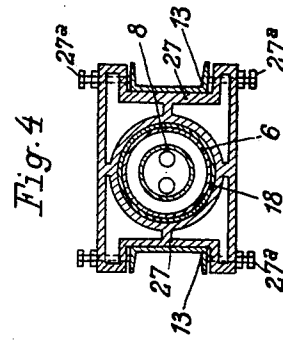
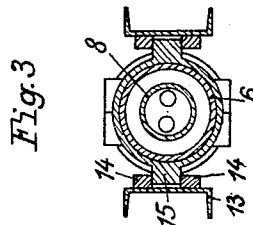
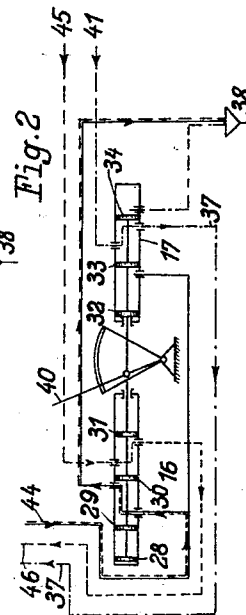
Dec. 22, 1931.

O. UHDE ET AL

**1,838,014**

# HYDRAULIC DEVICE FOR EMPTYING FURNACES

Original Filed Jan. 22, 1929



*Inventors:*

Otto Uhde  
Victor Koll

Victor Koll

by Byrnes, Townsend & Potter,  
Attorneys

История

## UNITED STATES PATENT OFFICE

OTTO UHDE, OF HAMBURG, AND VICTOR KOLB, OF FRANKFORT-ON-THE-MAIN,  
GERMANY

## HYDRAULIC DEVICE FOR EMPTYING FURNACES

Original application filed January 22, 1929, Serial No. 334,279, and in Germany August 5, 1928. Divided  
and this application filed March 11, 1930. Serial No. 434,984.

The invention relates to hydraulic devices mounted for emptying shaft furnaces and other furnaces provided with a hearth, especially refuse-burning furnaces, by means of an ejecting shield forming one wall of the hearth, and the invention resides in the fact that the movable part of the hydraulic drive carrying the shield is guided at the front in the furnace casing and behind the same in a straight guide, both the fixed part of the drive and the straight guide being mounted so that they can turn about a horizontal axis at the outer end.

The hitherto known arrangements of this type do not take sufficiently into account the fact that furnaces, especially shaft furnaces, undergo changes in length under the action of the heat, this being generally designated as the swelling of the furnace. In one of the devices hitherto proposed a certain flexibility of the ejecting device is obtained in that the hydraulic cylinder is mounted so that it can swing at the outer end, and the shield articulated to the plunger rod, together with a protective housing located on the shield and extending to the outside, form the front support and the guiding means for the ejecting device. In contrast to this device, according to the present invention, two guides separate from each other are provided so that the possibility of fitting the ejecting shield to the movements of the furnace wall is increased and a tighter joint is to be expected. In order that the distortion of the furnace casing under the action of the heat will cause no jamming of the cylinder in the guides, adjusting means, for instance screw adjustments, are provided in the mounting of the cylinder in the casing.

When operating the ejecting shield according to the invention it is, of course, unavoidable that incandescent cinders should fall on the shield supports. In order that no disturbance in operation of the operating engine should be produced by these cinders, according to the invention the ejecting shield is not mounted on the plunger rod, but fixed to the cylinder, i. e., the cylinder is made movable and the piston, with piston rod, stationary. The piston rod is thus protected

from dirt and corrosion and therefore a tight joint between the piston rod and the cylinder is constantly assured. A control of the ejecting machine by means of the known valve gears can be provided. An especially simple control is obtained, however, if during the emptying operation the water under pressure is used as cooling agent for the ejecting shield, and a special supply of cooling water is provided during the inoperative period of the ejecting shield.

In the accompanying drawings, Fig. 1 represents a portion of the device in horizontal section, and Fig. 1a represents the remainder of the device in vertical section. Fig. 2 shows the position of the control for the reverse stroke. Figs. 3 and 4 are cross-sectional views on lines 3—3 and 4—4, respectively, of Fig. 1.

The device consists essentially of the movable cylinder 6, the water-cooled ejecting shield 7 secured on the cylinder 6 at the side of the furnace, a hollow piston rod 8 with piston 9, the built-in tubes 11 and 12 for the supply of water under pressure and cooling water, a straight guide 13, 14, 15, for the cylinder 6, and the control apparatus with two cylinders 16 and 17 for the water under pressure and the cooling water.

The cylinder 6 slides over the stationary piston 9 during operation and with its packing gland over the fixed, hollow piston rod 8 connected to the same. It is also guided by a fixed guide bushing 18 arranged on the rear furnace casing 24 and by two lateral sliding shoes 15 that run between the slide rails 14 of a straight guiding frame 13.

The water-cooled ejecting shield 7 forms a wall of the water-cooled hearth 19 of the furnace in its inoperative position. Upon the forward movement of the same in the direction of the arrow and after previous opening of the water-cooled rotary gates 20 opposite the same and likewise forming parts of the cooled furnace hearth, the contents of the hearth is ejected over the front edge of the grate 3 and the furnace hearth emptied in this way.

During the forward and backward stroke, the ejecting shield is cooled by the water

under pressure, but during the inoperative condition by a special supply of cooling water at lower pressure.

The hollow piston rod 8 carries at the side of the furnace a piston 9 with bore holes 21 and 22 and forms the passage for the water under pressure for the forward stroke of the machine in the direction of the arrow. It also holds the built-in tubes 11 and 12 that provide passages for the water under pressure for the reverse stroke and for the cooling water for the ejecting shield. The piston valve controls the flow of the cooling water. The piston rod is mounted in two trunnions 23 at the rear end.

The cylinder guide consists of a frame 13 with slide rails 14; it is used for relieving the piston rod packing gland 25 from lateral deflections during the working stroke. It is mounted at the rear end in two trunnions 26 the center of which coincides with the center of the two plunger rod trunnions 23, and at the front end near the furnace it is adjustable by means of set screws 27a in two lateral cast-on projections 27 of the guide bushing 18. This adjustable mounting means makes possible an exactly parallel adjustment of the sliding path to the center of the cylinder or the axis of the movement of the machine. In this way an assured straight guiding is obtained.

Since the plane of the section in Fig. 1 is at right angles to the plane of the section in Fig. 1a, it will be clear that the guide and bearings shown in Fig. 1 are rotated 90° relative to the portion of the device shown in Fig. 1a.

The control apparatus consists of two small cylinders 16 and 17 with appertaining pistons 28, 29, 30, 31, 32, 33, 34, packed with leather sleeves of the known type and suitable drive. The pistons of the two cylinders are always moved in the same direction, the two to the right or left, by means of a control lever. According to their position, at the same time, in the forward stroke, the water under pressure is regulated and the flow of the cooling water through the ejecting shield is interrupted, or in the reverse stroke, the water under pressure is regulated and the flow of cooling water through the shield is again resumed. For instance, the connection diagram of Fig. 1 with control lever 40 in the position to the right shows the corresponding positions of the pistons in the control cylinders and the flow of the water under pressure and the cooling water caused by the same during the forward stroke. The water under pressure (solid line 35) flows through the control cylinder 17, the hollow piston rod 8 and the bore hole 21 of the piston 9, into the chamber 36, and forces the cylinder 6 with the shield 7 forward. The contents of the furnace hearth after previous opening of the turning gates

20 is thrown out over the front edge of the grate 3. The water under pressure at the back of the piston 9 can flow off through the pipe 11 and the passages shown by the broken lines 37 through the control cylinder 17 into the outlet funnel 38. At the same time the cooling water follows the broken line 39 through the control cylinder 16 into the funnel 38. The flow of cooling water to the shield is therefore interrupted and it is cooled only by the water under pressure.

Fig. 2 with the control lever 40 in the position at the left shows, together with Fig. 1, the corresponding positions of the pistons and the course of the water under pressure and of the cooling water caused by the same during the reverse stroke. The water under pressure (broken line 41) flows through the control cylinder 17 following the line 37 through the tube 11 into the chamber between the piston 9 and the cylinder head 42 and forces the cylinder 6 with the shield 7 backward into the end position. At the same time the water under pressure in front of the piston 9 in the space 36 flows through the bore hole 21, the hollow plunger rod 8, the tube 43 following the solid line 44 through the control cylinder 16 into the funnel 38. At the end of the reverse stroke, the cooling water (tube 45) flows through the control cylinder 16 following the broken line 46 through the tube 12, the bore-hole 22, the shield 7 and back through the bore-hole 21, the hollow piston rod 8, the tube 43 in the broken line 44 through the control cylinder 16 into the funnel 38. The supply of cooling water to the ejecting shield is therefore resumed.

During the inoperative condition of the machine, therefore, the ejecting shield is not cooled by water under pressure, but by less expensive cooling water under less pressure, and the pressure pump system can consequently be made smaller than if the cooling were to be accomplished only by water under pressure. Moreover, as shown by a comparison of Figs. 1 and 2, the same passages can be used to a great extent both for the cooling water and the water under pressure.

This application is a division of our application Serial No. 334,279, filed January 22, 1929.

We claim:—

1. Apparatus for emptying furnaces provided with a hearth, especially refuse-burning furnaces, comprising a water-cooled ejecting shield forming in its inoperative position one wall of the hearth, a reciprocating hydraulic drive mechanism therefor, the movable part of said hydraulic drive mechanism carrying the shield and being guided at the furnace end in the furnace casing and back of the furnace in a rectilinear guide, the fixed parts of said drive mechanism and

said guide being vertically movable about a horizontal axis at their rear ends.

2. Apparatus for emptying furnaces provided with a hearth, especially refuse-burning furnaces, comprising a water-cooled ejecting shield forming in its inoperative position one wall of the hearth, a reciprocating hydraulic drive mechanism therefor, the movable part of said hydraulic drive mechanism carrying the shield and being guided at the furnace end in the furnace casing and back of the furnace in a rectilinear guide, said guide being adjustably secured to the furnace casing at the front end, and the fixed parts of said drive mechanism and said guide being vertically movable about a horizontal axis at their rear ends.

3. Apparatus as described in claim 1 in which the movable part of the hydraulic drive mechanism is a cylinder slidably movable lengthwise of a fixed piston and piston rod.

4. Apparatus as described in claim 1 in which the movable part of the hydraulic drive mechanism is a cylinder slidably movable lengthwise of a fixed piston and piston rod, said piston including passages designed to connect the interior of the water-cooled ejecting shield to a pressure water conduit during the forward stroke and to a cooling water conduit at the end of the reverse stroke.

In testimony whereof, we affix our signatures.

OTTO UHDE.  
VICTOR KOLB.