

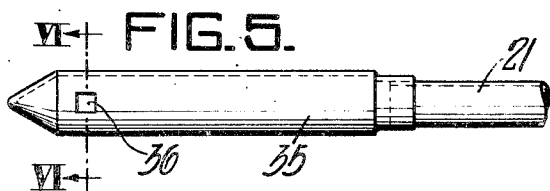
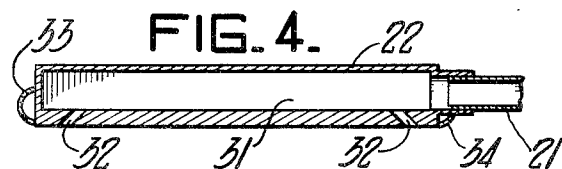
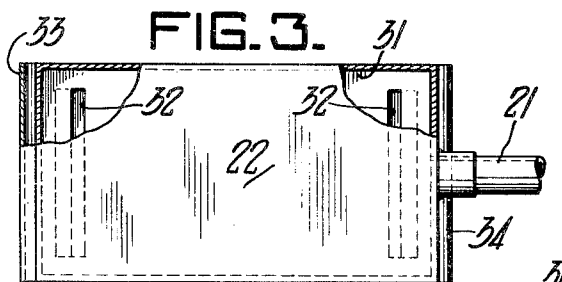
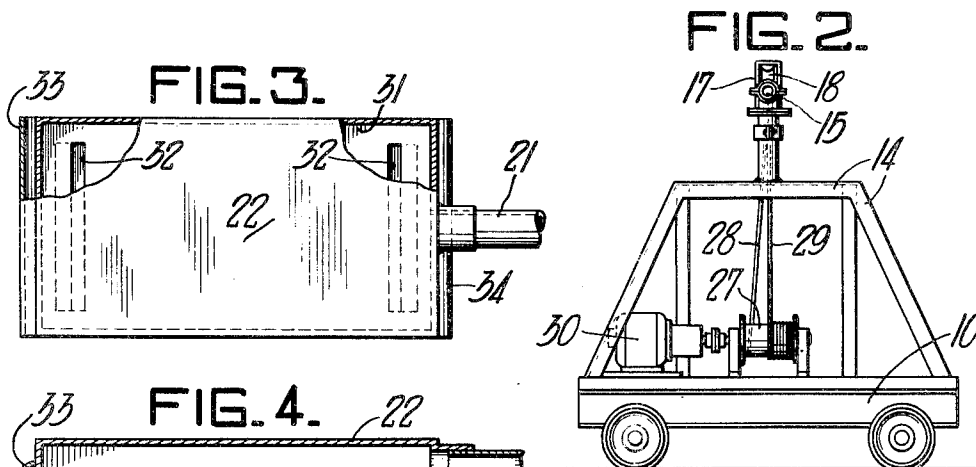
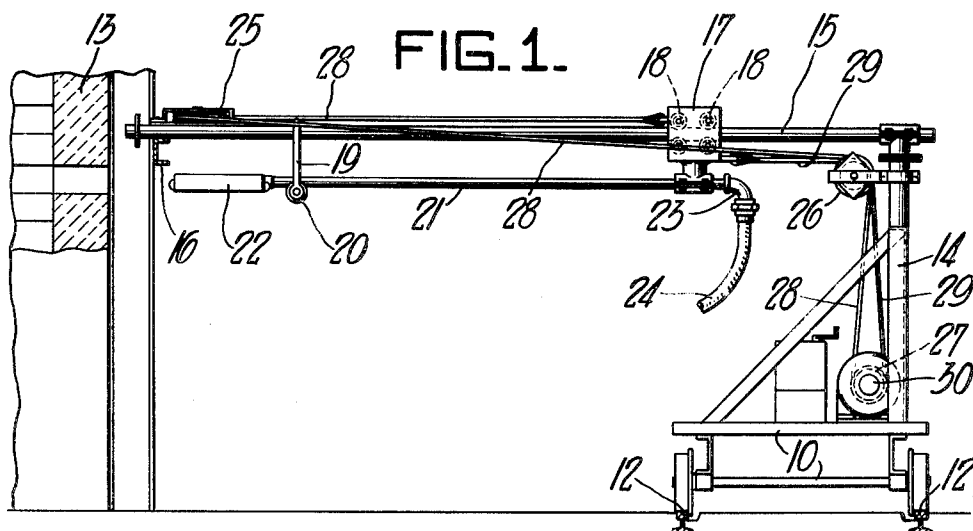
July 22, 1952

E. R. RICHARDS

2,604,358

APPARATUS FOR CLEANING FURNACE CHECKERWORKS

Filed April 22, 1948



INVENTOR:
EDWIN R. RICHARDS,
BY:
Donald G. Dalton
his Attorney

UNITED STATES PATENT OFFICE

2,604,358

APPARATUS FOR CLEANING FURNACE
CHECKERWORKSEdwin R. Richards, Provo, Utah, assignor to
United States Steel Company, a corporation of
New Jersey

Application April 22, 1948, Serial No. 22,528

2 Claims. (Cl. 299—47)

1

This invention relates to apparatus for cleaning checkerwork in furnaces, particularly in open hearth steel-making furnaces.

During operation of open-hearth furnaces, debris such as flue dust accumulates in the checkerwork, which therefore must be cleaned regularly. In previous practice with which I am familiar, the checkerwork has been cleaned by fluid, such as steam or compressed air, introduced through lances which are manually handled. The pressure and temperature of the fluids must be relatively low. Therefore such cleaning practices not only have been uncomfortable and hazardous for workmen, but also have been slow and inefficient.

An object of the present invention is to provide improved apparatus for cleaning checkerwork in which the lances for introducing steam or air are handled mechanically, making possible the use of higher fluid pressures and temperatures and thereby overcoming the principal disadvantages of past practices.

A further object of the invention is to provide improved apparatus for cleaning checkerwork, such apparatus including mechanical means of sturdy and simple design for handling the lances and being readily portable.

In accomplishing these and other objects of the invention, I have provided improved details of structure, a preferred form of which is shown in the accompanying drawing, in which:

Figure 1 is a side elevational view of an improved apparatus for cleaning checkerwork embodying features of the present invention;

Figure 2 is an end elevational view of the apparatus;

Figure 3 is a top plan view of one form of nozzle which may be used with the apparatus shown in Figures 1 and 2;

Figure 4 is a vertical sectional view of the nozzle shown in Figure 3;

Figure 5 is an elevational view of a modified form of nozzle that may be used with the apparatus; and

Figure 6 is a sectional view on line VI—VI of Figure 5.

Referring more in detail to the drawing:

The apparatus illustrated comprises a portable chassis 10, which preferably travels on rails 12 parallel to a furnace wall 13 as illustrated. The chassis may be moved along the rails manually or may be propelled by any suitable mechanical means, not shown. The chassis carries an upright frame 14. An elongated boom 15 is hinged to the upper extremity of frame 14 and may

2

thus be turned to facilitate maneuvering the apparatus. The boom preferably is formed of a cylindrical pipe. Preferably when the apparatus is in position for cleaning checkerwork the outer end of the boom is slidably supported on a rail 16 fixed to the furnace wall. The weight of the chassis is sufficient to balance the weight of the boom as long as the lance, hereinafter described, is retracted.

A trolley 17 is supported on boom 15 for movement longitudinally of the boom. Preferably the trolley includes rollers 18 which have grooved circumferences engaging the top and bottom of the boom to facilitate movement of the trolley. Adjacent its outer end the boom carries a stirrup 19 which preferably has an anti-friction roller 20. A tubular lance 21 is fixed adjacent its rear end to trolley 17 and is slidably received on roller 20 in stirrup 19. The forward end of the lance carries a nozzle 22 hereinafter more fully described. The rearward end of the lance has a connection 23 to which is attached a steam or air inlet hose 24.

The forward portion of boom 15 carries a sheave 25. Upright frame 14 carries a two-pulley sheave 26 near its upper portion. A reversible power driven winch 27 is supported on chassis 10. A cable 28 has one end attached to trolley 17 and extends around sheave 25 on the boom, thence back around one pulley of sheave 26 on the upright frame, and around winch 27 on the chassis. A second cable 29 has one end attached to trolley 17 and extends around the other pulley of sheave 26 and around the winch. It is seen that rotation of the winch projects or retracts the trolley and lance longitudinally of the boom depending on the direction of rotation. Winch 27 is driven by a reversible motor 30, through suitable speed reducing gearing.

The details of nozzle 22 are shown in Figures 3 and 4. The nozzle is of the pan type and has a rectangular chamber 31, the rear wall of which is attached to the lance. The bottom wall of the chamber has oblique orifices 32 through which fluid, such as steam or compressed air, is directed into the checkerwork. The oblique direction of the orifices enables the fluid to clean horizontal surfaces as well as vertical surfaces. The forward and rearward ends of the nozzle have rounded buffers 33 and 34 to prevent damage to the checkerwork from scraping by sharp edges.

The modified nozzle shown in Figure 5 is of the bullet type and comprises a cylindrical body 35 which has outlet orifices 36. Preferably the for-

3

ward end of the body is tapered to prevent damage to the checkerwork.

It is seen that the apparatus of the present invention projects and retracts the lance in or out of the checkerwork mechanically and thus eliminates need for workmen to handle lances manually and makes possible the use of higher fluid pressures and temperatures. The apparatus may be moved about to desired locations on its track. The different types of nozzles provide suitable means for cleaning different forms of checkerwork.

While I have shown and described only a single embodiment of the apparatus, it is apparent that modifications may arise. For example, it is possible to utilize the principle of cleaning checkerwork with lances handled mechanically by other types of handling mechanism. While the cable and sheave mechanism is preferred, I do not intend necessarily to exclude other handling mechanisms that are functionally equivalent. Therefore, I do not wish to be limited to the disclosure set forth but only by the scope of the appended claims.

I claim:

1. An apparatus for cleaning furnace checkerwork comprising a movable chassis, an upright frame on said chassis, an elongated boom supported by said frame, an elongated tubular lance, a nozzle carried by the forward end of said lance, a hose connection carried by the rearward end of said lance for introducing fluid to said lance, a trolley fixed to the rear portion of said lance and movably carried by said boom, a stirrup carried by the forward portion of said boom and movably carrying said lance, a sheave carried by the forward portion of said boom, a two-pulley sheave adjacent the rear of said boom, a reversible power driven winch on said chassis, a cable having an end attached to said trolley and extending around said first named sheave, back around one pulley of said second named sheave and around said winch, and a second cable having an end attached to said trolley and extending around the other pulley of said second sheave and around

4

said winch, rotation of said winch projecting and retracting said lance longitudinally of said boom.

2. An apparatus for cleaning furnace checkerwork comprising a movable chassis, an upright frame fixed to the rearward edge of said chassis, an elongated cantilever boom hinged to the upper end of said frame, an elongated tubular lance, a nozzle carried by the forward end of said lance, a hose connection carried by the rearward end of said lance for introducing fluid to said lance, a trolley fixed to the rear portion of said lance and movably carried by said boom, a stirrup depending from the forward portion of said boom and movably carrying said lance, a sheave carried by the forward portion of said boom, a two pulley sheave adjacent the rear of said boom, a reversible power driven winch on said chassis, a cable having an end attached to said trolley and extending around said first named sheave, back around one pulley of said second named sheave and around said winch, and a second cable having an end attached to said trolley and extending around the other pulley of said second named sheave and around said winch, rotation of said winch projecting or retracting said lance longitudinally of said boom, said chassis and frame balancing the weight of said boom and lance as long as the lance is retracted, the outer end of said boom being supportable for balancing this weight when the lance is projected.

EDWIN R. RICHARDS.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
669,377	Bacon	Mar. 5, 1901
757,522	Van Doren	Apr. 19, 1904
1,020,979	Hay et al.	Mar. 26, 1912
1,268,911	Ziesing et al.	June 11, 1918
1,661,931	Dolan	Mar. 6, 1928
2,441,112	Hibner et al.	May 4, 1948