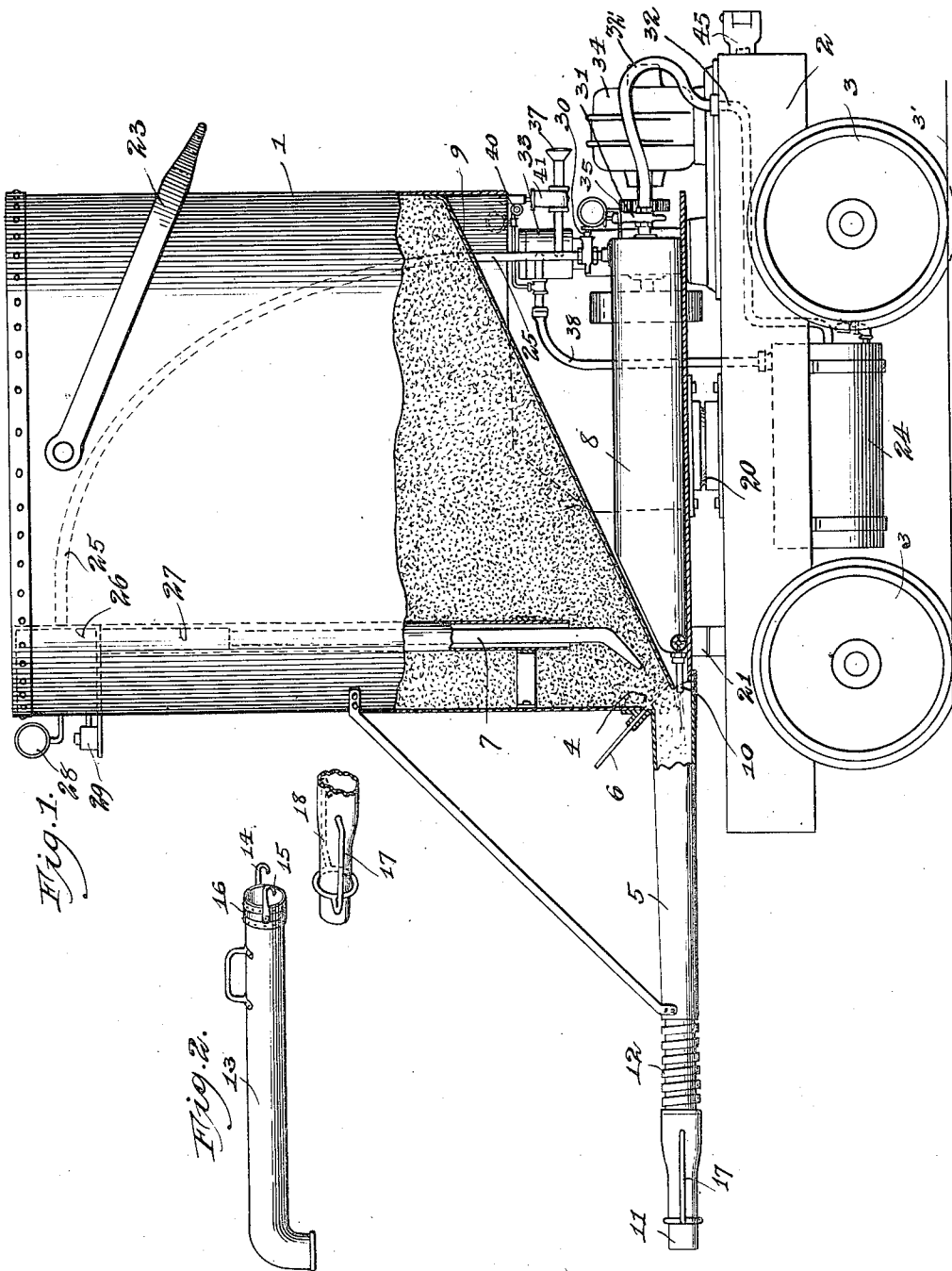


J. A. BLACK.
 MEANS FOR LINING FURNACE BOTTOMS.
 APPLICATION FILED NOV. 9, 1914.

1,240,409.

Patented Sept. 18, 1917.

3 SHEETS—SHEET 1.



Witnesses,

J. B. Mann
 Joyce M. Lutz

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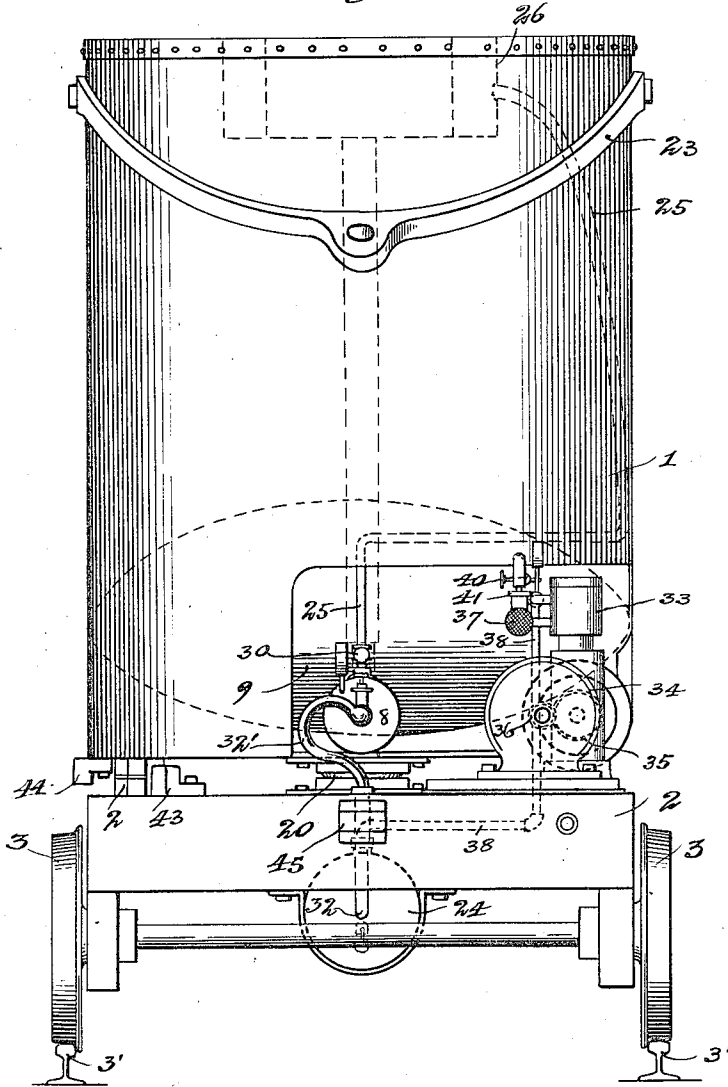
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Fig. 3.



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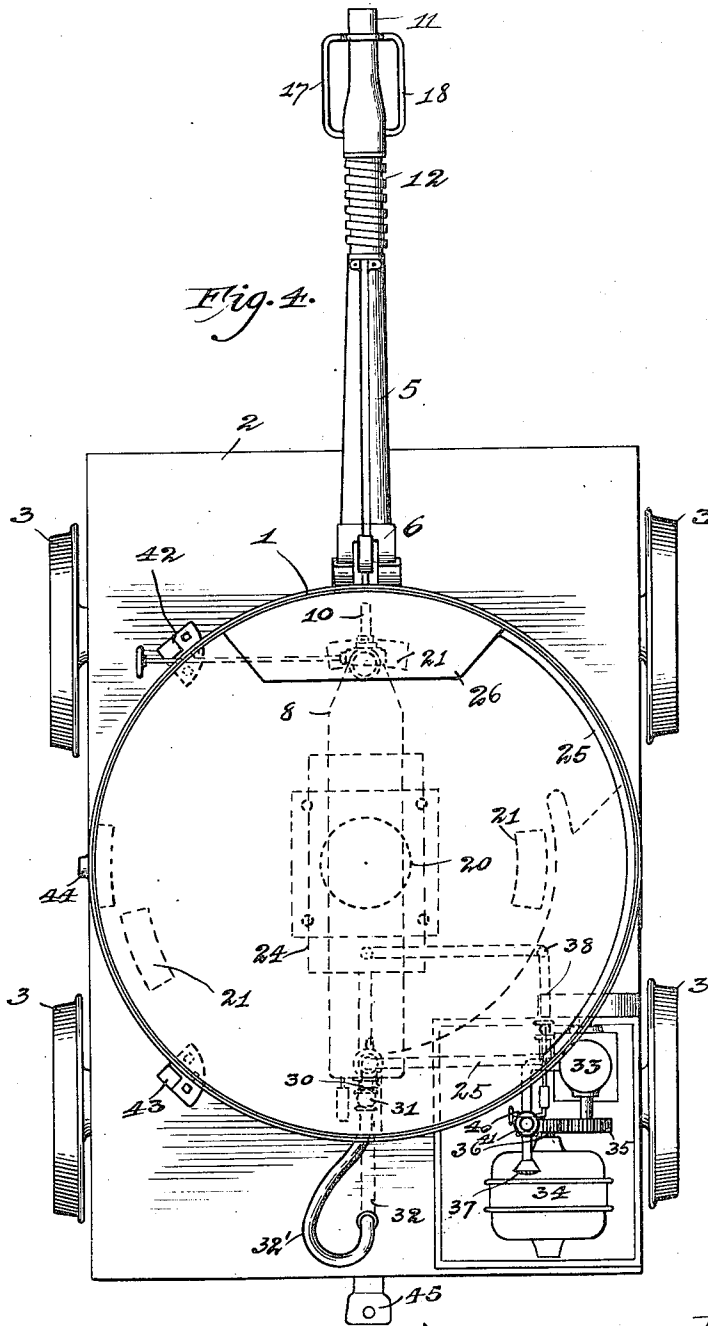
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UNITED STATES PATENT OFFICE.

JOHN A. BLACK, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO ROBERT R. MENAUGH, OF CHICAGO, ILLINOIS.

MEANS FOR LINING FURNACE-BOTTOMS.

1,240,409.

Specification of Letters Patent.

Patented Sept. 18, 1917.

Application filed November 9, 1914. Serial No. 871,093.

To all whom it may concern:

Be it known that I, JOHN A. BLACK, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Means for Lining Furnace-Bottoms, of which the following is a specification.

This invention relates to means for lining furnace bottoms, and more particularly to a mechanism for automatically feeding the sand and dolomite or other lining material to the bottom to be lined.

The salient objects of the invention are to provide an apparatus by which the sand, dolomite or other lining substance may be fed to the furnace bottom from a point exterior of the latter; to avoid the necessity of subjecting the feeding mechanism to the direct heat of the furnace; to provide a portable device capable of successively lining a plurality of furnace bottoms, the storage hopper of the device holding a sufficient amount of the lining substance to line a plurality of bottoms from a single filling of the hopper; to utilize air under pressure as a means for forcing the lining material into the furnace, the air being preferably compressed by means of a suitable device mounted on the truck which carries the hopper; to provide a structure in which a truck of standard construction may be employed and the motor for operating the truck conveniently connected to a source of current such as is available in work of this class; to provide an auxiliary source of compressed air so that the desired pressure may be maintained in the main tank at all times and to utilize the compressed air for operating a pneumatic hammer to mechanically force the material from the hopper into the discharge conduit; to provide means whereby the entire device may be bodily lifted and transferred from one point of a building to another, the hopper and conduit being also rotatably adjustable relative to the truck; to provide a supplemental conduit which if necessary may have its end inserted in the furnace for deflecting the lining material from its normal path, thus avoiding any danger of the main conduit being destroyed by the necessity of subjecting it directly to the heat of the furnace; to provide means by which the furnace can be lined without the use of hand labor; and in

general to provide an improved apparatus and means for lining furnace bottoms and other structures subjected to high temperatures.

In the drawings—

Figure 1 is a side elevation of a device embodying my invention, a portion of the hopper being broken away in the part shown in section.

Fig. 2 is a perspective view of the detachable nozzle showing the manner of attaching the same to the conduit.

Fig. 3 is a rear elevation of the construction shown in Fig. 1, and

Fig. 4 is a top plan view thereof.

Referring to the particular embodiment of my invention illustrated in the drawings, 1 designates a hopper mounted upon a truck 2, the wheels 3 of the truck being preferably formed to engage rails 3' forming a track of the usual gage employed in connection with industries using open hearth basic furnaces. In lining the bottoms of furnaces of this type, difficulty in using feeding devices is encountered owing to the excessive heat, and the use of hand labor requires the employment of several additional men each time the furnace is relined or repaired. The present construction is designed to overcome both of these objections, the material being projected into the furnace from a nozzle positioned wholly exterior of the furnace. In detail, the hopper 1 is provided with a discharge opening 4 through which the sand or other lining material passes into a discharge conduit 5, the passage of the sand, dolomite or other comminuted material being controlled by a slide 6. In order to insure the sand being continuously fed to the conduit during the operation of the device, I preferably provide a mechanical agitator 7 actuated by air under pressure in a manner hereinafter further described.

The sand, dolomite or other material must be discharged from the conduit 5 with sufficient force to carry it entirely clear of the apparatus and if necessary completely across the furnace bottom. Air under pressure is employed for this purpose, a main air tank 8 being located below the inclined bottom 9 of the hopper and having an air nozzle 10 opening just below the discharge opening 4 of the hopper. The arrangement is such that the comminuted material as it is

fed from the hopper by gravity and by the action of the agitator 7 passes directly into the path of the compressed air coming from the nozzle 10, the air in the tank being under sufficient pressure to force the lining material through the nozzle 5 and with considerable force out of its discharge end 11.

The central portion of the conduit 5 preferably comprises a flexible metallic hose portion 12 so that the operator can slightly change the direction of discharge without rotating the entire hopper. In certain instances it will be necessary to deflect the material downward so as to line the portion of the furnace just inside the door, and for this purpose I have provided a supplemental nozzle 13 having hooks 14 and 15 mounted upon a rotatable band 16 and adapted to interlock with the handles 17 and 18 on the main discharge conduit 5. By employing a supplemental conduit for this purpose I avoid the necessity of inserting the main conduit into the furnace, and any damage from the heat will only affect the supplemental conduit. Further adjustment of the device can be obtained by rotating the hopper 1 upon its turn-table 20 which connects it with the truck 2. A plurality of additional side bearings 21 serve to steady the hopper in its rotatable mounting upon the truck platform, and at its upper end the hopper is provided with a heavy bail or handle 23 by which the entire device can be picked up by a crane and moved from one portion of the building to another.

In addition to the main air tank 8 there is preferably employed an auxiliary tank 24 adapted to receive a supplemental charge of compressed air and preferably at a higher compression than that in the main tank. Also, leading from the latter is a conduit 25 opening into an air chamber 26, the air in this chamber being employed for operating the pneumatic hammer 27 which carries the actuating member 7, and in the normal reciprocation of the hammer the actuating member 7 moves up and down so as to force the granular material into the air conduit. The air chamber 26 is provided with the usual pressure gage 28 and blow-off cock 29, and inasmuch as it is not necessary that the air in this chamber be under as high compression as that in the main chamber 8, a governor 30 is employed on the conduit 25 for the purpose of shutting off communication between the tank 8 and air chamber 26 when the latter reaches the desired pressure. A similar governor 31 is employed in the conduit 32 leading from the auxiliary tank 24 to the main tank 8, the purpose of this governor being to permit a higher degree of compression in the auxiliary tank than in the others.

While various systems can be employed for producing and regulating the air pres-

sure used for forcibly ejecting the lining material from the nozzle, I preferably employ an air compressor 33 mounted upon the truck 2 and driven from the motor 34 similarly mounted on the truck 2 and connected to drive the air compressor through intermeshing gears 35 and 36. In operation the air is drawn in through the strainer opening 37 into the compressor and from there forced through the conduit 38 into the tank 24. From the latter it flows through the conduit 32 and flexible conduit 32' and conduit 25 respectively into the main tank 8 and air chamber 26. When, however, the pressure in the latter chamber reaches a predetermined point the governor 30 shuts off the conduit 25 and in a similar manner the governor 31 controls the degree of compression in the tank 8. In order to prevent the air in the tank 24 being too highly compressed, a third governor 40 is used to actuate the cutoff 41 which controls the admission of air to the compressor.

As clearly shown in Fig. 4 the motor and compressor are mounted near the rear end of the truck and at one side, a portion of the space below the inclined bottom 9 of the hopper being utilized for mounting the main tank 8 and the pipe leading from the compressor, a fragmentary portion of the wall of the hopper being cut away to permit the rotation of the hopper upon its center plate 20 to an angle of approximately 45 degrees. Suitable stops 42 and 43 mounted on the truck platform 2 serve to limit the degree of rotation of the hopper on the truck platform, these stops being in the path of a lug 44 carried by the hopper. Projecting from the rear end of the platform is a draft bar 45 by which the truck may be hauled along the track 3', the purpose of this particular mounting and the pivoting of the hopper on the truck, being to permit of a plurality of furnaces being lined from a single charge of the hopper, and with the least possible labor.

While I have shown and described a particular embodiment of my invention, it is obvious that various changes in construction and combination of parts can be made without departing from the scope of my invention, and I do not desire to limit the latter except as specified in the appended claims.

I claim as my invention:

1. In apparatus for lining furnace bottoms with dolomite and the like, the combination with a portable hopper adapted to contain sufficient of the material to line a plurality of furnace bottoms, a conduit leading from one side of the bottom of said hopper, a mechanical agitator extending down through said hopper and having a movable portion positioned in close proximity to the connection between the hopper

and conduit, a source of air under pressure, and a connection between the source of air under pressure and the mechanical agitator for reciprocating the latter, there being also
 5 a connection between the source of air under pressure and the conduit directly in rear of the connection between the latter and hopper for forcing the material fed into the conduit out of the end of said conduit with
 10 sufficient force to carry the material into a furnace and across the bottom thereof, from a position wholly exterior thereof.

2. In apparatus for lining furnace bottoms with dolomite and the like, the combination with a portable hopper adapted to contain sufficient of the material to line a plurality of furnace bottoms, a conduit leading from the forward end of said hopper, said hopper having an inclined bottom sloping toward its connection with said conduit,
 15 a mechanical agitator positioned adjacent the connection between said hopper and conduit, a source of air under pressure, and a connection between said source of air and
 20 the mechanical adjutator for reciprocating the latter to force the material directly into said conduit, and a connection between the source of air under pressure and the rear end of conduit for forcing the material in

said conduit out of the end thereof with
 30 sufficient force to carry the same into a furnace and a relatively long distance across the interior thereof, from a position wholly exterior of the furnace.

3. In apparatus for lining furnace bottoms with dolomite and the like, the combination with a truck, of a hopper revolubly mounted therein, a plurality of tanks carried by said truck, a pneumatically operated mechanical agitator within said hopper for
 35 forcing the material from one side of the bottom thereof, a conduit connected to said hopper and adapted to receive the material forced out by the mechanical agitator, a connection between one of said tanks for supplying air under pressure for actuating said
 40 mechanical agitator, forcing the material in said conduit out of the end thereof with sufficient force to carry a stream of dolomite or the like into a furnace and across the bottom
 50 thereof, and a pump mounted on said truck and adapted to supply said tanks with air under pressure.

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Witnesses:

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