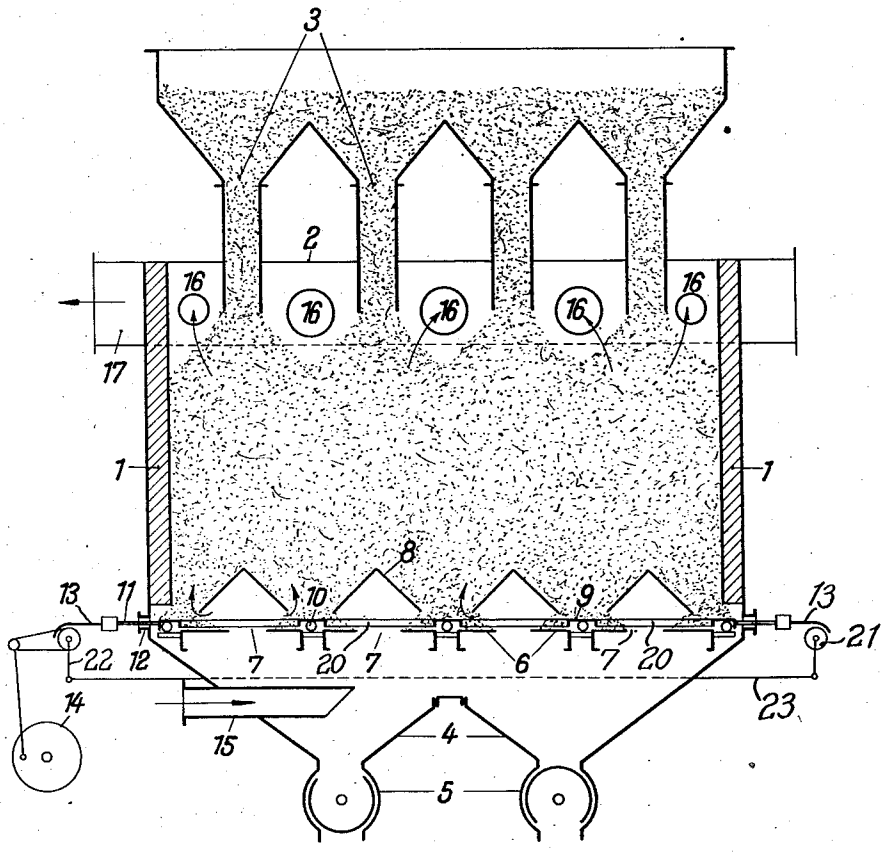
Feb. 28, 1939. O. HUBMANN ET AL 2,148,946

DEVICE FOR DISCHARGING MATERIALS

Filed Dec. 1, 1936 3 Sheets-Sheet 1

Fig.1



Inventors:
Otto Hubmann,
Ludwig Ruckes,
By Potter, Pierce & Scheffler,
Attorneys.

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Fig. 2

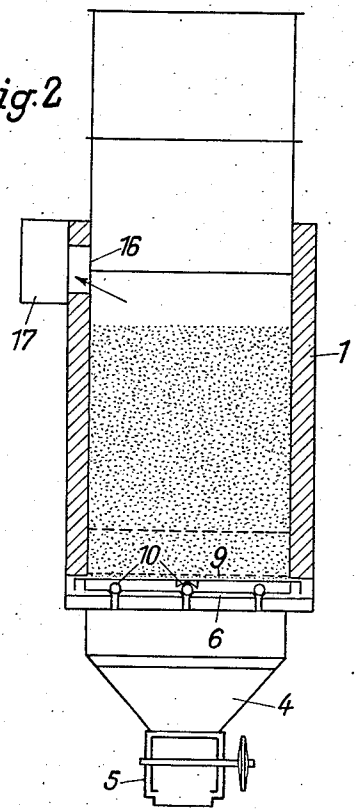
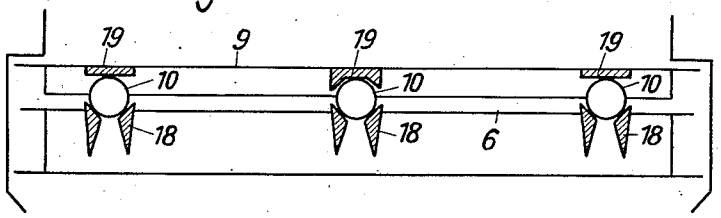


Fig. 3



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DEVICE FOR DISCHARGING MATERIALS

Filed Dec. 1, 1936 3 Sheets-Sheet 3

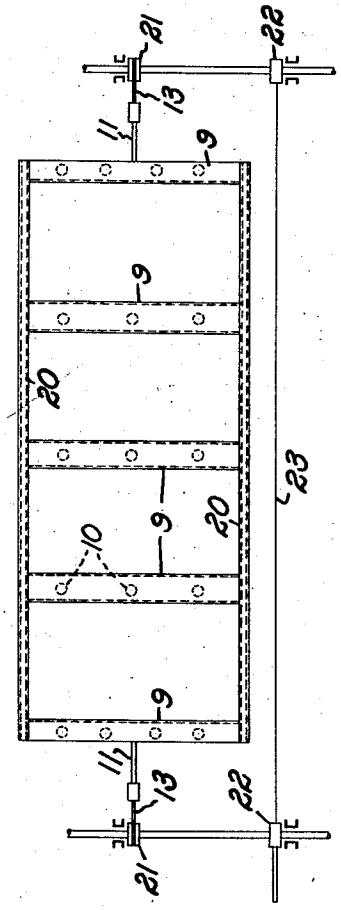

Fig. 4.

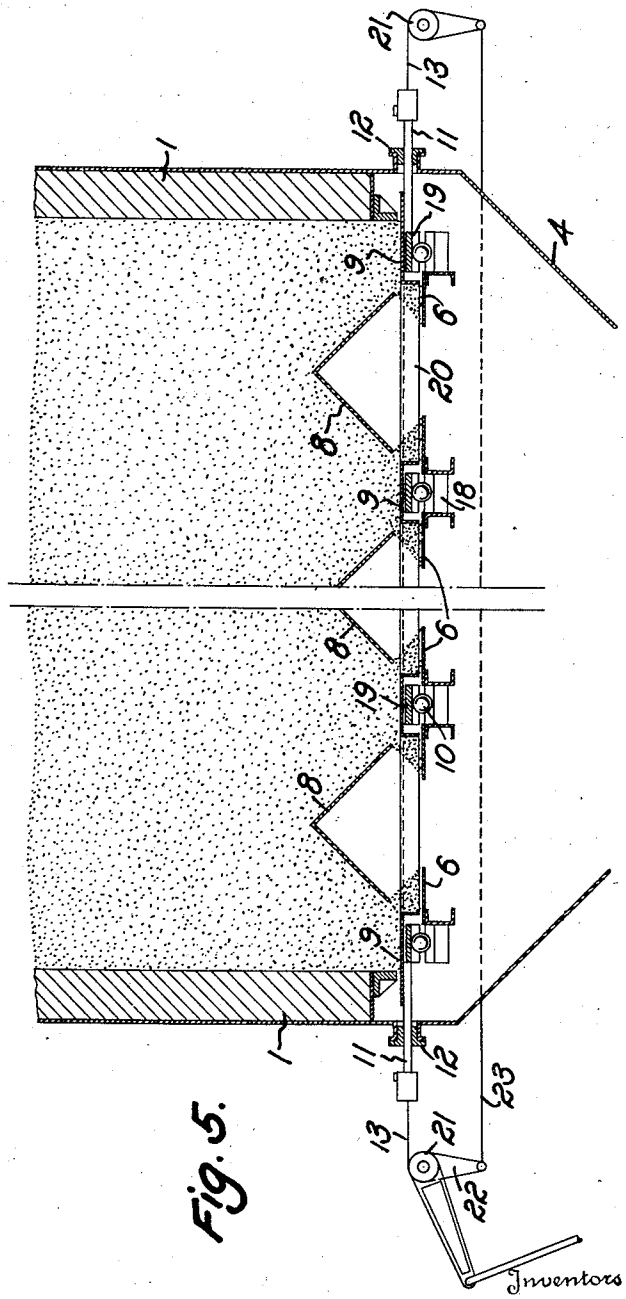

Fig. 5.

Inventors:
Otto Hubmann
Ludwig Ruckes
By Potter, Pierce & Scheffler
their Attorneys.

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UNITED STATES PATENT OFFICE

2,148,946

DEVICE FOR DISCHARGING MATERIALS

Otto Hubmann, Frankfort-on-the-Main, and Ludwig Ruckes, Offleben, near Helmstedt, Germany, assignors to American Lurgi Corporation, New York, N. Y., a corporation of New York

Application December 1, 1936, Serial No. 113,748
In Germany December 4, 1935

2 Claims. (Cl. 214—17)

This invention relates to a device for discharging materials, such as solid fuels or the residues from degasification, combustion, gasification or like processes, from shafts of preferably rectangular cross section, such as are used, for example, for drying, gasifying or distilling fuels and the like. In such processes, the usual practice is to pass heated gases through the layer of material, from above downwards or vice versa. In order to obtain a uniform transmission of the sensible heat of the gases to the fuel, or the like, it is necessary that the individual sectional portions or strata of the column of charge material should descend in the shaft at an identical rate. This condition is not fulfilled by the operation of the known discharge or control devices when installed in shafts of large cross section, on which account it has not hitherto been possible to employ shafts of large dimensions and capacities for the aforesaid purposes.

The present invention aims at obviating this drawback, even in the case of shaft furnaces with cross-sectional areas of 30 sq. metres or more, and at enabling such shafts to be operated so as to furnish an output many times exceeding that of the (mostly circular) known shaft furnaces.

To this end, according to the invention, the shaft of, for example, a rectangular cross-section and of any convenient dimensions is closed at the bottom by a table supporting the column of fuel. This, preferably horizontal, table is provided with a plurality of openings, such as slots running in the same direction, above which are located hoods or baffles at a certain distance from the surface of the table, so as to prevent the charge material from reaching the slots and dropping through the latter directly. Located between the table and the hoods are pusher members, adapted to be actuated separately, in groups, or jointly. On said pusher members being reciprocated, uniform quantities of the charge material are fed to each of the slots, and drop through the latter, so that the rate of descent is the same over the whole cross section of the shaft.

In order to dispense with lubrication, which would be a cause of difficulty, especially in the case of high working temperatures, the pusher members are mounted on balls, and moreover they may also be connected together to enable them to be actuated jointly. In order to prevent the moving parts from seizing, the connected pusher members are actuated solely by traction, from both sides alternately.

The bearings on which the balls travel are preferably channelled, each channel being open below, so that the bearing surfaces remain clear and free from any substantial wear, even in the case of heavy charge material. In very wide shafts, in which the pusher members undergo considerable longitudinal expansion under the influence of the heat, each pusher member is provided with a plurality of bearings. In such case, one of the races in which the balls run is preferably of channel design above and below and serves to guide the pusher member, while the other races are flat at the top and channelled below.

In order more clearly to understand the invention reference is made to the accompanying drawings, which illustrate diagrammatically and by way of example, one embodiment thereof and in which:—

Fig. 1 is a longitudinal section;

Fig. 2 is a cross-section;

Fig. 3 shows a detail on a larger scale;

Fig. 4 is a diagrammatic top plan view of the pusher mechanism, and

Fig. 5 is an enlarged longitudinal section similar to Fig. 1 showing details of construction.

The rectangular shaft formed by the walls 1, is provided with a top 2, above which are located charging hoppers 3. In the case of lump material, these may be replaced by lock chambers. The bottom of the shaft terminates in hoppers 4, closed below by discharge members such as the rotary valves 5. Mounted in the bottom of the shaft chamber is a fixed table 6, having slots 7 and supporting the column of fuel. Located above the slots are hoods 8, and pusher members 9 arranged so as to travel along the table by the aid of balls 10. Said pusher members are interconnected, for example by means of drawbars 20, and are attached, in common, to the tractor rods 11 which pass out through the shell of the shaft, being guided by means of a stuffing box 12. Wire ropes 13 connect the tractor rods to any convenient known type of actuating means 14. For example, the ends of the wire ropes 13 are secured to the wheels 21 which are rotated first one way and then the other. The levers 22 are connected by the cable 23 so that power always is transmitted from the actuating means 14 to pull rather than push the pusher members 9.

Underneath the table is a supply pipe 15 for the admission of hot gases, which issue from the furnace by way of the flues 16 and 17.

Fig. 3 shows, on a larger scale, the method of mounting the pusher members. The bearings 18 are attached to the table, and the balls 10 roll in the channelled races, which are open below. The

pusher members rest on the track plates 19, and these latter on the balls 10. One of the track plates, for example the middle one, is also channelled and assures the rectilinear guidance of the pusher members, while the other track plates are flat and therefore allow the pusher members to expand freely.

Even in the case of shafts of the largest dimensions, the discharging device of the present invention enables the charge material to descend uniformly in the shaft, without any zonal displacement. Said device is therefore applicable to the treatment of granular materials with a counterflow of hot gases, especially when very uniform heating of the material is desired.

The mounting of the pusher members on ball bearings and the interconnection of said members by means of drawbars in such a manner that their movement in both directions is effected solely by traction, prevents said pusher members from seizing, in any circumstances, even when slightly warped by the influence of heat. Guiding the pusher members by means of a row of balls, preferably along the centre line of the shaft, allows the said members to expand under the influence of heat, without seizing. The arrangement of other freely rolling balls ensures permanently reliable supporting of the load of material resting on the pusher members. The provision of ball races, open below prevents any lodging of charge material on said races. In practical operation, no trouble has ever occurred with the hereindescribed device.

We claim:—

1. A discharging device for shaft furnaces, drying apparatus and the like, of rectangular cross section, said device comprising a table closing the bottom of the shaft and supporting the charge material contained therein, said table being provided with slots which are covered by hoods in such a manner as to prevent the charge material from trickling down directly through said slots and pusher members mounted on the table by means of balls rolling on a plurality of tracks open below, at least one track serving to guide each pusher member while the other tracks allow expansion due to heat, said pusher members being adapted to reciprocate on the table and push the charge material through said slot into a bunker disposed beneath said shaft.

2. A discharging device for shaft furnaces, drying apparatus and the like, of rectangular cross section, said device comprising a table closing the bottom of the shaft and supporting the charge material contained therein, said table being provided with slots which are covered by hoods in such a manner as to prevent the charge material from trickling down directly through said slots and pusher members mounted on the table by means of balls rolling between upper and lower tracks the lower tracks being open below, one of the upper tracks being channeled whereas the other upper tracks are flat, said pusher members being adapted to reciprocate on the table and push the charge material through said slots into a bunker disposed beneath said shaft.

OTTO HUBMANN.
LUDWIG RUCKES.