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O. HUBMANN ET AL

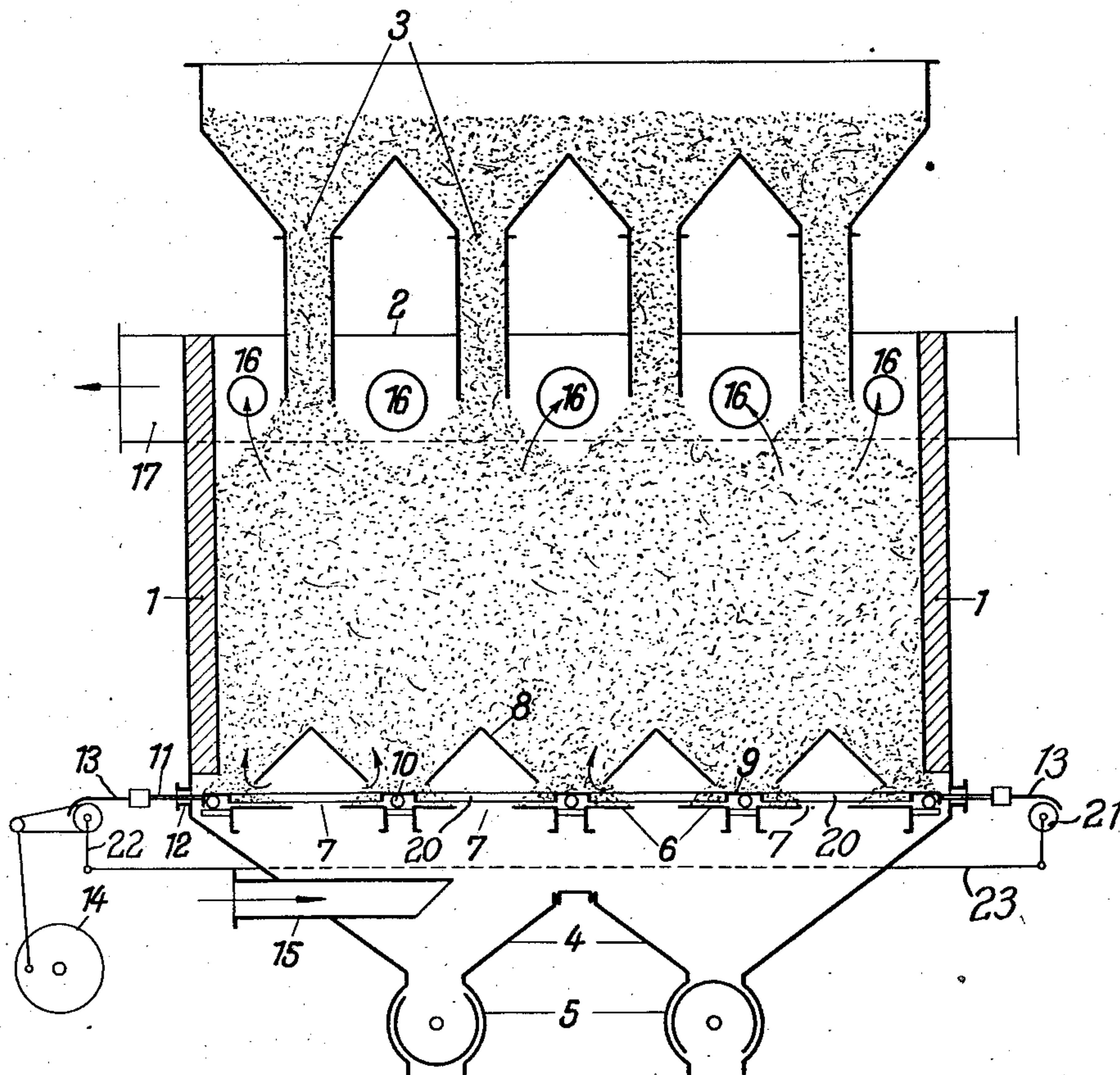
2,148,946

DEVICE FOR DISCHARGING MATERIALS

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Fig.1



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Fig. 2

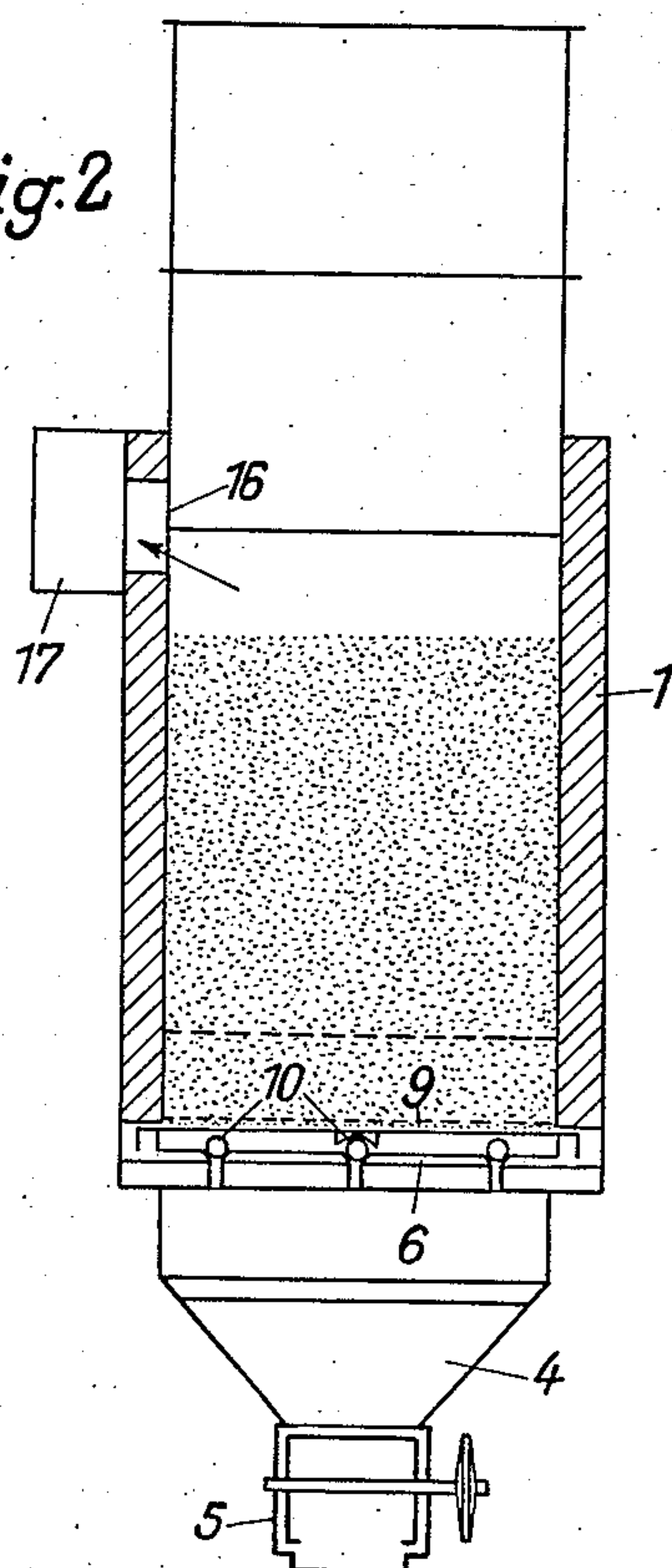
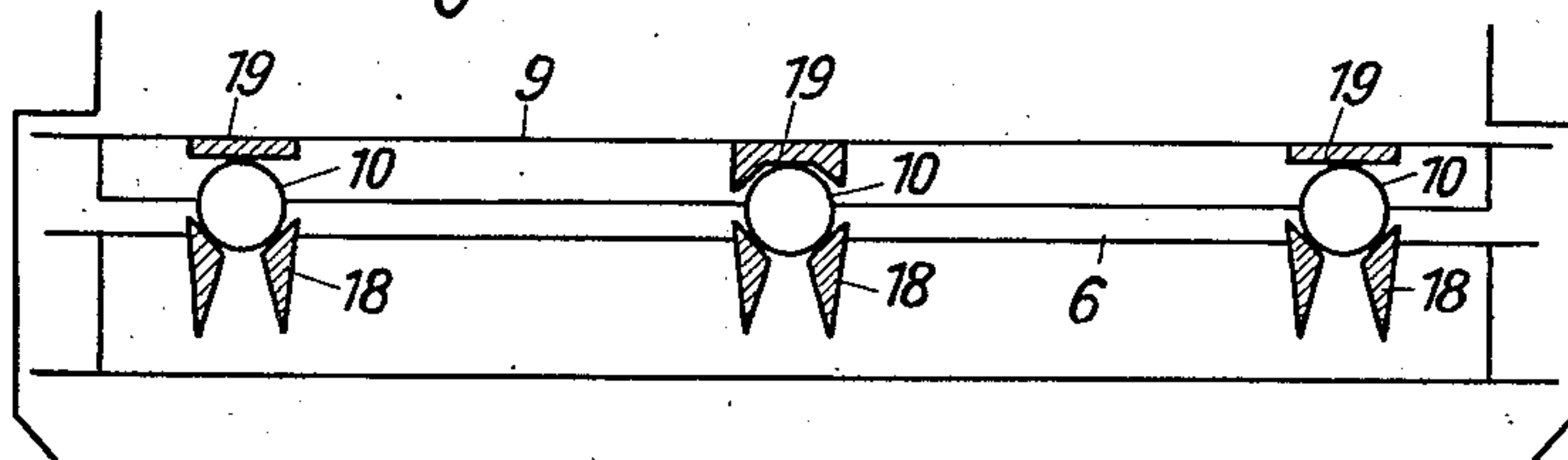


Fig. 3



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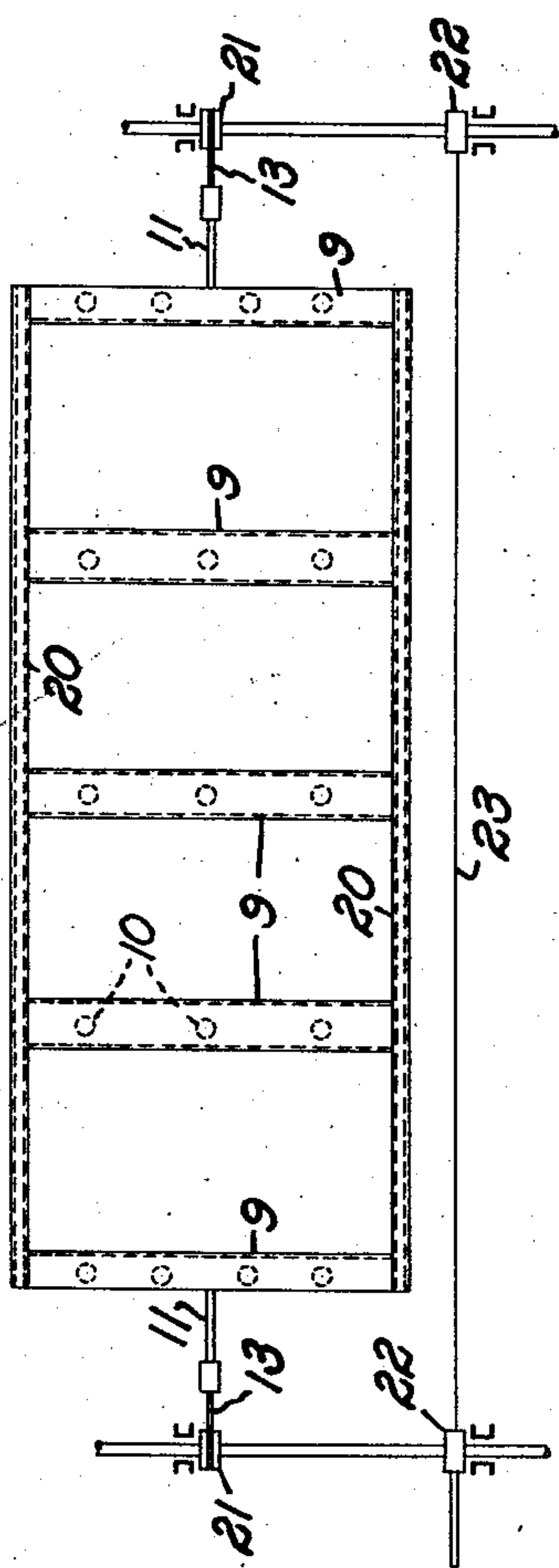


Fig. 4.

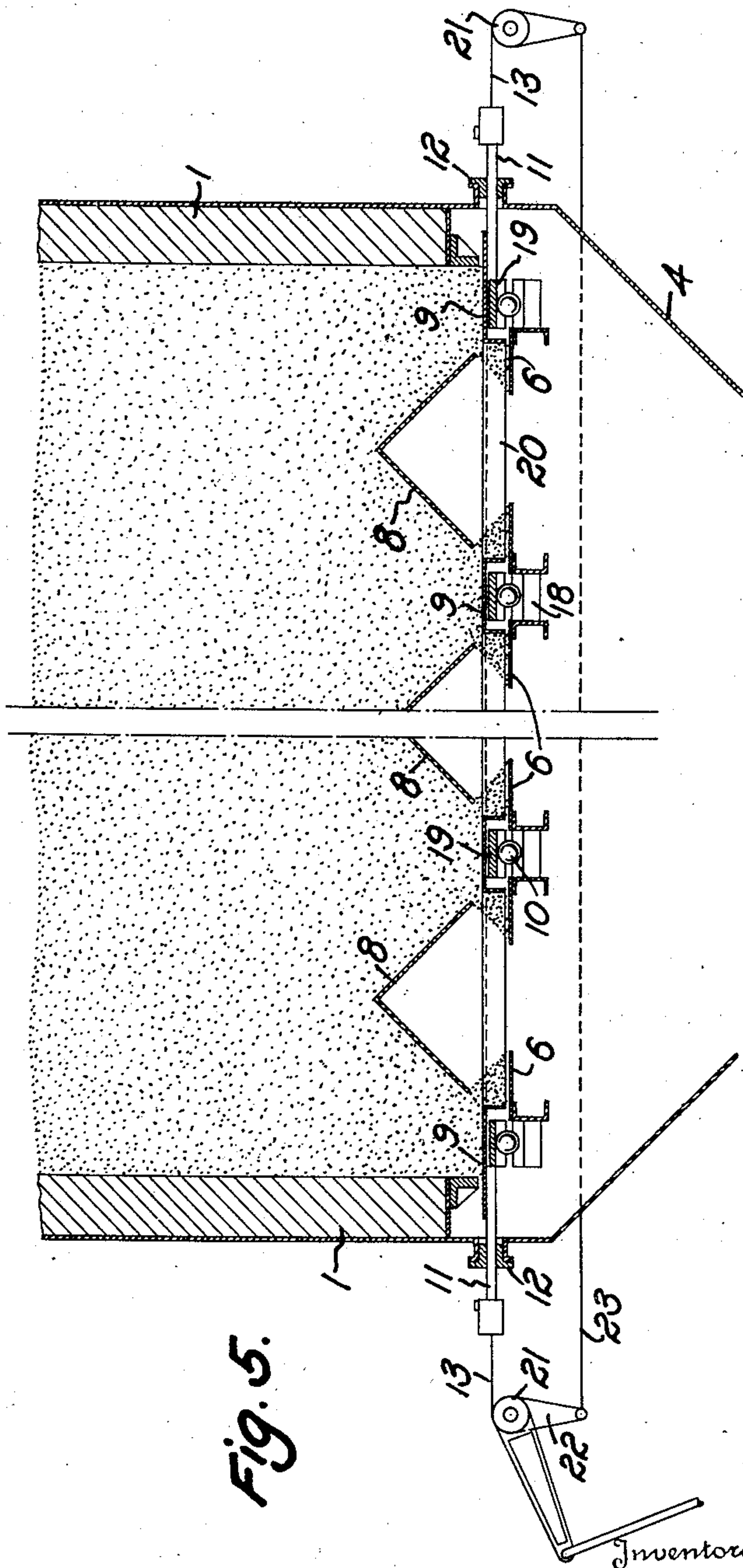


Fig. 5.

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## UNITED STATES PATENT OFFICE

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## DEVICE FOR DISCHARGING MATERIALS

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In Germany December 4, 1935

2 Claims. (Cl. 214—17)

This invention relates to a device for discharg-  
ing materials, such as solid fuels or the residues  
from degasification, combustion, gasification or  
like processes, from shafts of preferably rectan-  
gular 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 inven-  
tion 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 simi-  
lar 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 mate-  
rial, 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 inter-  
connected, 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 con-  
venient 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 trans-  
mitted 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



5 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.

10 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.

15 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 here-indescribed device.

We claim:—

35 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 channelled 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.

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