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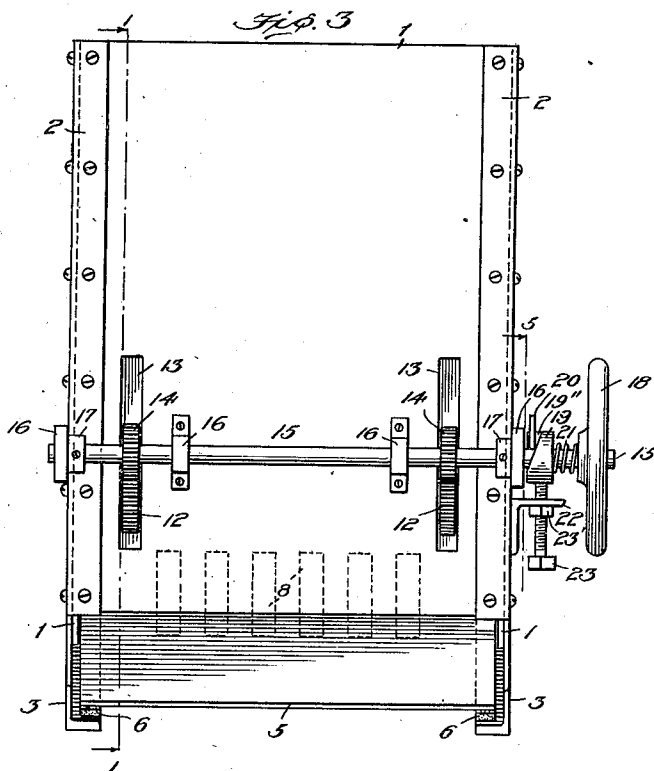
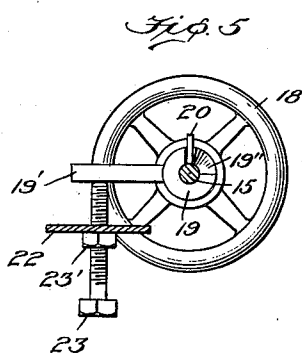
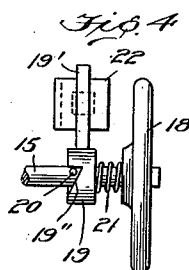
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FEEDING MECHANISM

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## UNITED STATES PATENT OFFICE.

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## FEEDING MECHANISM.

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*To all whom it may concern:*

Be it known that I, JOSEPH WEATHERBY, a citizen of the United States, residing at Harrisburg, in the county of Dauphin and State of Pennsylvania, have invented certain new and useful Improvements in Feeding Mechanism; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings.

My invention relates to an improved means for feeding materials to various types of apparatus which require a constant and accurate flow.

The hopper is more particularly adapted for accurately feeding fine ground materials, which, owing to dampness or fine ground state, arch and pack in a hopper and are discharged irregularly.

A further object is to provide a means whereby if the hopper gate becomes clogged by oversize materials or refuse, it may be opened to discharge such obstructions, and be again closed to the exact feed before opening the gate. A further object is to provide a means to close the gate of the hopper, stopping the flow of materials, and to then again open it to the exact point of feed as before the gate was closed. A further object is to provide a means whereby the gate can be accurately adjusted for any feed requirement, and then opened wide or closed tight and be opened again to the exact feed as before.

I have found, particularly in the use of ore separators that fine ground ores cannot be fed accurately, even though they be granular, and in consequence there is either rush feed or no feed at all, and by such irregular feed an ore separator or other apparatus, cannot be adjusted to do very close work. The ore in the hoppers take on various degrees of dampness or else pack and arch. My present invention is arranged to overcome the above fault.

I have found that by imparting very rapid vibrations to a mass of ground ore or other materials, that it does not pack or arch, and even though the material be very damp it will feed as constantly as it would in a dryer state.

I bring into effect an alternating current magnet, using any commercial frequency, mounted below a steel plate or diaphragm on which the ore or other materials to be fed, rest. The plate or diaphragm by ac-

tion of the alternating magnetism, vibrates or pulsates rapidly, imparting the vibrations to the ore or other materials massed thus causing the particles to break contact with one another and they will flow.

In describing the hopper:

Fig. 1—is a sectional elevation of a hopper embodying the present improvements.

Fig. 2—is a transverse section view showing the alternating current magnet with its adjustments in relation with the vibrating steel plate.

Fig. 3—is a front elevation of a hopper showing its gate raising and gate adjusting mechanism.

Fig. 4—is a detail elevation of the gate actuating mechanism.

Fig. 5—is another view of the parts shown in Fig. 4.

I will now describe the invention and its action referring to the various numerals and letters in the drawings attached.

Referring to Figs. 1 and 3, the hopper is preferably built of steel plates (1) which form the sides, front and back and part of the bottom. The hopper is held together with angle bars (2) on the corners and may be either riveted or held together with machine screws or bolts. On each side and projecting from the lower part of the hopper are angle bars (3) which hold the sides and bottom and support the following mechanism. In the bottom of the hopper is an iron plate (4) which is riveted or held by machine screws to bottom plate, and in turn projects over a vibrating steel plate or diaphragm (5). This plate or diaphragm rests loosely on two strips of heavy felt (6) which in turn are laid on the inner legs of angles (3). Two studs (5' and 5'') rigidly fastened to plate or diaphragm (5) loosely project through holes in base angles (3) and serve to hold diaphragm in position. The plate or diaphragm is free to vibrate on its bed of felt.

Adjustable but securely hung from angle bars (3) by threaded stud bolts (7) is an alternating current magnet (8) composed of laminated iron punchings forming poles for the coils that energize it.

The alternating current magnet is directly under the diaphragm and is adjustable to or away from it by nuts on stud bolts (7).

When the alternating current is switched on the windings or coils, the diaphragm is attracted by the magnet and released by the

action of the alternating current changing from positive to negative, and is violently vibrated according to the frequency of the current that energizes the magnet. When the magnet is adjusted toward or away from the diaphragm (5) the vibrations are stronger or weaker.

Mounted on the front plate of the hopper is a gate (9). The gate is raised or lowered to or from the diaphragm to permit the proper feed of material to pass under it. It is also arranged to bisect the diaphragm so that part of the diaphragm is inside and part outside of the hopper. On the part inside, the ore or other feed rests upon the diaphragm while the outside section guides the feed to discharge. On the side walls of the hopper are guide strips (10) arranged to hold the gate in place and form slide grooves.

Overlapping the gate at its top and arranged to form a pocket for the gate is a protector plate (11). Plate (11) prevents fine ore packing between the gate and front plate.

Rigidly fastened to the gate are gear racks (12) arranged to pass through slots (13) in front plate, and be meshed with gears (14) or shaft (15). Shaft (15) is mounted on front plate by bearings (16) and is free to turn to raise or lower gate (9). Thrust collars (17) prevent end motion of the shaft and on the end of the shaft (15) is a hand wheel (18).

Loosely mounted on shaft (15) is a collar (19) which has a projecting stem (19'), the collar having a slot in its inner face (19''). The slot is arranged to form a stop for pin (20) which rigidly projects from shaft (15). The slot is beveled one way so that the shaft can turn in one direction to raise the gate. Arranged on the shaft between the hand wheel and collar (19) is a spiral spring (21) to force the collar tight against the pin (20).

Mounted on the side of the hopper is a bracket (22) supporting a long adjusting screw (23) which has a lock nut (23') to prevent it from turning after it is set.

Adjusting screw (23) contacts with the projecting stem (19') on collar (19), and as screw (23) is turned up the stop slot in collar (19) forces the pin (20) to turn shaft and raise gate the desired distance.

The gate may be opened its full distance by turning hand wheel but on closing the stop pin (20) is forced in slot by action of spring and the gate can only close to the regular adjustment.

Should it be desired to close the gate and stop the feed without disturbing the adjustment for the next time, the collar (19) is forced against spring by hand and moved toward hand wheel in such a way as to disengage pin (20) and the gate can be

closed tight, and when it is again opened the spring will force collar back to position and the former gate adjustment is obtained.

The action is as follows: The hopper is filled with ore or other material to be fed which rests partly on bottom plate and partly on plate or diaphragm (5). The gate (9) is raised and adjusted to permit the proper feed to pass under. The current is switched on and the diaphragm violently vibrates. This vibration not only passes through the material resting on the diaphragm but also to the whole overlying and surrounding material thus preventing packing and arching, and at the gate itself the material no matter how finely ground will be violently agitated and will pass under the gate whether in a thin granular ribbon or a thick stream. After passing the gate the discharge is still kept in granular shape and in motion by the outwardly extending portion of the diaphragm.

I find that when using the hopper with the gate set to a certain adjustment it will take approximately thirty seconds to feed three hundred pounds of minus half inch size dry ore but if this ore is ground to minus ten mesh, it will take double the time for it to be fed, and if the ore is ground still finer, say to minus thirty mesh it will take nearly two minutes to feed the same weight of ore.

In the case of the large size ore, for example the half inch size first mentioned, the time required to feed a hopper-full of ore will be the same whether the ore be damp or dry, while in case of the finer ground ore the rate of feed of damp ore will be much slower than that of dry ore of the same fineness but nevertheless the feed of the damp material will be as exact in rate (although slower) as the dry material.

A hopper holding five hundred pounds of ore of a certain size will discharge the ore through a certain opening of the gate in so many seconds by a stop watch and this same ore can be put back in the hopper and will be discharged again and again in the same number of seconds, thus showing a remarkably constant rate of discharge due to the action of the diaphragm.

The importance of an almost instantaneously operated gate in combination with an agitator of the type described can best be shown by taking a concrete case.

Fine ground materials as cement, flour or the like in which a very slow but accurate rate of speed is desired require the gate to be almost closed to a point that would require a five hundred pound charge an hour to discharge. Refuse matter, oversize material and the like, often occur in the feed and when coming to the gate will close or clog the feed if not released, and consequently a means must be provided to permit freeing the gate quickly. The operator noting the

feed is clogged can, with extremely rapid movement of the hand wheel, raise the gate an extremely small amount to allow the obstruction to pass and yet return the gate to the desired position without appreciably altering the rate of discharge.

In handling non-magnetic material the plate or diaphragm may be of any desired thickness provided that it is not so thin that it will bow down under the action of the magnet and therefore make a greater clearance under the gate at the center than at the ends, but in handling magnetic material or material containing magnetic elements it is preferable that the diaphragm be of sufficient thickness to prevent material magnetic action on the substance being fed and in this connection it is preferable that the gate be of non-magnetic material.

A multiple pole magnet is preferably employed, some of the poles being at the same instant north and some south poles and this polarity varies or changes in accord with the alternations in the alternating, or multi-phase current employed.

What I claim is:

1. In a device for discharging a finely divided material in a stream of desired thickness at a closely regulated rate of flow, a hopper, a discharge-controlling gate, a magnetically vibrated diaphragm over which the material passes, means for holding said gate at a chosen distance above said diaphragm, and means for temporarily raising said gate above said adjusted position to permit passage of a piece of refuse and for returning the gate to the chosen adjustment without alteration of the volume of discharge.

2. The device of claim 1 characterized by said diaphragm being loosely mounted on said hopper and constrained to move with its surface constantly parallel to its position when at rest.

3. The device of claim 1 characterized by the gate being vertical and located substantially centrally of the diaphragm.

4. The device of claim 1 characterized by the provision of a resilient means secured to the hopper and that the diaphragm rests by gravity on said resilient means without being secured thereto.

5. The device of claim 1 characterized by the gate being vertical and located substantially central of the diaphragm, and by the provision of a resilient means supported by the hopper beneath the gate, the diaphragm resting by gravity on said resilient means.

6. The device of claim 1 in which the diaphragm is a sheet of steel unconnected with the hopper but supported thereon by gravity.

7. The device of claim 1 in which the diaphragm is a sheet of steel and vibration is caused by a multi-pole magnet energized

by alternating current of commercial frequency.

8. The device of claim 1 in which the gate may be lowered beneath the desired adjustment and be returned to said desired adjustment without alteration of the adjustment thereof.

9. The device of claim 1 in which the electro magnet is multi-polar and in which adjacent poles are simultaneously of opposite polarity.

10. In a device for preventing arching and packing of material in a feeder, a diaphragm over which the material passes, a gate adjustably mounted over the diaphragm and an electro magnet of which said diaphragm is the armature.

11. The device of claim 10 in which the magnet and the diaphragm are relatively movable for adjustment of the strength of attraction of the magnet on said diaphragm.

12. The device of claim 10 characterized by the provision of a frame suspended from the hopper and adjustable towards and away therefrom.

13. The device of claim 10 in which the magnet is multi-polar and is energized by alternating current.

14. The device of claim 10 in which the magnet has an even number of poles and the current is such as to make adjacent poles simultaneously of opposite polarity.

15. The device of claim 10 in which the magnet is energized by single phase alternating current.

16. The device of claim 10 in which the diaphragm rests by gravity on said hopper.

17. The device of claim 10 characterized by the provision of a member secured to the hopper bottom and resting upon one edge of the diaphragm.

18. In a device for discharging finely subdivided material at a constant rate of discharge; a hopper having a vertical front wall and a sloping bottom, a reciprocating gate in said front wall, a shield for preventing access of the material to the top of said gate, a resilient layer of felt on said bottom, a metal diaphragm beneath said gate resting on said felt and mounted for movement only at a right angle to the plane of its face, a plate secured to said bottom and holding said diaphragm against said felt, an alternating current operated multipole magnet adjustably mounted beneath said diaphragm, means for moving said gate to a desired adjustment above said diaphragm, means for opening said gate to a greater extent independently thereof, and further means for automatically restoring said gate to said desired adjustment upon release of said gate opening means.

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