Jan. 9, 1934. E. B. TOLMAN, JR 1,942,581

VIBRATING APPARATUS

Filed June 8, 1933

Fig. 1.

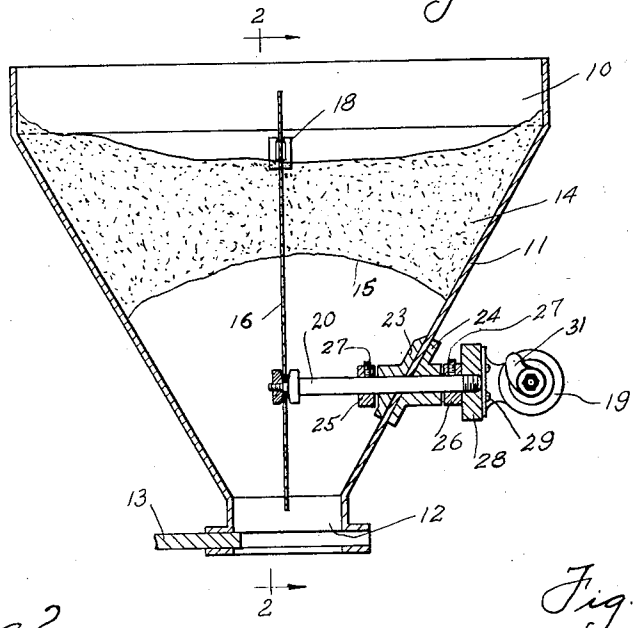


Fig. 2.

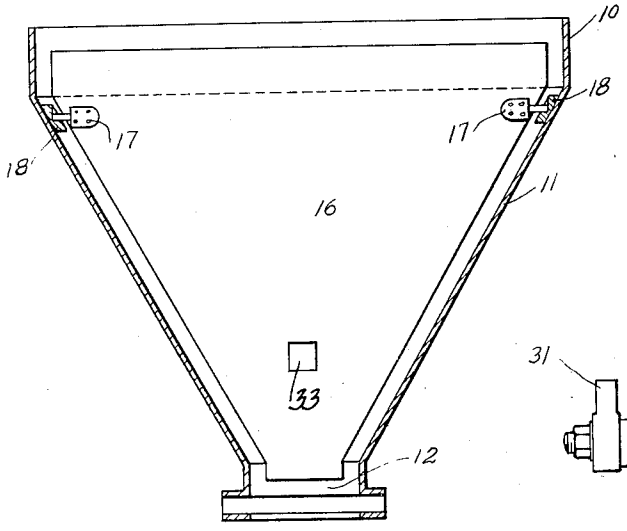


Fig. 3.

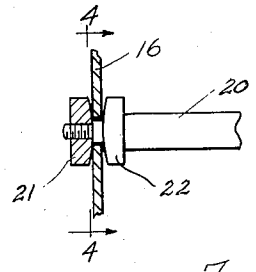


Fig. 5.

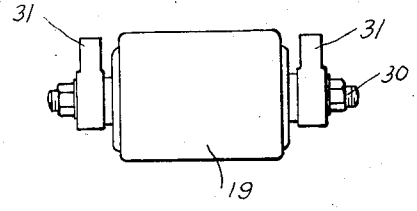
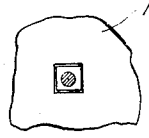


Fig. 4.



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VIBRATING APPARATUS

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Application June 8, 1933. Serial No. 674,855

3 Claims. (Cl. 259—39)

The invention relates to storage hoppers for finely divided solid materials and more particularly it relates to means for accelerating the discharge of such materials by gravity by preventing their arching in accordance with their natural tendency.

It is well known to those familiar with the art that considerable trouble and delay is experienced in discharging cement, powdered coal, fly ash and similar materials by gravity from a hopper due to the fact that such materials form a natural arch over the discharge opening.

The described tendency of such materials to arch not only increases the time required for discharging the material, but also requires the attention of an operator in order that the arch be broken up by ramming or poking and an object of the invention is the provision of means which permits the finely divided material to be freely discharged by slightly vibrating the material in the zone wherein the crown of the arch would otherwise naturally form.

Another object of the invention is the provision of a device of the kind described which is simple, easily installed and manipulated, economical of construction and satisfactory for its intended purpose.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosures herein given.

To this end, my invention consists in the novel construction, arrangement and combination of parts herein shown and described and more particularly pointed out in the appended claims.

In the drawing, wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a vertical sectional view through a hopper equipped with a device embodying the principles of the invention;

Fig. 2 is a vertical section taken along the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary view of the device shown in Fig. 1 and drawn to a larger scale;

Fig. 4 is a view along the line 4—4 of Fig. 3; and

Fig. 5 is a view of a motor forming a portion of the device.

Referring now more particularly to the drawing, the numeral 10 generally designates a material storage bin terminating in a downwardly converging hopper 11 having a discharge opening 12. A member 13 operable to close the opening 12 is shown in Fig. 1 in open position with the hopper 11 partially filled with finely comminuted solid material 14.

A plate 16, substantially bisecting the hopper 11, is suspended from a pair of pivots 17 suitably journalled in bearings 18 in a manner whereby the plate may be oscillated about the pivots. The plate 16 has its side edges terminating in closely spaced relation to the bounding walls of the hopper 11 and is vibrated or oscillated by means of a rod 20 for a purpose hereinafter more particularly described. The rod 20 is mounted in bearings 23 and 24 respectively positioned on the inner and outer faces of one side wall of the hopper 11. The inner end of the rod 20 is offset to provide a threaded portion of relatively small diameter on which a nut 21 is mounted. The rod 20 is also provided with a collar or integrally formed band 22 providing a curved surface in contact with the plate 16. Similarly, the nut 21 has a curved surface in contact with the other side of the plate 16, the nut being adjusted to clamp the plate between the nut and the collar 22. The portion of the rod 20, adjacent the collar 22 and extending through the plate 16, is angular in cross section and closely fits within a similar angular aperture 33 formed in the plate so that rotation of the rod 20 is prevented. Collars 25 and 26 are fastened to the rod 20 by set screws 27 adjacent to the bearings 23 and 24, respectively, the spacing between the collars and the bearings being such as to permit slight longitudinal movement of the rod. The permissible longitudinal movement of the rod 20 may be increased or diminished as desired by shifting the collars 25 and 26 longitudinally of the rod.

A base plate 28, fixedly mounted on the outer end of the rod 20 in any suitable manner, has a motor 19 fastened thereto by bolts 29, or the like. The motor 19 is connected with a source of electrical energy by any suitable means (not shown) and in operation is caused to vibrate sufficiently to produce longitudinal movement of the rod 20 within the limits permitted by the spacing between the collars 25 and 26 and the adjacent bearings 23 and 24. The motor 19 is caused to vibrate while in operation by eccentrically mounting members 31 on the projecting ends of the motor shaft 30 as best shown in Fig. 5. The longitudinal movement of the rod 20 produces a corresponding oscillation or vibration of the plate 16 clamped between the nut 21 and the collar 22.

The natural arching of the finely comminuted material being discharged from the hopper 11,

which it is the purpose of the invention to minimize or eliminate is shown in Fig. 1 as it occurs without the device of my invention. The drawing illustrates the condition in the hopper after a portion of the material has been discharged from the bottom of the hopper through the opening 12 leaving the material above the surface 15 forming a natural arch. This condition is avoided or prevented by the oscillation of the plate 16 which immediately breaks up incipient arching as rapidly as it occurs. In practice, I have found that a permissible longitudinal movement of one-sixteenth of an inch of the rod 20 and the corresponding oscillation of the plate 16 is sufficient to prevent arching of the material and that the vibration of the motor 19 mounted as described produces the necessary reciprocatory movement of the rod.

The curved contacting surfaces of the nut 21 and of the band 22, clamped as described against opposite sides of the plate 16, prevent any lost motion between the rod 20 and renders the operation noiseless. As the plate 16 is oscillated about the rod 20, the plate changes its angle of inclination to the rod. This change of inclination is accomplished without distortion of the plate 16 since the curved surface of the nut 21 and band 22 are so arranged as to permit shifting or rolling of the contacting surfaces while the nut 21 and the band 22 remain in close contact with the plate.

Thus, it will be seen that I have provided novel means operable to prevent natural arching of materials of the kind described and adapted to break up and counteract any incipient arching action as rapidly as it may occur.

Having thus described the invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit and scope of the invention; hence, I do not wish to be understood as limiting myself to the exact form, construction, arrangement, and combination of parts herein shown and described, or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. In combination, a storage hopper having downwardly converging side walls terminating in a discharge opening, a plate positioned in the hopper above said opening, means providing a pivotal support from which the plate is suspended and adapted to be oscillated laterally, a rod fastened to said plate and having one end projecting through the wall of the hopper, means adapted to prevent rotation of the rod, a pair of lateral projections on the rod positioned on opposite sides of said hopper wall providing stop members permitting limited reciprocal longitudinal movement of the rod, a motor mounted on and supported by the projecting end of the rod, the shaft of said motor extending transversely to said rod, and a member eccentrically mounted on and revolvable with the motor shaft.

2. In combination, a storage hopper having downwardly converging side walls terminating in a discharge opening, a plate positioned in the hopper above said opening, means providing a pivotal support from which the plate is suspended and adapted to be oscillated laterally, a rod fastened to said plate and having one end projecting through the wall of the hopper, means adapted to prevent rotation of the rod, a pair of lateral projections on the rod positioned on opposite sides of said hopper wall providing stop members permitting limited reciprocal longitudinal movement of the rod, a motor mounted on and supported by the projecting end of said rod, said motor having a shaft extending transversely to said rod, and a pair of members eccentrically mounted on opposite ends of the shaft and revolvable therewith.

3. In combination, a storage hopper having downwardly converging side walls terminating in a discharge opening, a plate positioned in the hopper above said opening, means providing a pivotal support from which the plate is suspended and adapted to be oscillated laterally, a rod fastened to said plate and having one end projecting through the wall of the hopper, means adapted to prevent rotation of the rod, a pair of lateral projections on the rod positioned on opposite sides of said hopper wall providing stop members permitting limited reciprocal longitudinal movement of the rod, a motor mounted on and supported by the projecting end of said rod, said motor having a shaft with projecting ends extending transversely to the rod, and a pair of members eccentrically mounted on said projecting ends of the shaft and revolvable therewith.

EDGAR B. TOLMAN, JR.