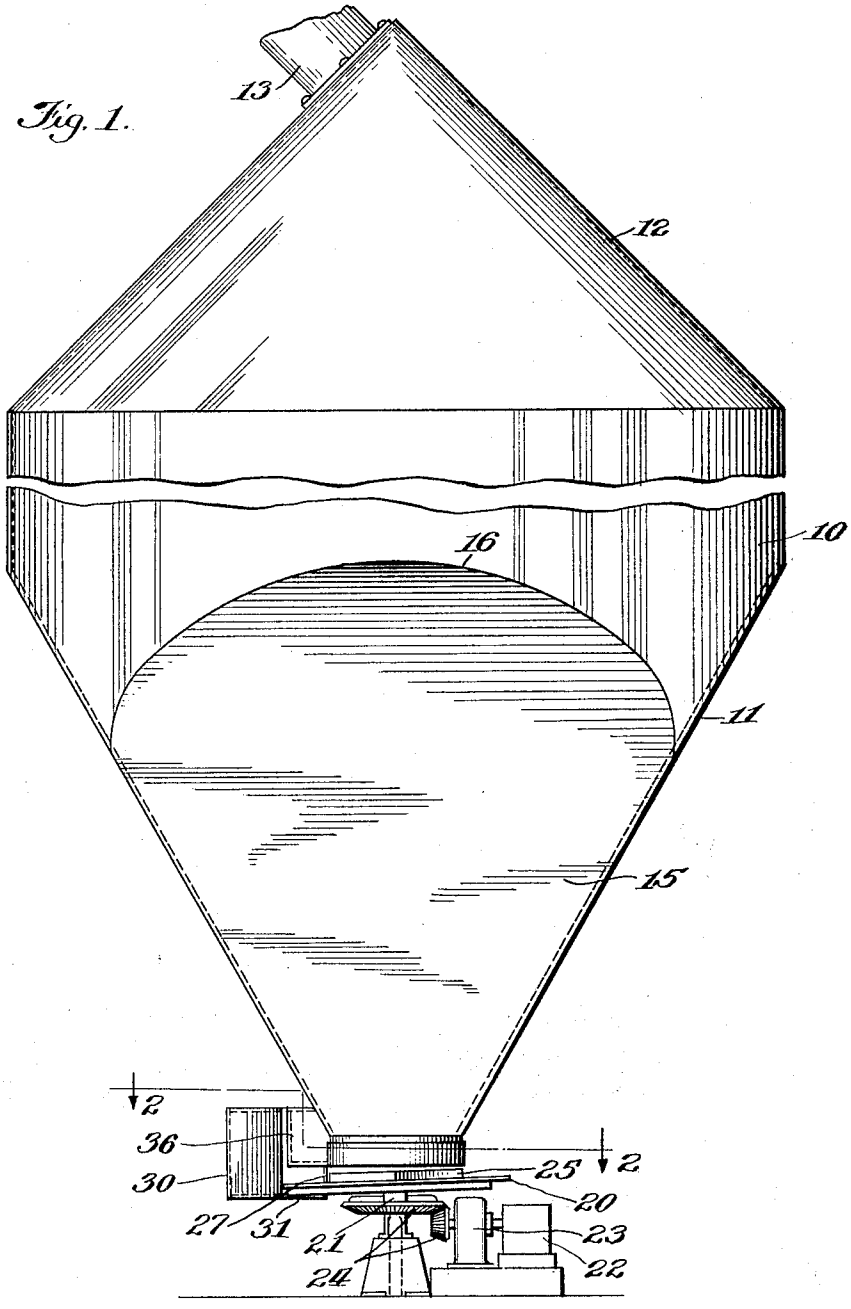
Dec. 13, 1932. W. E. ALLINGTON 1,890,925

AUTOMATIC DELIVERY STORAGE VAULT

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Fig. 1.



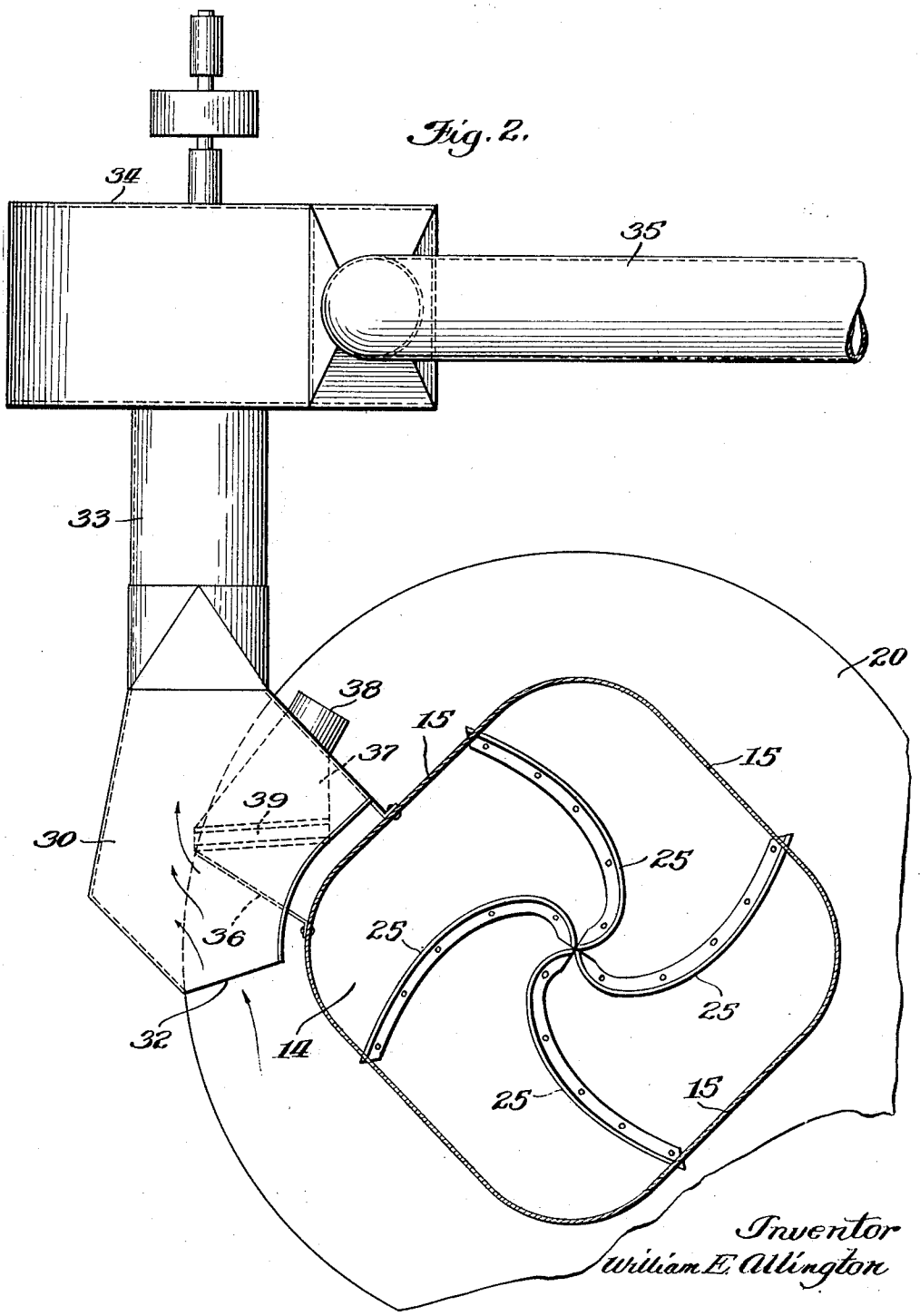
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AUTOMATIC DELIVERY STORAGE VAULT

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Fig. 2.



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AUTOMATIC DELIVERY STORAGE VAULT

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Fig. 3.

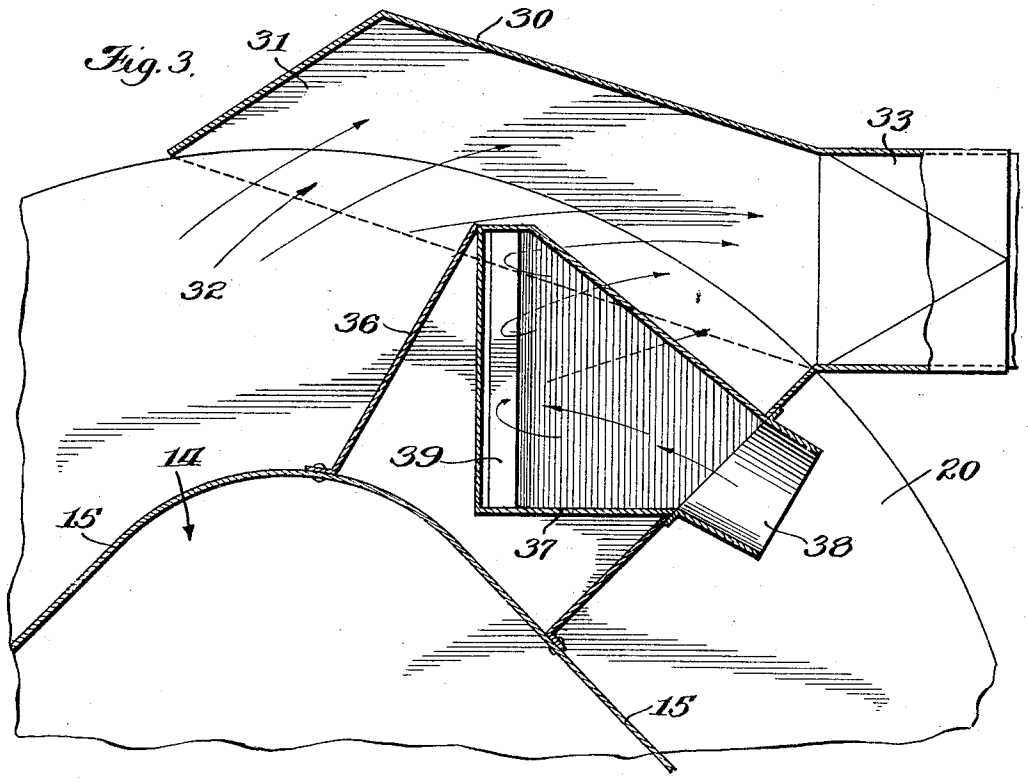
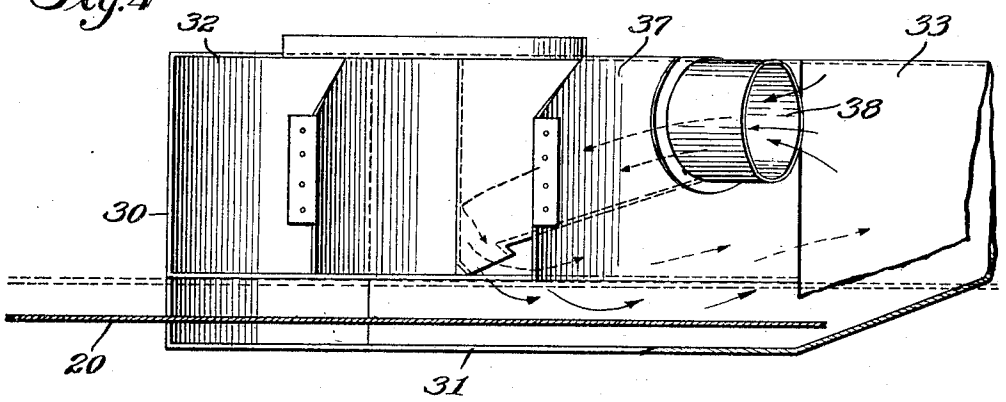


Fig. 4



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AUTOMATIC DELIVERY STORAGE VAULT

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Fig. 5.

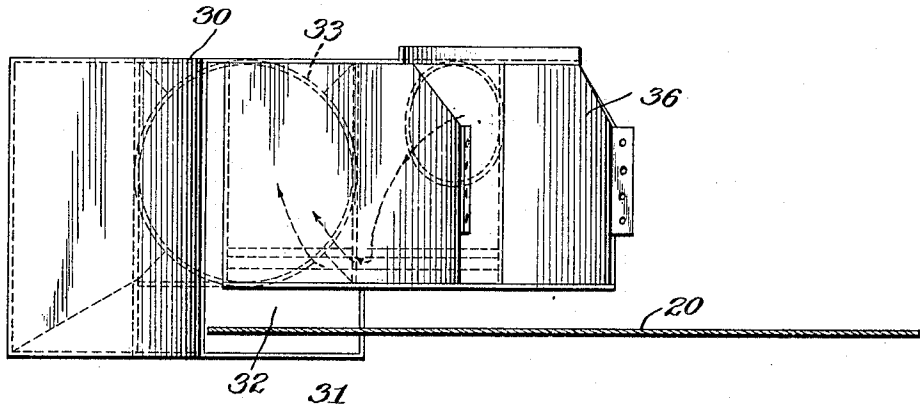


Fig. 6.

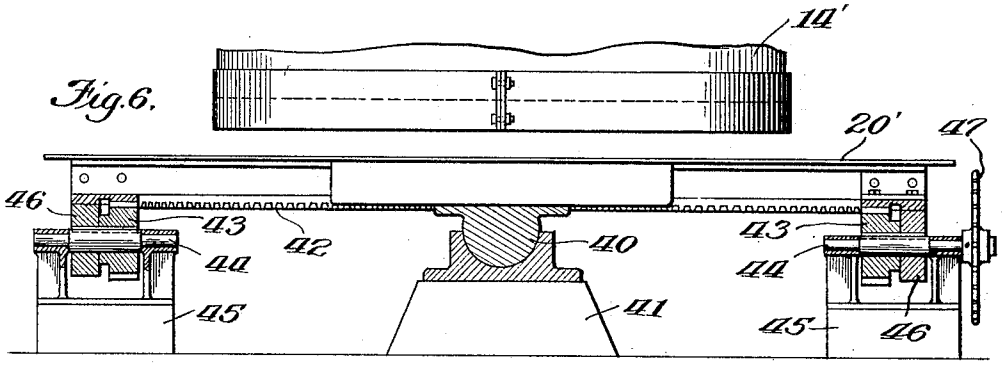
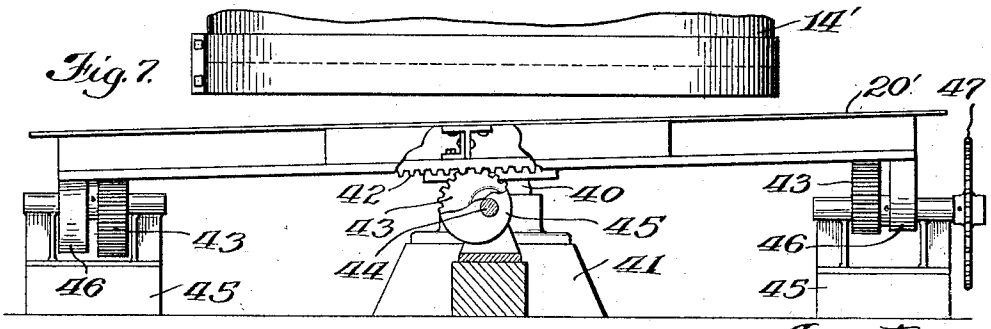


Fig. 7.



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UNITED STATES PATENT OFFICE

WILLIAM E. ALLINGTON, OF HIGHLAND PARK, ILLINOIS

AUTOMATIC DELIVERY STORAGE VAULT

Application filed July 12, 1928. Serial No. 292,311.

My invention relates to automatic-delivery storage-vaults.

It is particularly applicable and will be disclosed in connection with the storage and delivery of planing mill waste, consisting usually of a conglomeration of shavings, saw dust, chips, small blocks, wood powder, etc.

The storage and proper delivery from storage of such heterogeneous material as planing mill waste, which, because of its tendency to arch and clog rather than to flow freely as does sand, grain and similar relatively uniform or homogeneous materials, is a matter that has long presented a serious problem. With the ordinary storage vault it becomes necessary for the workmen to break down the arches and clogs from time to time in order to effect any delivery of material at all and, under the best of conditions the delivery is slow, intermittent, and unsatisfactory. In order to break down the arches and clogs it is usually necessary for a workman to wholly or partly enter the storage vault, either from the top or through the delivery outlet at the bottom, and release the arched and clogged material with a bar or poker. The time consumed in such labor represents a considerable waste of effort and money and, of far greater importance, the hazard to the health and life of the workmen is a matter of grave concern.

One of the objects of my invention is to provide an improved automatic-delivery storage-vault.

Another object is to overcome the objections heretofore mentioned and inherent in the storage of heterogeneous, arch-forming material in vaults of the usual type.

Another object is to provide a vault in which heterogeneous material, such as planing mill waste, may be stored and from which the material may be satisfactorily withdrawn when and as required.

Another object is to provide a storage that is reliable and safe.

Another object is to provide a heterogeneous material storage vault wherein arching is prevented entirely or, if not entirely prevented, the arches are broken automatically before they can objectionally affect delivery of the material.

Other objects and advantages will hereinafter appear.

Embodiments of the invention particularly adapted for planing mill waste are illustrated in the accompanying drawings wherein:

Fig. 1 is a side elevation of a storage-delivery-vault;

Fig. 2 is an enlarged section on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged top plan and partial section of a portion of the delivery mechanism;

Fig. 4 is a side elevation of the mechanism shown in Fig. 3;

Fig. 5 is an end elevation of the mechanism viewed from the left side of Fig. 3;

Fig. 6 is a mid-vertical cross section of a modified type of delivery mechanism; and

Fig. 7 is a side elevation, partly in section, of the mechanism shown in Fig. 6.

In general, the automatic-delivery storage-vault comprises a receptacle for receiving and holding the material which is delivered therefrom through an outlet at the bottom, and delivery mechanism including a movable material-supporting platform which, when stationary, serves to interrupt the flow of material from the receptacle and, when moving serves to augment and insure the flow of material therefrom. The delivery mechanism may include means for taking the material from the movable platform.

Referring first to Figs. 1 to 5, the receptacle chosen for illustration comprises a large, generally cylindrical sheet metal tank or body 10 having a tapering hopper bottom 11 and a sloping roof-like cover 12. Experience has demonstrated that a cylindrical shape and sheet metal construction are generally to be preferred from the standpoint of expense, space, lightness, etc., although other shapes, such as rectangular, and other materials, such as reinforced concrete, may be used. In a typical planing mill installation the cylindrical portion of this storage receptacle may be twenty-five feet in diameter and fifty feet high.

The material such as the heterogeneous planing mill waste may be fed to the receptacle through an inlet 13 connected, for example, to the waste discharge of a dust collector. The lower end of the hopper bottom is provided with a discharge or delivery outlet 14 through which the stored material flows by gravity from the receptacle. I prefer to shape the hopper bottom in the form of an inverted pyramid rather than an inverted frustum of a cone because the material will flow downwardly more freely along a flat inclined surface than it will along an inwardly curved inclined surface. Thus in the illustrated receptacle the hopper bottom is substantially square in cross section with four downwardly and inwardly sloping side walls 15 which, at their upper ends, merge into the cylindrical body on curved joints. While above the discharge opening the flat walls forming the hopper bottom may, for purposes of reducing expense and difficulties of fabrication, be joined together at sharp corners, it is preferred to have the corners rounded at and immediately above the outlet opening. For handling ordinary planing mill waste a hopper bottom with a slope or inclination of about 30 degrees from the vertical has been found to give excellent results, although, of course, the permissible and best slopes or inclinations for different materials may vary.

The delivery mechanism includes a flat circular platform plate 20 located below and spaced from the lower rim of delivery outlet 14 so as to provide clearance for the escape of material thereabout. This plate, whose area is considerably larger than the area of the delivery outlet, is mounted upon a shaft 21 for rotation about a vertical axis and is tilted slightly relative to the horizontal so that when rotated it will produce the effect of a progressive series of vertical reciprocatory movements or undulations relative to the delivery outlet. Shaft 21 may be driven by a motor or other source of power 22 through suitable speed reduction mechanism 23 and a bevel gear train 24. Typical speeds for the platform are from 5 R. P. M. to 20 R. P. M. and its inclination or slope may be varied to best suit the material to be handled and other conditions, but for planing mill waste a slope of about 2 to 5 degrees from the horizontal has been found to give good results. In order to facilitate the movement or travel of material from the center toward the periphery of the platform a series of curved vanes 25 secured to the upper face of and extending outwardly from the center of the platform (see particularly Fig. 2) may be employed.

When the receptacle is filled or partly filled, the material rests upon and is supported in part at least by disc or plate 20 and when that disc is stationary the inherent arching and clogging tendency of the material prevents any discharge. However, when the platform is rotated the material resting thereon is forced, by centrifugal action, toward the outer edge thereof and discharge takes place. Rotation of the material with the platform is insured by the curved radial vanes carried thereby. In addition to the creation of centrifugal force to move the material toward its rim, the rotation of the platform produces another and vitally important result, viz., a vertical reciprocatory or undulatory action upon the material within the storage receptacle. This action is caused by the inclination of the platform relative to its axis whereby rotation upon its vertical drive shaft causes the surface of the platform to assume vertically different positions relative to the outlet of the storage receptacle and the materials stored therein. Thus the high side of the platform, as does also the low side and intermediate portions thereof, moves progressively about the axis of rotation producing a lifting and lowering effect upon the materials stored thereabove and supported thereby. This vertical undulatory effect of the platform being communicated to and through the stored material in the receptacle breaks down such arches as may have been formed, prevents the formation of other arches and insures a relatively steady and copious flow of material. Thus the platform serves not only as a valve to control the discharge of material from the receptacle (material discharge being effected when the platform is rotated and arrested when the platform is stationary) but as an agitator of the stored material to insure satisfactory discharge of heterogeneous materials that tend to clog the arch and discharge unsatisfactorily.

Ordinarily it will be inadvisable to permit the material to be discharged from the entire periphery of the platform and consequently means are provided for localizing the discharge, removing all of the material from the platform within a defined region and directing the discharged material to a convenient or desired point of disposal, such as the boiler furnaces, stokers, cars and the like. By properly proportioning the size and tilt of the platform plate with reference to the area of the receptacle discharge opening, to the material being handled and to the desired speed of rotation, the material will not flow over the rim of the platform except in the desired localized region where it is positively removed. Thus for handling typical planing mill waste a delivery outlet four feet square with a platform seven feet in diameter rotating at speeds of from 5 to 20 R. P. M. have been found to give satisfactory results.

Located adjacent one side of the receptacle discharge outlet is a sheet metal hood 30 into which platform 20 projects through one open side. Hood 30 may be riveted or bolted to one of the walls of the receptacle hopper

bottom and part of its floor is formed by a bottom wall 31 and part by a portion of the rim of disc 20. The hood has a main air inlet 32 and at the opposite side is connected by a pipe 33 to an exhaust fan 34. Fan 34 may be driven in any appropriate manner and its discharge is connected to a distributor pipe 35 leading to the boiler furnaces, stokers or other desired point of disposal of the material. A plow 36 in the form of a vertically disposed plate is attached to the hopper bottom of the receptacle to stand over disc 20 slightly inclined in the direction of the disc's rotation, as shown most clearly in Figs. 2 and 3. The lower edge of this plow is so positioned as to just clear the high side of disc 20, and during the rotation of the disc it scrapes the material therefrom and directs the same in the general direction of the full line arrows shown in Figs. 2 and 3 over the rim of the disc and into the hood in the path of the current of air induced by the fan to pass therethrough from inlet 32 to pipe 33.

Because of the tilted condition of the platform and the necessity of locating the lower edge of the stationary plow above its highest point of vertical reciprocation, the plow will leave a relatively thin layer of material on the lower portions of the disc. This relatively small residue of material is continuously removed and the platform kept clean by a draft of air induced by fan 34 through an auxiliary hood 37 located within the main hood 30. Auxiliary hood 37, constructed of sheet metal, has an air inlet 38 and a downwardly and forwardly directed air outlet in the form of a long, relatively narrow, nozzle 39. Through this auxiliary hood a stream of air induced by fan 34 flows through inlet 38 and out of nozzle 39 to play upon the top of disc 20, after which the material laden air from the auxiliary hood joins the stream of material laden air flowing through the main hood and together they pass to the fan and thence to the distributor pipe 35.

Briefly summarized and reviewed, the operation of the apparatus is as follows:

The material is stored in receptacle 10, being retained therein by platform 20 when the same is stationary. When it is desired to discharge material from the receptacle the platform is rotated, causing the material to travel toward the rim thereof where a large proportion of it is scraped off by plow 36 into the main blast of air flowing into hopper 30. The undulatory action produced in and through the stored materials by the rotation of the tilted platform insures that a supply of material always rests upon the upper surface thereof so that discharge is not retarded or interrupted by the arching and clogging characteristics of heterogeneous materials. By properly proportioning the platform with reference to the receptacle discharge opening, to the material being handled and to the desired speed of rotation the material will not flow over the rim of the platform until it is forced off by the plow and thus the discharge will be localized within the hopper. On the high side of the platform practically all of the material will be removed by the plow but whatever material the plow may not remove is blown from the plate by the induced current of air that flows through auxiliary hood 37 and is directed against the plate by nozzle 39. The material then is drawn through pipe 33 into the fan and from thence blown through distributor pipe 35 to the desired point of disposal.

Figs. 6 and 7 show a modified construction for mounting, driving and producing the desired undulatory effects upon and through the stored materials. By such an arrangement the number of vertical oscillations or undulations performed by the platform or plate during each rotation may be varied as conditions may require. A platform or disc-plate 20′ is mounted for rotational and vertical reciprocatory movements below the receptacle discharge outlet 14′ as previously described. The disc is mounted upon a central ball and socket support 40 which permits the plate to be rotated upon a vertical axis and tilted relative to the horizontal. Support 40 may be carried on any suitable pedestal or foundation 41. The underside of plate 20′ near the rim thereof is provided with a ring gear 42 which is adapted to mesh with a series of eccentric pinions 43. Pinions 43 are located in pairs at the opposite ends of right angularly related diameters of disc 20′, being carried upon shafts 44 that are journalled in suitable bearings mounted on pedestals 45. Each shaft 44 also has rigidly mounted thereon an eccentric wheel 46 which underlies and supports platform 20′. One or more of the eccentric pinion-supporting wheel sets may be driven in any suitable manner, such as a sprocket chain trained over a sprocket wheel 47. The operation of this modified arrangement is substantially the same as that of the preferred embodiment heretofore described, except for the fact that the number of vertical oscillations per revolution of the platform has been increased to four.

This mechanism may be equipped with a plow and material receiving hoods such as hereinbefore described.

Having thus illustrated and described the nature and typical embodiments of my invention, what I claim and desire to secure by United States Letters Patent is as follows:

1. A heterogeneous material storage and delivery vault comprising a storage receptacle having a discharge outlet at its bottom, a rotatable plate positioned beneath the discharge outlet and spaced therefrom to permit discharge of material when rotated and obstruct flow of material when stationary,

and a shaft supporting the plate, said plate being mounted at an angle to the shaft so that the relation of its surface to the discharge outlet varies continuously during rotation and undulatory agitating effects are produced in the stored materials.

2. A heterogeneous material storage and delivery vault comprising a receptacle having a discharge outlet at its lower end, a platform located below and projecting beyond the outlet to support the material in the receptacle, a vertical shaft for supporting and rotating the platform, rotation permitting discharge of material from the receptacle and non-rotation obstructing the discharge thereof, said platform being mounted at an oblique angle to the vertical shaft whereby the vertical relation between the outlet and the surface of the platform changes as the platform rotates and thereby undulatory agitating effects are produced in the material supported on the platform.

3. A heterogeneous material storage and delivery vault comprising a storage receptacle having a discharge outlet in its bottom, and a platform rotatable about a substantially vertical axis and located below the outlet to support the material thereabove in the receptacle, material being discharged when the platform rotates and discharge ceasing when the platform is stationary, said platform being mounted to assume an oblique angle to the axis about which it turns whereby the vertical relation between the platform and a plane perpendicular to its axis changes as the platform rotates, and the material is thereby moved up and down to break incipient arches and clogs.

4. A storage and delivery vault for heterogeneous material comprising a material storing receptacle having a discharge outlet in its bottom through which material passes, an inclined material supporting platform mounted below the outlet, and a vertical shaft for supporting and rotating the platform, rotation of the platform effecting vertical undulatory movements in the stored material and discharge thereof from the receptacle and non-rotation of the platform serving to interrupt the movement and discharge of material.

5. A storage and delivery vault for heterogeneous material comprising a material storing receptacle having a discharge outlet at its bottom, a rotatable platform located below the outlet to support the material in the receptacle thereabove, rotation of the platform effecting discharge of material and discharge ceasing when the rotation stops, and means for supporting the platform so that during rotation it is variously inclined to produce vertical undulatory movements in the material supported thereby.

6. A storage and delivery vault comprising a material storage receptacle having an outlet at its bottom through which material flows in a generally vertical direction, a rotatable platform spaced below the outlet, said platform supporting the material in the receptacle thereabove and effecting discharge of material when rotated and cessation of discharge when rotation is stopped, and a mounting for supporting the platform at an inclination which varies during rotation whereby material supported by the platform is vertically undulated.

7. A storage and delivery vault comprising a material storage receptacle having an outlet at its bottom, a rotatable platform located below the outlet to support the material in the receptacle and effect discharge of material or cessation of discharge of material depending upon whether the platform is rotating or stationary, and means for progressively and continuously varying the inclination of the platform during rotation thereof to effect undulatory movements in the material in the receptacle.

8. A storage and delivery vault comprising a material storage receptacle having an outlet at its bottom, a rotatable material-supporting platform located below and spaced from the outlet so that rotation of the platform causes material to be discharged from the receptacle and discharge ceases when rotation of the platform stops, and means for mounting the platform so that during rotation the inclination of its material supporting surfaces varies to cause the material thereabove to be supported at varying heights and moved up and down to prevent arching in said material.

9. A storage and delivery vault comprising a material storage receptacle having a discharge outlet at its bottom, a rotatable platform below the outlet to support the material in the receptacle and effect discharge and cessation of discharge of material therefrom depending upon whether the platform is rotating or stationary, and means for variously tilting the platform during its rotation to produce vertical undulatory movements in the stored material thereabove.

10. A storage and delivery vault comprising a material storage receptacle having a delivery opening at its bottom, a rotatable platform located below and spaced from said opening, rotation of the platform effecting discharge of material from the receptacle and discharge ceasing when the rotation stops, and means for continuously reciprocating in a vertical direction regions of the platform during rotation thereof to produce vertical undulatory movements in the material stored thereabove.

In witness whereof, I hereunto subscribe my name this 30th day of June, 1928.

WILLIAM E. ALLINGTON.