H. D. BOWMAN.

FEEDING APPARATUS FOR WEIGHING MACHINES.

APPLICATION FILED AUG. 25, 1915.

1,295,959. Patented Mar. 4, 1919.

Fig. 1.

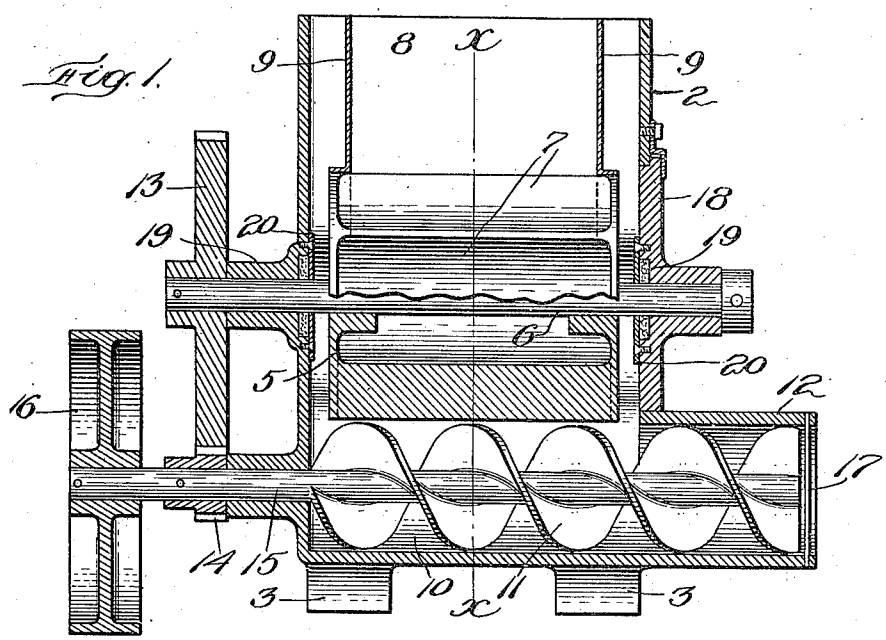


Fig. 2.

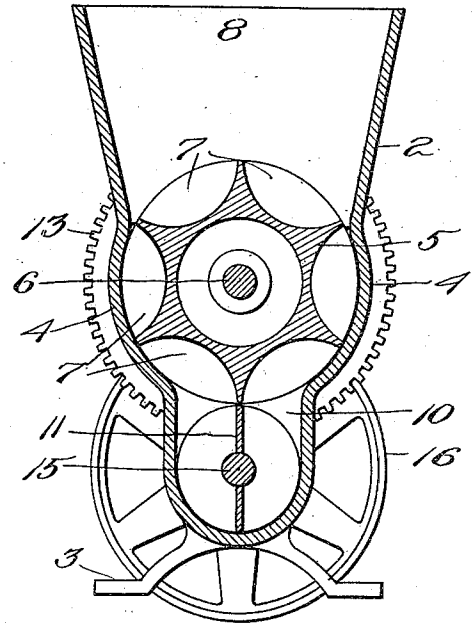
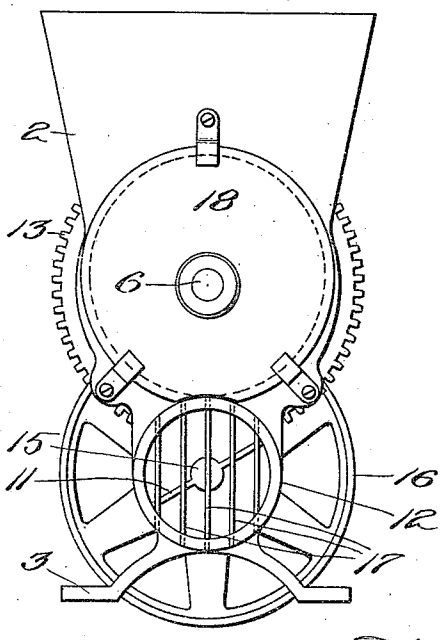


Fig. 3.



Inventor

Harry D. Bowman,

By E. D. Chadwick, Atty.

UNITED STATES PATENT OFFICE.

HARRY D. BOWMAN, OF EAST ORANGE, NEW JERSEY.

FEEDING APPARATUS FOR WEIGHING-MACHINES.

1,295,959. Specification of Letters Patent. Patented Mar. 4, 1919.

Application filed August 25, 1915. Serial No. 47,366.

To all whom it may concern:

Be it known that I, HARRY D. BOWMAN, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented new and useful Improvements in Feeding Apparatus for Weighing-Machines, of which the following is a specification.

In automatic weighing it is important to provide means for feeding a uniform stream of material to the weighing machine in order that the resulting weights may be accurate, particularly if the loads to be weighed are small, and while free-flowing materials give little trouble in this respect it has been found very difficult to secure a uniform feed of powders and other finely-divided materials of various kinds. The difficulties encountered are due mainly to the tendency of such materials to become compacted during their progress through the feeding apparatus and to pack and form arches over the openings through which they are expected to flow, whereby the material is temporarily held back and then released in excessive quantity when the arch breaks.

The present invention is intended to provide a simple form of feeding apparatus by means of which a powdery material, or any material which gives rise to the difficulties above referred to, can be fed in a continuous stream of practically absolute uniformity, so that by using the apparatus for delivering such a material to a weighing machine a high degree of accuracy in the weights obtained can be secured. This object is accomplished in the manner hereinafter described in connection with the accompanying drawing, in which:

Figure 1 is mainly a central longitudinal section through my feeding apparatus as preferably constructed, certain parts being shown in elevation;

Fig. 2 is a transverse section on the line *x*—*x* in Fig. 1; and

Fig. 3 is an elevation of the apparatus as viewed from the discharge end.

In the preferred construction illustrated the moving parts are carried by a casing 2 supported by legs 3—3 and having its front and back walls curved outwardly as at 4—4 to receive between them a longitudinally-extending cylinder 5, which is secured to a horizontal shaft 6 journaled in the ends of the casing. In the periphery of the cylinder 5 are formed cavities 7, which preferably consist of similar longitudinally-extending grooves curved in cross-section on the arc of a circle, these grooves being equidistant in a circumferential direction and being closed at their ends by the ends of the cylinder. Immediately above the cylinder is located a hopper 8, the front and back walls of which consist of the front and back walls of the casing 2, while the end walls consist of vertical plates 9—9 extending from front to back and also extending downward to the curved portions 4 of the front and back walls of the casing, said plates 9 being shaped at their lower edges to conform to and make a close fit with the adjacent ends of the cylinder. The cylinder thus forms a rotatable bottom for the hopper, from which the material can be discharged only by entering the grooves 7 and being carried around with the cylinder as the latter rotates.

The lower portion of the casing 2 is shaped to provide an approximately cylindrical chamber 10 immediately beneath the cylinder 5 and contains a rotatable screw 11, which screw has practically the same diameter as the cylindrical portion of the chamber and therefore fills the same, except for the shallow space between the screw and the cylinder. The discharge end of the screw 11 extends a short distance beyond the corresponding end of the cylinder and is contained within a cylindrical extension 12 of the casing. Intermeshing gears 13 and 14 carried by the shaft 6 and the shaft 15 of the screw 11, respectively, cause the cylinder and screw to rotate simultaneously and at a predetermined relative speed, power being applied to one of these shafts by means of a belt pulley 16 secured thereto. The relative speed of these shafts is such that the transferring capacity of the cylinder is at least as great as the discharge capacity of the screw, so that the latter is kept com-

pletely filled with the material during its operation, and in order to insure this result the cylinder is preferably rotated fast enough with relation to the screw to deliver a little more material to the latter than is discharged thereby, any excess material being merely carried around with the cylinder as it rotates.

At the open or discharge end of the extension 12 a number of vertical rods or bars 17 are preferably provided, as shown in Fig. 3. These rods are located close to the end of the screw, and serve to break up and equalize any slight irregularities in the discharge which might otherwise result from the changing angle of the blade of the screw as the latter rotates.

One end of the casing 2 is preferably provided with a removable plate 18, to give access to the interior of the device for cleaning it. This plate and the opposite end of the casing are provided on their inner faces with recesses filled with packing material 19 and covered by thin plates 20 closely surrounding the shaft 6, whereby the material being handled is prevented from getting into the bearings of the shaft.

In operation, assuming that the hopper 8 is kept supplied with the material to be handled and that the shaft 15 is continuously driven at a speed suitable to produce the desired rate of feed, the material falls into and fills the grooves in the rotating cylinder 5 as fast as they are brought beneath the hopper and is then carried around with the cylinder until it drops into the chamber 10, which is kept filled therewith. It is then continuously fed by the screw 11 toward the discharge end of the casing extension 12 and delivered therefrom in a uniform stream. Inasmuch as the rotating cylinder is nearly co-extensive with the transverse area of the hopper it is impossible for the material to arch or pack in the hopper to such an extent as to interfere with its filling the grooves 7 as they are presented beneath it, and thereafter it is subjected to the positive feeding action of the moving parts until it is finally discharged at the outer end of the screw.

I am aware that rotating screw conveyers have been employed heretofore for feeding various materials, both in connection with weighing machines and in other relations, but it has been found that powdery materials will frequently flow through a conveyer of this kind almost as freely as a liquid, without regard to the rotational or feeding movement of the screw, and hence such a screw is not in itself sufficient to control the flow of a material of this character and secure a uniform delivery thereof. In my feeding apparatus above described, however, it is impossible for the material to flow through the screw for the reason that the screw is located so closely below the rotating cylinder that the material within the screw cannot be subjected to a pressure or "head" sufficient to cause it to flow, the material being able to reach the screw only by being positively fed thereto by the rotating cylinder. Consequently it is possible to keep the screw completely filled with the material at all times, which I have found to be essential for accurate and uniform feeding, and this is done by rotating the cylinder and the screw at such relative speeds that the material is delivered by the former to the latter at a rate at least as great as that at which it is discharged by the apparatus. Thus the cylinder combines the two functions of keeping the screw full of the material and of preventing the material in the screw from being caused to flow through the latter, independently of its rotation, by the weight of the material above the screw. In this way the rate at which the material is discharged by the screw is made dependent solely upon the dimensions and rate of rotation of the latter and hence is kept constant regardless of the nature of the material being handled.

I claim:

1. An apparatus for feeding finely-divided material to automatic weighing machines, comprising a hopper having an open bottom, a rotary cylinder extending horizontally beneath the bottom of the hopper and constituting a closure therefor, said cylinder being provided with peripheral cavities, a screw conveyer extending horizontally beneath and closely adjacent to said cylinder, with an open space extending unobstructedly between them throughout the length of their adjacent exposed peripheries, and means for simultaneously rotating said cylinder and screw conveyer at such relative speeds that the material is delivered by the cylinder to the conveyer at a rate not less than that at which it is discharged by the latter, whereby the conveyer is kept filled with the material while operating thereon.

2. An apparatus for feeding finely-divided material to automatic weighing machines, comprising a hopper having an open bottom, a rotary cylinder extending horizontally beneath the bottom of the hopper and constituting a closure therefor, said cylinder being provided with shallow longitudinal grooves equally spaced around its periphery, a screw conveyer extending horizontally beneath the cylinder in close proximity thereto and also extending laterally beyond the same to the point of discharge, the space between the cylinder and the screw conveyer being unobstructed throughout the length of their adjacent exposed peripheries, and means for continuously rotating said cylinder and screw conveyer simultaneously and

at such relative speeds that the material is delivered by the cylinder to the conveyer at a rate not less than that at which it is discharged by the latter, whereby the conveyer is kept filled with the material while operating thereon.

In testimony whereof, I have hereunto subscribed my name this twenty-third day of August, 1915.

HARRY D. BOWMAN.

Witnesses:
PAUL H. DE WYNGAEOT,
GEORGE L. RIPLEY.