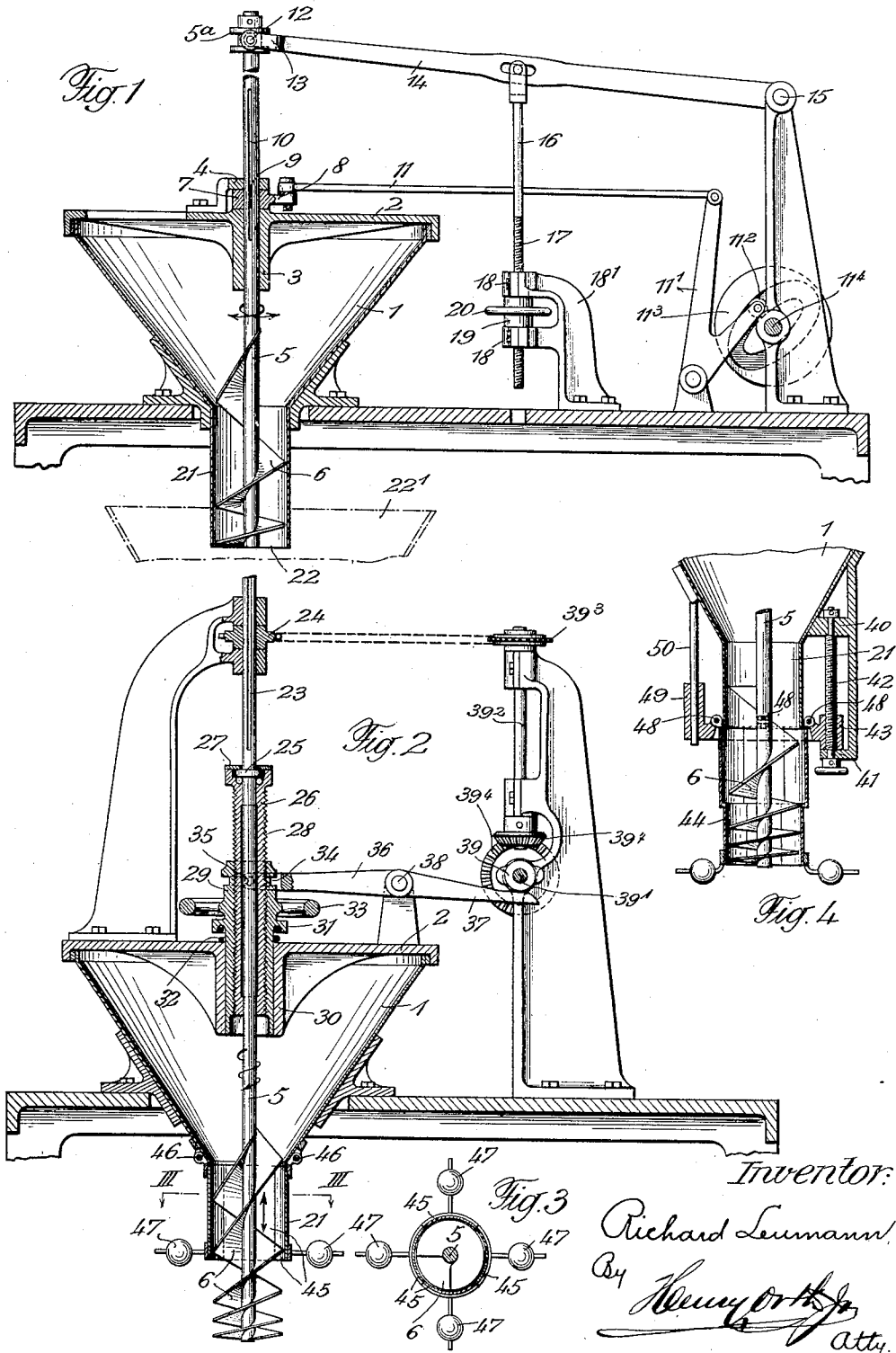


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CONTROLLING DEVICE FOR CHARGING HOPPERS.
APPLICATION FILED JULY 1, 1919.

1,331,017.

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att.

UNITED STATES PATENT OFFICE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RICHARD LEUMANN, a citizen of the Republic of Switzerland, residing at villa "La Loex," Chailly-sur-Lausanne, Switzerland, have invented certain new and useful Improvements in Controlling Devices for Charging-Hoppers; and I do hereby declare the following to be a clear, full, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to a controlling device for charging hoppers, and it consists in providing such a device with means adapted to effect a change of the position of a worm of changing or irregular pitch relatively to the lower portion of the hopper partly surrounding said worm and provided with a discharge opening.

The invention consists also in the particular construction, arrangements and combination of parts of the controlling device as will be hereinafter fully set forth and pointed out in the claims, reference being had to the accompanying drawing showing by way of example several embodiments of the invention. In this drawing:

Figure 1 is a vertical cross-section through a first embodiment;

Fig. 2 is a corresponding section through a second embodiment;

Fig. 3 is a section on the line III—III of Fig. 2, and

Fig. 4 shows a modification of a detail.

Referring at first to Fig. 1, 1 denotes a stationary charging hopper having the shape of a funnel and provided with a cover 2. The latter has a sleeve-like portion 3 and it carries a bracket 4 forming a bearing for a shaft 5 adapted to be moved in its axial direction. The shaft 5 carries a worm 6. The helical surface of the worm 6 has a changing pitch, the upper spirals having a greater pitch than the lower spirals. 8 designates a crank comprising a ring 7 surrounding the shaft 5 and arranged between the cover 2 and a portion of the bracket 4. A key 9 fixed to the ring 7 is adapted to engage a groove 10 of the shaft 5. The crank 8 is pivotally connected to a rod 11 connected in its turn to an arm

of a double armed lever 11¹. The other arm of this lever 11¹ carries a roller 11² running in a cam groove of a disk 11³ fixed to a driving shaft 11⁴.

The shaft 5 is operatively connected to an adjusting mechanism admitting an axial adjustment of this shaft 5. In all the constructions shown this mechanism can be actuated for instance by hand, and to this end the upper end of the shaft 5 carries a collar 5^a provided with a circular groove. Into this groove engage two pins 12 (only one is shown in the drawing) of the fork-shaped end 13 of a lever 14 pivotally mounted on a stationary pivot 15. 16 designates an adjusting rod operatively connected at its upper end to the lever 14 and provided at its lower end with a screw threaded portion 17 passing through a nut 19 which is formed integral with a hand-wheel 20 and which is kept in a determinate position by two extensions 18 of a stationary bracket 18¹.

To the charging funnel 1 is fixed a cylindrical member 21 closely surrounding the lower portion of the worm 6 and provided with an outlet-opening 22. The height of this member 21 exceeds that of the thread of the worm 6 having the greatest pitch so that more than a whole thread of greatest pitch will always be surrounded by the member 21.

The operation of a controlling device as hereinbefore described is as follows:

The quantity of material passing in a unit of time through the outlet opening 22 of member 21 can be controlled by means of the hand-wheel 20 bringing about upon its turning a vertical movement of the rod 16 and consequently an axial movement of the worm shaft 5. The said quantity depends, when it is assumed that the level of the material within the hopper 1 remains always the same, on the speed of the material sliding down that thread of the worm 6 which is situated immediately above the outlet opening 22 and which is surrounded by the cylindrical portion 21. The speed of the material moving down said worm thread depends solely on the angle of inclination of this thread, as it is evident that the speed of a body sliding down an inclined plane increases owing to its weight until the resistance due to the friction (which resistance increases with the increase of said speed) is equal to the component of gravity that is

parallel to the inclined plane. The distance through which the sliding body is moved until said constant speed is reached is of no material importance, as the friction between the material to be discharged through the opening 22 and the worm 5 is as a rule relatively great. Thus, it can be assumed with approximative accuracy that the speed of the goods running down the worm 6 is at every point of this worm not dependent on the preceding threads of the worm 6, but solely on the angle of inclination of the worm at this point. The angle of inclination of the thread of the worm 6 situated immediately above the discharge opening 22 can now be changed in a device of the described construction by vertically adjusting the shaft 5, so that the speed and consequently the quantity of material discharged through the opening 22 into a receptacle 22¹ can also be adjusted at will.

The rotary and shaking movement imparted to the worm 6 about its own axis by means of the crank 8 has the effect, when the goods moving down the worm are powdery, to shake said goods, thus preventing any temporary clogging.

In the embodiment of the invention illustrated in Fig. 2, the cylindrical member 21 forming the lower part of the charging hopper 1 consists of several sections. As shown in Fig. 3 it comprises four sections 45 of equal size. Each of these sections is pivotally connected at 46 to the lower end of the hopper 1 and each of them is acted upon by a counterweight 47. These weights 47 press the sections 45 against one another. The worm 6 is double threaded. The upper portion of the shaft 5 is provided with a groove 23 into which engages a key driven into the hub of a driving wheel 24 prevented from moving in the axial direction of the shaft 5, while the latter can be displaced axially relatively to said wheel 24. On the shaft 5 is also mounted a collar 25 rotatably mounted on balls in a recess of a sleeve 26. The latter is provided with a removable plate 27 and with an external screw-thread 28. This thread 28 engages with an internal thread of a sleeve 29 slidably mounted in the hub-like portion 30 of the cover 2 of the charging hopper 1. The sleeve 29 is provided with a flange 31 against which abuts a compression spring 32 abutting on its other end against the cover 2. The sleeve 29 is further provided with a hand wheel 33 formed integral therewith and with an annular recess 34 into which project the pins 35 of a fork-shaped end of a two-armed lever 36, 37. The latter is pivotally mounted at 38 and it abuts on its other end against a rotary cam disk 39 fixed to a driving shaft 39¹. The latter actuates by means of a bevel gearing 39² a shaft 39³ carrying a chain wheel 39³ over which passes

a chain coöperating also with the chain wheel 24.

The controlling device illustrated in Fig. 2 works as follows:

In order to adjust the spiral of the worm 6 on which depends the quantity of goods discharged, in the required manner within the lower portion 21, the sleeve 26 is turned by means of the hand wheel 33 in one or the other direction, the shaft 5 being then rotated. Upon a rotation of the cam disk 39, an axial shaking movement is imparted to the sleeve 29 and consequently also to the shaft 5, said movement preventing a clogging of the passages confined by the spirals of the worm 6. The pivotally mounted sections 45 prevent a stoppage of the worm 6 when any grains are jammed between the latter and one of the sections 45. The driving wheel 24 imparts moreover to the shaft 5 an uninterrupted rotary movement.

In the embodiment of the invention illustrated in Fig. 4 and showing only the lower part of the controlling device, 42 designates an adjusting screw mounted in stationary bearings 40, 41 of the charging hopper 1. The screw 42 coöperates with an annular nut 43 acting as a carrier for a cylindrical tube-like member 44 consisting of several sections and adapted to be pushed over the lower tube-like portion 21 of the hopper 1. The sections of the member 44 are pivotally connected at 48 to the ring 43. 49 denotes a sleeve formed integral with the ring 43 and acting as a guide for this ring, it being adapted to slide along a bolt 50 fixed to the hopper 1. The shaft 5 carrying the worm 6 cannot be adjusted axially and the quantity of goods flowing through the member 44 can be regulated by axially adjusting this member 44, the latter being adapted to be moved by means of the screw 42 from the position shown, which corresponds to a certain delivery-quantity of goods, to a certain amount upward. In consequence of this adjustment of the member 44, the lower spiral threads of the worm 6 having a smaller angle of inclination lie outside the member 44 so that they become inoperative. Thus, the discharging speed of the goods through the outlet opening of the member can be gradually increased by causing spiral threads having a greater angle of inclination to become operative.

What I claim now as my invention is:

1. A controlling device of the character described, comprising a charging hopper provided at its lower end with an outlet opening, a worm having threads of changing pitch and having its bearing in said hopper, said worm being partly surrounded by the lower cylindrical part of said hopper, and means for changing the position of the worm relatively to said cylindrical part of the hopper.

2. A controlling device for charging hoppers, comprising a funnel-shaped member, a worm having threads of changing pitch and having its bearing in said member, a cylindrical member forming the lower continuation of said first mentioned member and provided with an outlet opening, said cylindrical member closely surrounding at least one thread of the worm, and means for changing the position of the worm relatively to said cylindrical member.

3. A controlling device for charging hoppers, comprising a funnel-shaped member, a worm having threads of changing pitch and having its bearing in said member, a cylindrical member forming the lower continuation of said first mentioned member and provided with an outlet opening, said cylindrical member closely surrounding at least one thread of the worm, and means for axially adjusting the worm in order to effect a change of its position relatively to said cylindrical member.

4. A controlling device for charging hoppers, comprising a funnel-shaped hopper, a worm having threads of changing pitch and having its bearing in said hopper, members pivotally connected to the lower end of said funnel-shaped hopper, counterweights acting upon said pivotally mounted members and causing them to assume a vertical position so that said members confine a cylindrical channel and closely surround at least one thread of the worm, and means for axially adjusting the worm for the purpose of changing its position relatively to said pivotally mounted members.

5. A controlling device for charging hoppers, comprising a funnel-shaped member, a worm having threads of changing pitch and having its bearing in said member, a cylindrical member forming the lower continuation of said first mentioned member and provided with an outlet opening, said cylindrical member closely surrounding at least one thread of the worm, means for changing the

position of the worm relatively to said cylindrical member and means for imparting to said worm a shaking movement.

6. A controlling device for charging hoppers, comprising a funnel-shaped member, a worm having threads of changing pitch having its bearing in said member, a cylindrical member forming the lower continuation of said first mentioned member and provided with an outlet opening, said cylindrical member closely surrounding at least one thread of the worm, means for changing the position of the worm relatively to said cylindrical member, and means for imparting to the worm a rotary and shaking movement.

7. A controlling device for charging hoppers, comprising a funnel-shaped member, a worm having threads of changing pitch and having its bearing in said member, a cylindrical member forming the lower continuation of said first mentioned member and provided with an outlet opening, said cylindrical member closely surrounding at least one thread of the worm, means for changing the position of the worm relatively to said cylindrical member, means for imparting a shaking movement to the worm in its axial direction and means for imparting to the worm a rotary and shaking movement about its own axis.

8. A controlling device of the character described, comprising a charging hopper provided at its lower end with an outlet opening, a multiple thread worm having threads of changing pitch and having its bearing in said hopper, said worm being partly surrounded by the lower cylindrical part of said hopper, and means for changing the position of the worm relatively to said cylindrical part of the hopper.

In testimony that I claim the foregoing as my invention, I have signed my name.

RICHARD LEUMANN.

Witnesses:

EUGENE DAVIS,
EMILE GIDDEY.