July 8, 1958 K. NEIDHARDT 2,842,243

SLIDE REGULATORS

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Fig. 1.

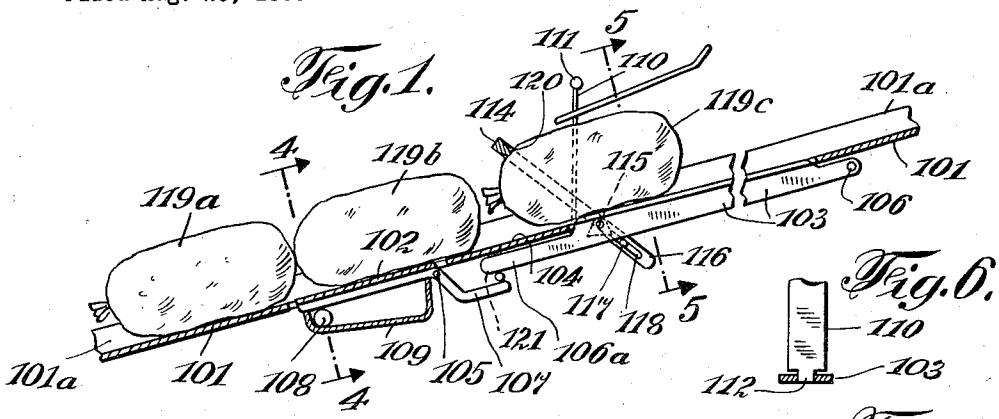


Fig. 6.

Fig. 7.



Fig. 2.

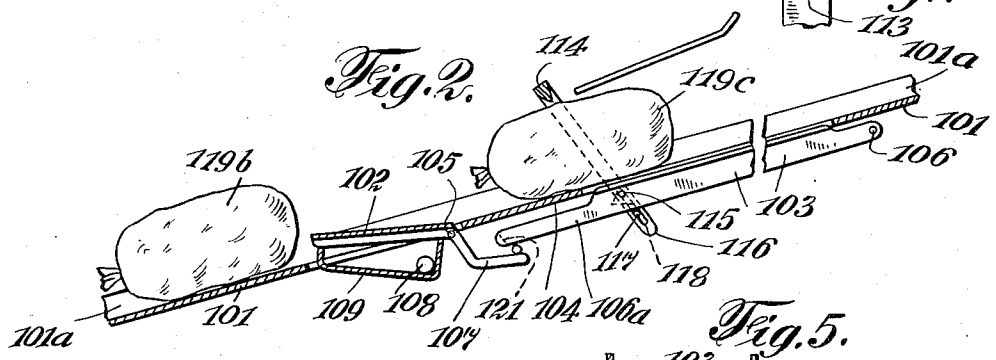


Fig. 5.

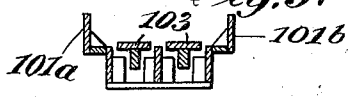


Fig. 4.

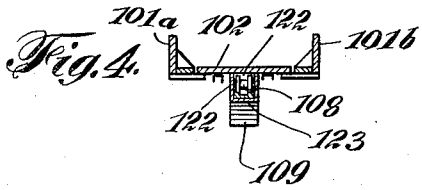
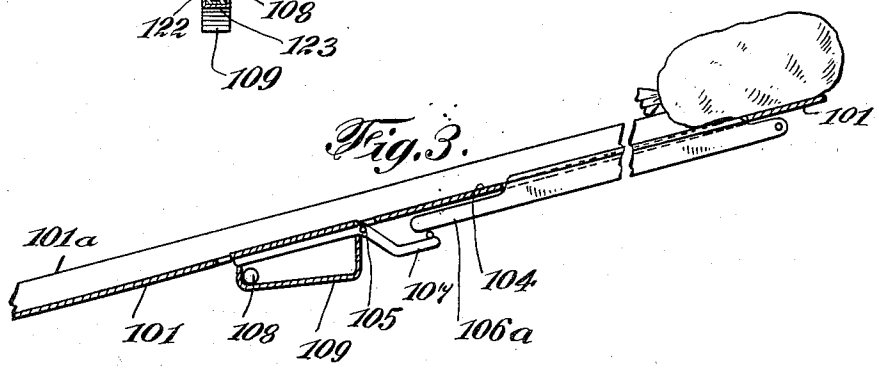


Fig. 3.



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Fig. 8.

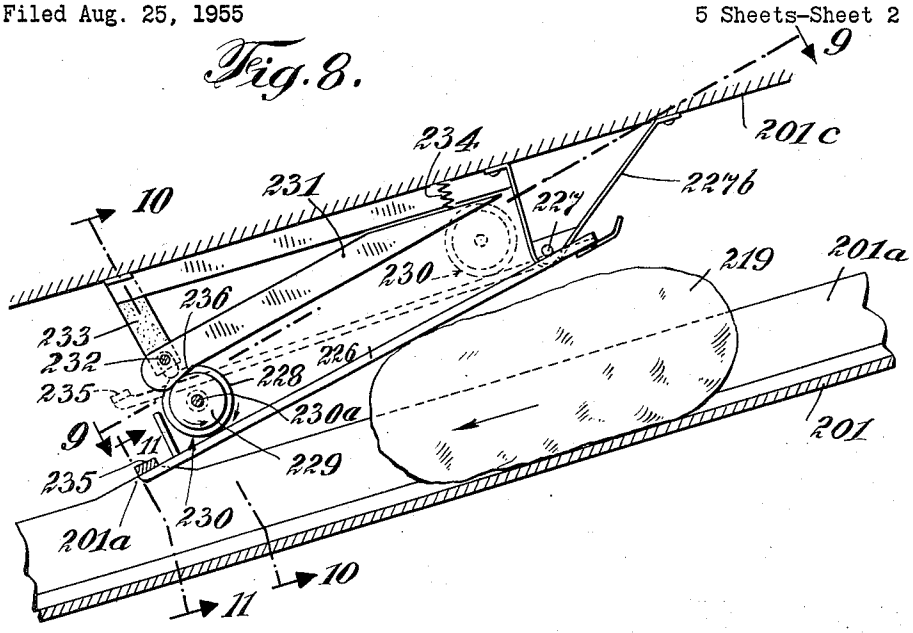


Fig. 9.

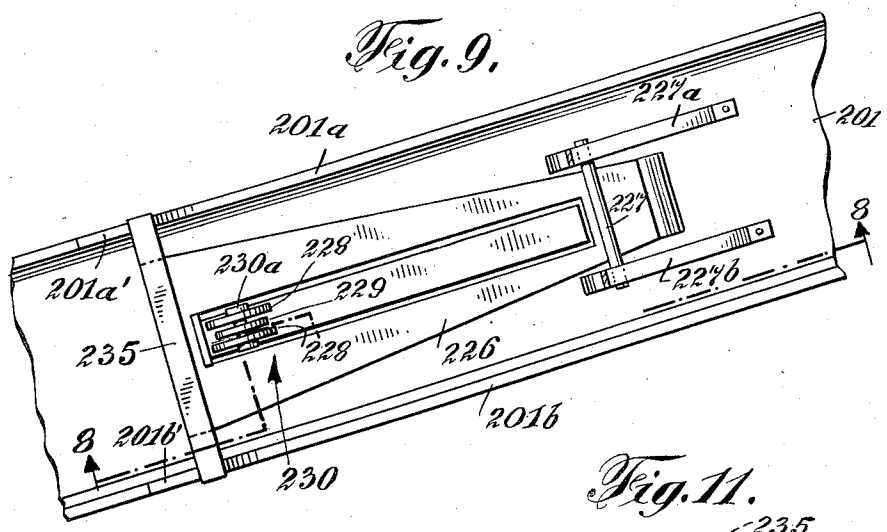


Fig. 11.

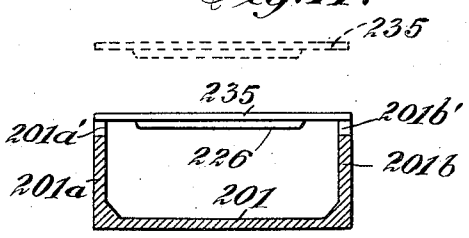
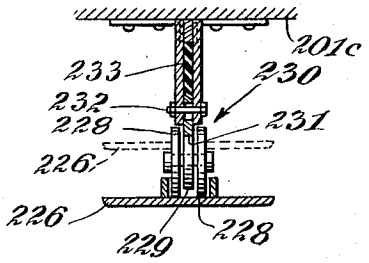


Fig. 10.



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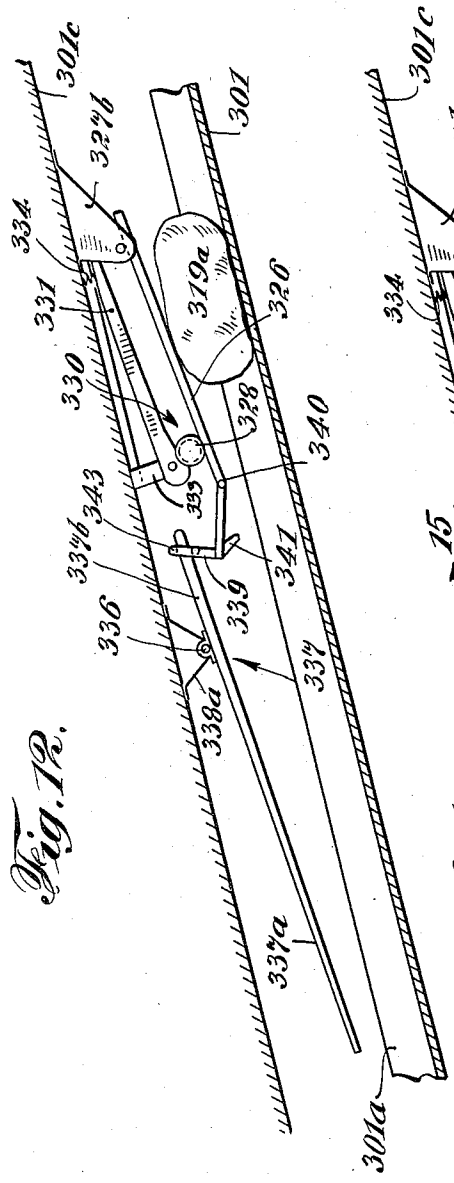


Fig. 12.

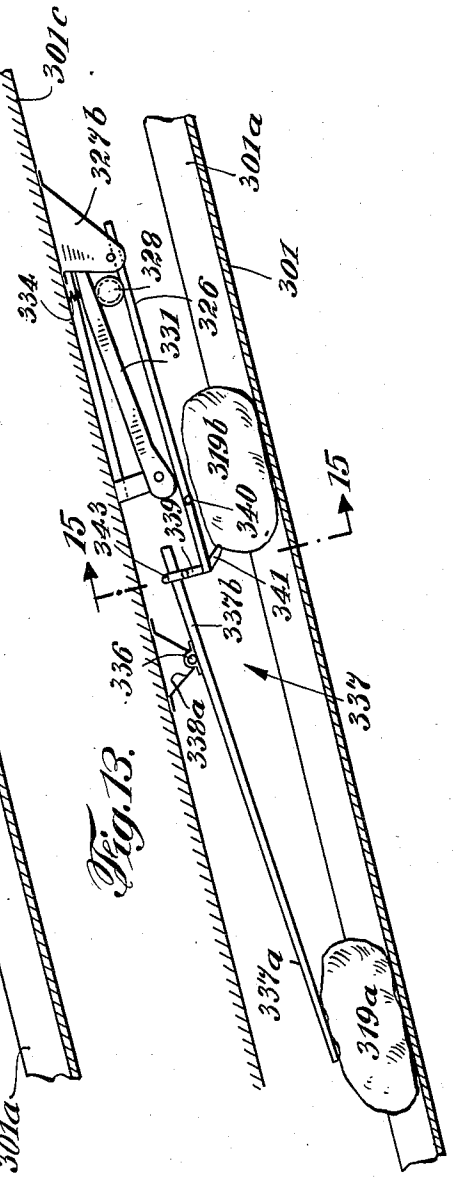


Fig. 13.

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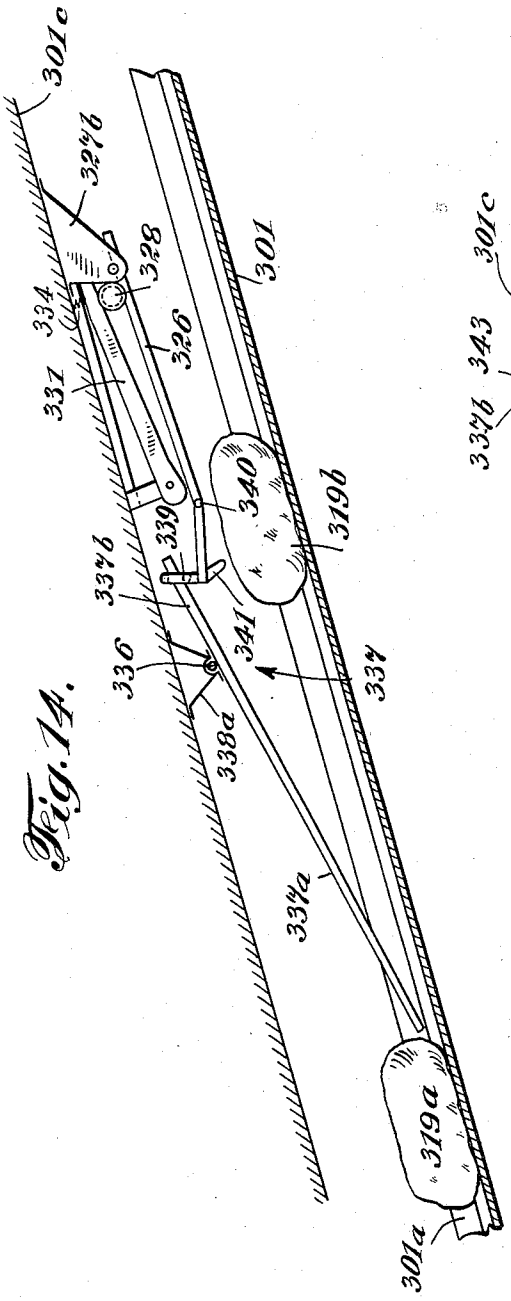


Fig. 14.

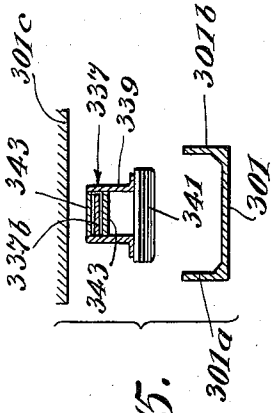


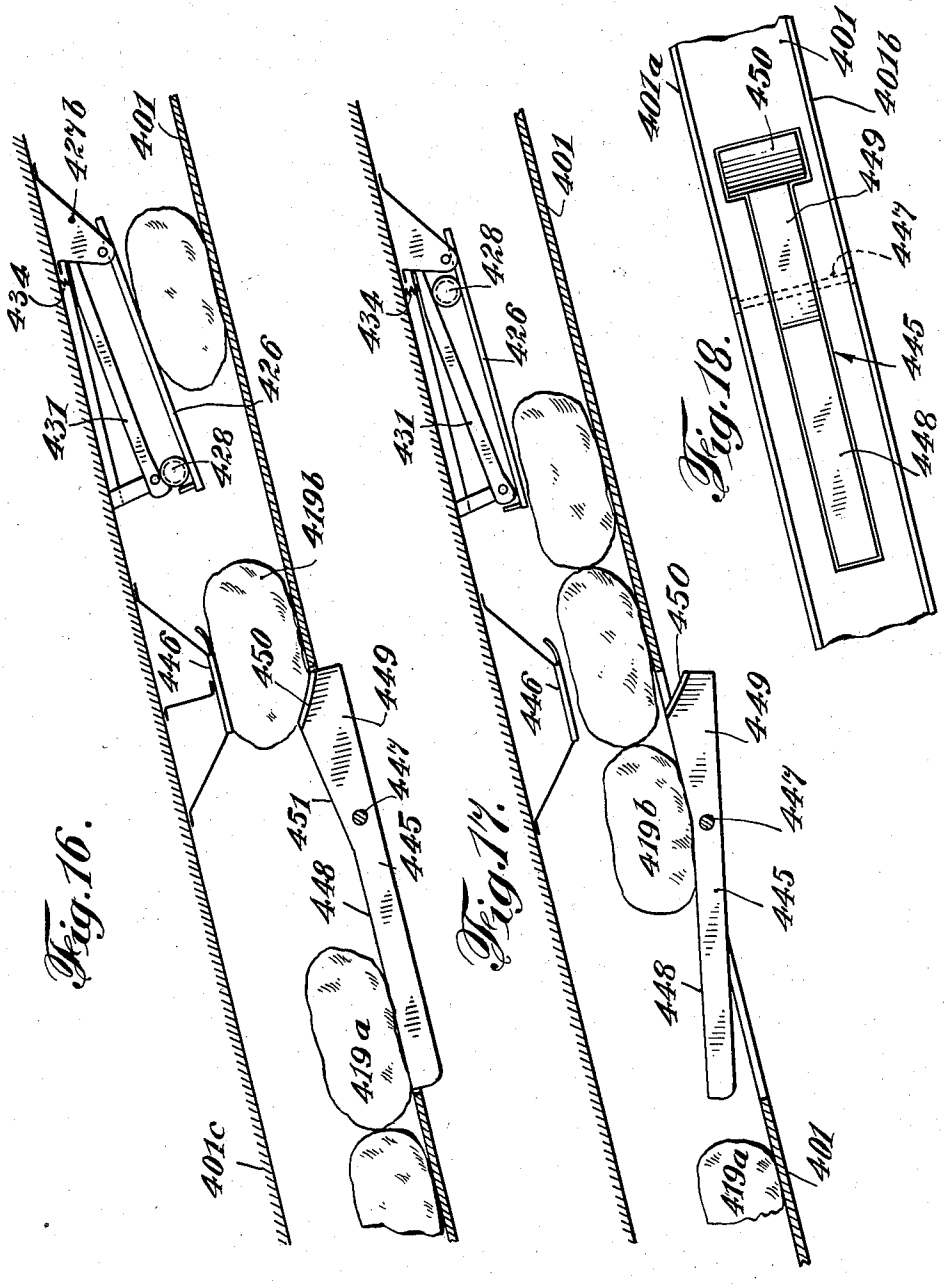
Fig. 15.

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SLIDE REGULATORS

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2,842,243

SLIDE REGULATORS

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Application August 25, 1955, Serial No. 530,594

Claims priority, application Germany August 27, 1954

11 Claims. (Cl. 193—40)

This invention relates to slide regulators, and more particularly to a device for automatically controlling the speed of bulky articles delivered in the inclined slideway of a chute.

It is common practice to store piece goods in inclined chutes by introducing such goods at the top according to the rhythm of production, permitting the goods to descend by gravity along the slideway, and discharging, when necessary, the goods at the bottom of the chute. Sack silos are but one of the devices based on this principle.

The known systems of this character almost invariably require chutes or slides with excessive inclination due to the variations in the friction factor between the piece goods and the surface of the slide. Hence, the friction is often insufficient and the piece goods, during their travel along the slideway, acquire speeds resulting in deformation by collision at or in the proximity of the chute bottom. If the containers for the piece goods are porous, i. e., jute sacks for aggregate goods, such as flour and the like, the goods will escape resulting in losses and other inconveniences, such as contamination of the air, etc. Also, when the slide is filled, the conveyed piece goods may press against one another with a force sufficient to jam the discharging device at the lower end thereof.

These disadvantages of the conventional chutes have been recognized and various types of brakes are now in use, such as those depending on the friction factor and electrically controlled brakes. Friction brakes hold the piece goods for a short period of time, depending on the friction factor between the sliding goods and the chute surface, and then release the goods under control by the operator, but do not provide a compensation for the tangential force. Electric controls, on the other hand, are rather complicated and also expensive, especially owing to the great number of slides in a sack silo.

The apparatus of this invention, which regulates the speed and load of piece goods on a sloping slide, especially such as is common in a sack silo, features a sectional slide with the slide sections operatively connected by certain control elements automatically responsive to the weight, respectively to the tangential force of the conveyed piece goods. In the preferred embodiment of this invention, the regulating or control elements associated with the various sections of the inclined slide are operatively interconnected and may control one another. The invention further provides a device with a passage-actuated brake that alternately brakes and releases the conveyed goods, and a holding and regulating element which is independent from the passage-actuated brake.

By dividing the slide into sections, it is possible to reduce the length of the conveyed sack column and hence to reduce the tangential force.

It is often advantageous to associate the slide with one or more retaining elements above and spaced from

the slide bottom, which elements alternately retain and release the passing piece goods. This arrangement finds its preferred application in the existing conventional slides as it does not require modifications in the slide bottom, and also for conveying of certain frail goods which are preferably braked by two polished surfaces. This system does not require a friction surface in the slide bottom.

The above and other features and advantages of the novel slide regulator will be pointed out in more detail in the course of the following detailed description of some at this time preferred embodiments which are illustrated in the accompanying drawing, and the invention will be finally pointed out in the appended claims.

In the drawing, wherein similar characters of reference indicate similar elements,

Figs. 1, 2 and 3 illustrate a first embodiment of the invention in longitudinal section;

Fig. 4 is a section taken on line **4—4** in Fig. 1;

Fig. 5 is a section taken on line **5—5** in Fig. 1;

Figs. 6 and 7 show details of a retaining flap and of the friction surface in the bottom of an inclined chute, respectively;

Fig. 8 is a partly sectional side elevational view of an overhead brake actuated by the passing goods, taken on line **8—8** in Fig. 9;

Fig. 9 is a section taken on line **9—9** in Fig. 8;

Fig. 10 is a section taken on line **10—10** in Fig. 8;

Fig. 11 is a section taken on line **11—11** in Fig. 8;

Figs. 12, 13 and 14 are schematical illustrations in side elevation of a passage-actuated overhead brake, such as shown in Fig. 8, combined with a holding device;

Fig. 15 is a section taken on line **15—15** in Fig. 13;

Figs. 16 and 17 are side elevational views of an overhead passage-actuated brake combined with a pivotable section in the slide bottom; and

Fig. 18 is a plan view of the pivotable section in the slide bottom.

Referring now in more detail to the illustrated embodiments, and more particularly to Figs. 1 to 7, an inclined slide having two substantially vertical lateral walls **101***a*, **101***b* (see Figs. 4 and 5) is indicated at **101**. It includes a pivotable section **102** with a pressure surface whose position is controlled by the weight of the conveyed goods, and a section **103** with a friction surface which is also pivotable to a limited extent and which produces a tangential force on the passing goods. A sliding surface **104** is provided between sections **102**, **103**, said sliding surface forming part of the bottom of slide **101**. The pressure section **102** which is pivotable at **105** carries a two-armed lever **107**, and the friction section **103**, pivotable around a fixed point **106**, also includes a lever **106***a*. The levers **106***a* and **107** cooperate in such a manner that the friction section **103** is raised when the pressure section **102** is depressed, and vice versa. In Fig. 2, section **102** is raised, whereas the friction section **103** is depressed by a passing sack **119***c*. Fig. 1 shows the pressure section **102** depressed by a sack **119***b*, and consequently, by the action of lever **107** on lever **106***a*, friction section **103** is raised together with a sack **119***c* which is slightly deformed. The pivotal movement of pressure section **102** is assisted by the weight **108** which automatically oscillates in a U-shaped stirrup **109** of lever **107** from its position below and near the lower end of section **102** to its other extreme position in the proximity of pivot **105**.

Fig. 1 illustrates the slide regulator in its position when the slide **101** is in the process of being filled. As soon as the sack column **119***a–c* has reached the device, the sacks maintain the pressure surface of section **102** depressed and the friction surface of section **103** rises.

The sacks on section **103** transmit thereto the force caused by the sack column which follows.

When the sacks are discharged from the chute **101** (see Fig. 2), they travel over and past the section **102** which then rises by the weight of sack **119***c* pressing against the friction surface of section **103**, causing the same to descend and the sack **119***c* comes into contact with the smooth sliding surface **104** which is now parallel with and at the same level as the friction surface of section **103**, to slide thereover and onto the surface of member **102**.

It is preferred to provide a pair of such regulators, one in the proximity of the discharge end of the slide **101** and the other higher up in the slide.

Fig. 3 illustrates how the sacks **119** are slowed down when they are not arrested by the regulator, i. e., when the slide is in the process of being filled. Passing over the friction surface of member **103**, sack **119** causes it to sink, but the inertia of oscillating weight **108** in the stirrup **109** of lever **107** prevents a quick depression of plate **103** which consequently reduces the velocity of a passing sack **119**. As soon as the pressure surface **102** is slightly pivoted, weight **108** quickly rolls toward pivot **105** causing plate **103** to descend into parallelism with sliding surface **104**, and the sack **119** is free to continue its unimpeded travel in chute **101**.

It is often advisable to provide a slide lock near the friction surface of member **103**, for example, a flap **110** which is pivotally mounted at **111** and whose reduced projection **112** (Fig. 6) may be retained in a slot **113** in member **103** (see Fig. 7).

To increase the holding action of member **103**, a shackle **114** may be provided to retain the piece goods. Shackle **114** comes into contact with a sack **119***c* when the member **103** rises (see Fig. 1). It is pivotable around **115** and has an elongated slot **118** in its lower extremity **116**. Slot **118** receives a shaft **117** fixed to the lever **106***a* of member **103**. When the member **103** rises, shackle **114** comes into contact with, say, sack **119***c* and retains the same by the action of its transverse element or bar **120**. When the member **103** descends, lever **106***a* by means of shaft **117** pivots shackle **114** and causes it to release sack **119***c* (see Fig. 2).

The pressure surface of member **102** may consist of a single leaf (see Fig. 4), but it is preferred to divide it in a manner (see Fig. 5) that a smooth surface is provided for the conveyed sacks in the middle of slide **101** when the friction surface of member **103** is depressed. The braking effect of the friction surface of member **103** may be increased by means of tapered elevations, or by means of a slightly tapered friction surface facing.

Member **103** may be freed suddenly by bevelling lever **106***a* at its contact end with lever **107**, as represented at **121** in Figs. 1 and 2.

To insure smooth oscillatory movement of weight **108**, it may be formed as a roller with a groove **122** to guide it along a rail **123** on the stirrup **109** (see Fig. 4).

The embodiment of Figs. 8 to 11 shows an overhead brake which is actuated by the passing goods. A flap **226** sloping toward the slide **201** and flaring in the direction of travel of conveyed sacks **219** (see Fig. 9), is pivotable around a horizontal shaft **227** supported by a pair of brackets **227***a*, **227***b*, depending from the chute ceiling **201***c*. A rail **231**, generally parallel with flap **226** when the latter is in its inoperative position, is pivotally supported by a member **232** resiliently carried by a rubber block **233**. The upper end of rail **231** is engaged and urged downwardly by a resilient element, such as a coil spring **234**, depending from ceiling **201***c*. A roller **230**, consisting of a median disc **229** and a pair of spaced discs **228** mounted on a shaft **230***a*, is provided between flap **226** and rail **231** in such a manner that the central disc **229** rolls on rail **231** while the outer discs **228** are free to roll on the upper surface of flap **226**. The downward pivotal movement of flap **226** is limited by a cross member **235** which normally rests on a pair of projections **201***a'*, **201***b'* extending from the side walls **201***a*, **201***b* of slide **201** (see Fig. 11).

When a sack **219** is conveyed in the inclined chute **201**, it enters the tapered passage between the bottom of the chute and the lower surface of flap **226**, bearing against said flap and causing it to rise whereby the roller **230** moves toward right. Discs **228** and disc **229** rotate in opposite directions. The roller **230** may be more easily moved from its idle position shown in full lines in Fig. 8 if the rail **231** is provided with a slope **236** in the proximity of its pivotal attachment at **232**. By pivoting around shaft **227**, flap **226** is sufficiently lifted to permit passage of sack **219** therebelow.

Rubber block **233** lends a certain resiliency to the overhead brake and allows for variations in the diameter of conveyed goods.

Figs. 12 to 15 illustrate a modification of the overhead brake of Fig. 8, wherein a holding device and a dragging lever **337** are operatively connected with the flap **326**. Lever **337**, pivotable around shaft **336**, the latter supported by a pair of brackets **338***a*, **338***b*, includes two arms **337***a*, **337***b*. Arm **337***a* extends downwardly in the path of conveyed piece goods **319**, and the other shorter arm **337***b* bears a holding element **339** which is pivotally attached to flap **326**. Holding element **339**, including a pair of levers with the one lever pivotally attached to flap **326** at **340**, and the other lever terminating in a shackle **343** cooperating with the shorter arm **337***b* of lever **337**, is provided with a beam **341** mounted transversely in the path of sliding goods **319**, and is preferably coated with rubber or the like. When the slide **301** is in the process of being filled with sacks **319**, and a sack **319***a* is retained by the dragging arm **337***a* of lever **337** (see Fig. 13), this arm is lifted and beam **341** attached to the other arm **337***b* of lever **337** descends to stop the next sack **319***b*. The pressure of the following sack column is thereby interrupted due to the spaced position of sacks **319***a* and **319***b*. When the sacks are discharged, the arm **337***a* descends, lifting arm **337***b* by means of the shackle **343**, together with the holding element **339** and transverse bar **341**, and sack **319***b* is free to continue its travel in slide **301** (see Fig. 14). When the last sack has passed the brake, roller **330** returns to its idle position, i. e., in the proximity of rubber beam **333**.

If the flap **326** is made of a relatively resilient material, e. g. ash wood, it may be used for sacks of different thicknesses. The force of holding beam **341** may be varied by varying the ratio of the relative lengths of arms **337***a*, **337***b* of lever **337**, a ratio of, for example 5:1, being considered sufficient.

In the embodiment of Figs. 16 to 18, the passage-actuated overhead brake and the holding device are independent. The holding device includes a lever **445** pivotable at **447**, mounted in the bottom of slide **401**, and a fixed overhead counter-surface **446**. The surface **448** of lever **445**, in Fig. 16, is parallel and at the level of the chute bottom. The upper end **450** of lever **445** is tapered and projects above the chute bottom when the surface **448** is in the position shown in Fig. 16, and the counter-surface **446**, rigidly connected to and depending from chute ceiling **401***c*, is disposed relative to the end **450** of lever **445** so as to form a trap for the sliding sacks **419**. The intermediate surface **451** between sections **448** and **450** of lever **445** is at an angle which brings it into substantial parallelism with the bottom of chute **401** on depression of surface **450** (see Fig. 17).

When the slide **401** is in the process of being filled, a sack **419***a* rests on surface **448** of lever **445**, causing projection **450** to rise above the chute bottom and retaining a sack **419***b* in cooperation with the counter-surface **446** (Fig. 16). When the sack **419***a* slides over and past surface **448** (Fig. 17), lever **445** pivots around **447** and sack **419***b* is free to continue its travel over intermediate surface **451**.

It is preferred to combine the overhead brake shown in

Figs. 8 to 18 with the sectional regulator of Figs. 1 to 7 because the freshly packed sacks are generally round and their contour does not correspond to that of the slide. The overhead brake flattens the passing sacks which are then better guided as well in the straight as also in the winding sections of the slide. Also, to economize height, the mechanism may be attached to the side of a slide.

While I have described some embodiments of my invention and the best mode known to me of practicing the same, various changes and modifications may occur to persons skilled in the art in the arrangement of parts and in the use of similar or equivalent elements, and I therefore do not desire to be limited to the exact details shown and described, but only by the scope of the appended claims.

I claim:

1. In a sloping slide, an apparatus for retarding the speed of conveyed goods comprising, in combination, a retarding member pivotally mounted in the path of conveyed goods, said member having a surface inclined with respect to said slide when not engaged by one of said conveyed goods and adapted to be brought into substantial parallelism with said slide when engaged by and owing to the pressure of one of said conveyed goods, and means operatively associated with said retarding member for returning said surface into inclined position with respect to said slide, said means including a guide and a weight in engagement with said guide, said weight having a position of rest in which said surface is inclined with respect to said slide and being movable from said position of rest by said retarding member when said surface is engaged and said retarding member pivoted by one of said conveyed goods.

2. In a sloping slide, an apparatus for regulating the speed and load of conveyed goods comprising, in combination, a pair of retarding members articulately mounted in the path of and automatically responsive to the weight and tangential force of conveyed goods, the first of said retarding members having a pressure surface and the second of said retarding members having a friction surface, lever means for interconecting said retarding members for displacing said friction surface from the plane of said slide when said pressure surface is in said plane and for displacing said pressure surface from the plane of said slide when said friction surface is in said plane, said lever means including a first lever attached to said first retarding member and a second lever attached to said second retarding member, and means for returning said friction surface into the plane of said slide, said last mentioned means including a weight and guide means for said weight attached to said second retarding member.

3. In a slide having a sloping channel which defines an upper and a lower opening spaced from one another, an apparatus for retarding the movement of goods conveyed in said channel and passing over said openings, said apparatus comprising a first and a second retarding member in said upper and said lower opening respectively, each of said retarding members having an upper and a lower end with said upper ends pivotally attached to said slide below the plane of said channel and said lower ends each rockable into a first position in which said retarding members substantially close the respective one of said openings and into a second position in which said lower ends of said retarding members are pivoted above the plane of said channel and said retarding members extending into the path of goods conveyed in said channel, an articulate connection between said retarding members below the plane of said channel for pivoting said lower end of said second retarding member into said second position when said first retarding member descends into said first position by the weight of one of said goods resting thereon, and for lifting said lower end of said first retarding member into said second position when said second retarding member is pivoted into said first position by one of the conveyed goods passing thereover, a guide member attached to said second retarding member below the plane of said channel and a weight operatively connected with said guide member for movement substantially between said upper and said lower end of said second retarding member and having a position of rest adjacent to said lower end of said second retarding member for returning the second retarding member into said first position and for pivoting the first retarding member into said second position when no goods pass over said retarding members.

4. The structure of claim 3, further comprising an arresting device for goods conveyed in said channel, said arresting device including a transverse arm and an articulate connection between said arm and said first retarding member for moving said arm into the path of conveyed goods when said first retarding member is in said second position, and for moving said arm away from the path of conveyed goods when said first retarding member is in said first position.

5. This structure of claim 3, wherein said articulate connection between said retarding members comprises a first lever attached to said first retarding member, extending toward said second retarding member and having a bevelled lower extremity and a second lever attached to said second retarding member and in contact with said bevelled extremity of said first lever in such a way as to permit quick release and movement of said first retarding member into said first position.

6. In a sloping slide, an apparatus for regulating the speed and load of conveyed goods, including a plurality of sections articulately mounted in the path of and automatically responsive to the weight and tangential force of the conveyed goods, and a retarding device disposed above said slide and in the path of conveyed goods, said retarding device including a retarding member pivotally attached in the proximity of the upper extremity thereof, a rolling member oscillatable between the upper and the lower extremity and above said retarding member, and a guide element associated with said rolling member and pivotable in the proximity of the lower extremity thereof, said retarding member flaring transversely and sloping downwardly in the direction of travel of the conveyed goods.

7. In a slide having a sloping channel and a ceiling, an apparatus for retarding the movement of conveyed goods in said channel including a retarding member, a pivot for swingably suspending said retarding member from said ceiling, said retarding member having an upper and a lower end and an upper and a lower surface with said lower surface normally inclined with respect to said channel and extending from said pivot in the direction of movement of conveyed goods, a weight including at least one rotatable member resting on said upper surface of said retarding member, stop means in the proximity of said lower end of said retarding member for limiting the movement of said weight in downward direction, with said weight normally resting against said stop means when said lower surface of said retarding member is inclined with respect to said channel, and guide means for said weight yieldably attached to said ceiling for controlling the movement of said weight in a direction toward said pivot and along said upper surface of said retarding member when said lower surface is engaged by one of the conveyed goods and said retarding member is pivoted away from said channel to permit passage of one of said goods in said channel and along said lower surface, said weight thereupon descending by gravity along said upper surface toward said stop means to return said retarding member into its initial position in which said lower surface is inclined with respect to said channel.

8. The structure of claim 7, wherein said weight includes at least one roller resting on said upper surface and at least one roller abutting and movable along said guide means, and a common shaft is provided for said rollers.

9. The structure of claim 7, wherein said guide means is an elongated rail having a sloping surfaced section at

the lower extremity thereof in contact with said weight when the latter is adjacent said stop means.

10. The structure of claim 7, further comprising a dragging lever having a long arm, a short arm and a connection for pivotally suspending same from said ceiling, with said long arm extending from said connection in the direction of travel of conveyed goods in said channel, and means for articulately connecting said short arm of said dragging lever with said lower end of said retarding member for moving said long arm into the path of conveyed goods when said weight is adjacent to said pivot, and for moving said long arm from the path of conveyed goods when said weight is adjacent to said stop means.

11. The structure of claim 10, further comprising a retaining member for conveyed goods attached to said short arm of said dragging lever, said retaining member

including a transverse beam which is in the path of conveyed goods when said long arm is moved from the path of conveyed goods.

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