

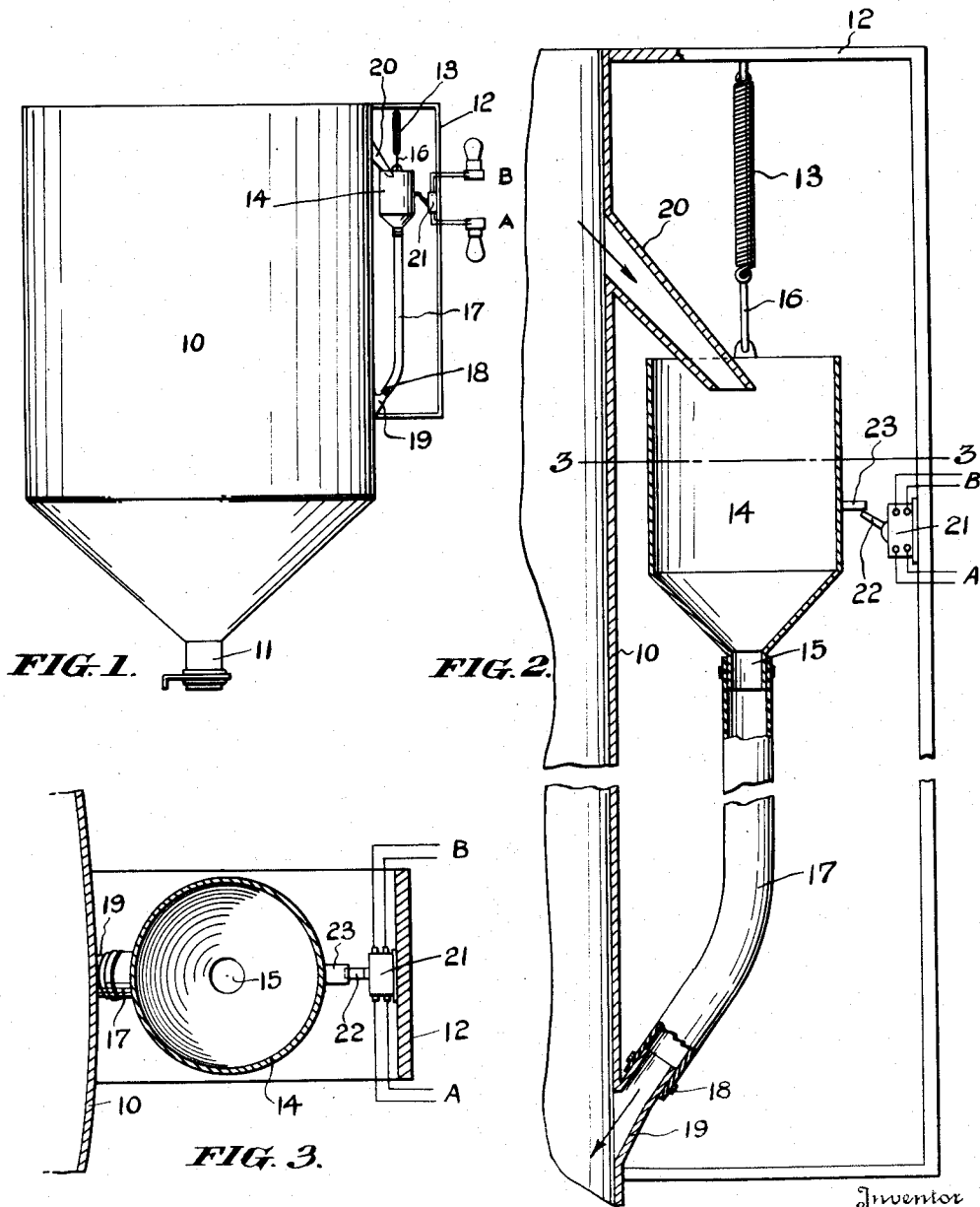
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SWITCH OPERATOR FOR STORAGE BIN INDICATORS

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SWITCH OPERATOR FOR STORAGE BIN INDICATORS

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7 Claims. (Cl. 200—52)

1

The present invention relates to apparatus for indicating the level of materials disposed within a storage bin or similar receptacle, and has particular reference to an improved mechanism for indicating storage conditions within a receptacle for granular materials, such as grain and the like.

Oftentimes, in the storage of granular or relatively finely divided materials, such as grain, sand, cement, gravel, and the like, the receptacles employed for such storage are disposed in overhead or relatively elevated positions whereby visual reference to the quantity of materials contained therein is precluded. In such instances, filling of the receptacles is made difficult due to the uncertainty as to the quantity of materials contained within the receptacle, and oftentimes, considerable wastage occurs when the receptacles are caused to overflow during filling operations. Further in the emptying of such receptacles, it has been found advantageous to know the approximate contents of the receptacle, in order that time may not be wasted with empty or near empty receptacles. Also, when it is desired to obtain a certain specified amount of materials from a receptacle of known capacity, it is prerequisite that the receptacle be in a full condition prior to the emptying of its contents, and it is therefore necessary to determine or to approximately determine the quantity of the contents within the receptacle before emptying the same.

It is therefore, an object of this invention to provide an indicator mechanism for storage receptacles for granular materials which provides an easy means of determining, within limits, the level of materials contained within the storage receptacle.

It is another object of this invention to provide a device for indicating storage conditions within a receptacle as the level of materials contained therein approaches the upper and lower limits of the receptacle during filling or emptying operations.

It is a further object of this invention to provide a device of the character described which is mechanically efficient, yet structurally simple, and which may be easily installed upon previously erected storage receptacles without extensive modification thereto.

For a further and more detailed understanding of my invention and the additional objects and advantages thereof, reference is made to the following description and the accompanying drawings.

For purposes of simplifying the following description and claims, the term "storage bin" is

2

intended to include all receptacles or containers, such as hoppers, drums, tanks, and the like which are adapted for the reception of finely divided or granular solids.

5 In the drawings,

Fig. 1 is a side elevational view of a level indicator mechanism formed in accordance with the present invention;

10 Fig. 2 is a vertical sectional view, on an enlarged scale, taken through the indicator device disclosed in Fig. 1;

Fig. 3 is a horizontal sectional view taken along the line 3—3 of Fig. 2.

Referring now to the drawings, it will be seen 15 that the present invention makes use of a substantially vertically arranged storage bin 10 which is opened at its upper end to receive granular solids, such as grain or the like, and which is formed at its lower end with a downwardly 20 tapered hopper bottom provided with a valve-controlled discharge outlet 11. Welded, or otherwise suitably joined to the outer surface of the storage bin 10 is an outwardly projecting substantially U-shaped supporting frame or bracket 12 25 which extends downwardly in spaced relation to the outer side wall of the bin to provide an open frame or housing for the indicator mechanism, to be hereinafter more fully described.

Resiliently supported within the bracket 12, by 30 means of a contractile spring 13, is a vertically arranged auxiliary receptacle 14 which is open at its upper end and tapered at its lower end to provide a discharge spout 15, similar to the discharge spout of the main storage bin 10. The 35 auxiliary receptacle 14 is provided at its upper end with a U-shaped bale or handle 16 which is attached to the lower end of the contractile spring 13, and provides a support for the receptacle. The discharge spout 15 of the receptacle is provided with a downwardly directed flexible hose 40 or conduit 17 which is joined at its lower end, as at 18, with an upwardly directed stationary hose connection 19 communicating with, and disposed substantially at the lower level of the 45 storage bin 10.

Opening into the upper end of the receptacle 14 is a downwardly inclined overflow spout or conduit 20, communicating with, and leading from substantially the upper level of the storage 50 bin 10.

Disposed adjacent the auxiliary receptacle 14 is an electrical switch 21, having a spring-pressed toggle actuator 22 projecting outwardly toward the receptacle 14. Preferably, the switch is of 55 the two-way type, wherein a pair of independent

circuits may be alternately opened or closed depending upon the position of the toggle actuator 22. As before stated, the toggle actuator is spring pressed, preferably, toward its upper position as indicated in Figs. 1 and 2 of the drawing. In this latter position, the switch 21 functions to close an electrical indicator circuit A which furnishes electrical energy to any suitable visual or audible signal device, such as an electric lamp, a bell, horn, or similar device. Likewise, the second circuit, indicated by the letter B, controls a second suitable signal device of the character aforementioned. The toggle actuator 22 of the switch is operated by the movement of a cleat 23 which is carried by the auxiliary receptacle 14 and projects outwardly therefrom in vertical alignment with the outer end of the toggle actuator. It will be seen, that as vertical movement takes place within the auxiliary receptacle 14, the cleat 23 will move the actuator 22 downwardly against the action of its associated spring which normally urges the actuator in an upward direction. Such downward movement within the actuator 22 causes the electrical circuit A to be broken, and the electrical circuit B to be closed in order that its associated signal device may be actuated. Normally, the receptacle 14 is maintained in an upward position, as indicated in Fig. 2, by means of the contractile spring 13; however, in the event that granular materials contained within the storage bin 10 reach the upper level of the bin and overflow through the spout 20 the same will be deposited within the auxiliary receptacle 14, and the weight thereof will cause the receptacle to be displaced downwardly against the action of the spring 13, and will consequently depress the toggle actuator 22 of the switch 21.

In operation, assuming that the storage bin 10 is in an empty condition, the auxiliary receptacle 14 will be maintained in its upward position by the spring 13, and at the same time, the switch 21 functions to close the circuit A to allow its associated signal device to indicate the empty nature of the bin. As incoming granular solids are introduced to the bin 10, by way of the open upper end thereof, the level of the solids will rise from the bottom of the bin, assuming the discharge spout 11 to be closed, and as the level approaches or reaches the level of the overflow spout 20, a portion of the solid material will flow by gravity through the overflow spout to the auxiliary receptacle 14 to fill the latter and its associated flexible conduit 17, whereupon the receptacle is displaced downwardly, due to the weight of the granular solids therein, to move the toggle actuator 22 of the switch 21 to its opposite or downward position to open the circuit A and to close the circuit B thereby indicating the full nature of the storage bin. It will be seen, that the granular solids introduced to the receptacle 14 will remain therein due to the block created by the body of granular material disposed within the bin at the level of the hose connection 19, and the receptacle will remain in its downward position until the level of materials within the bin falls below the level of the hose connection 19, at which time the granular materials within the indicator system will flow by gravity through the flexible conduit 17 to be returned once again to the storage bin; and as the granular materials leave the indicator system, the signal circuits A and B will be reversed to indicate the substantially empty condition of the bin.

While I have disclosed the switch 21 as con-

trolling a pair of signal circuits, it will be understood that the same may function with but a single signal circuit which may indicate either empty or full conditions within the bin. Also, the respective positions of the overflow spout 20 and the hose connection 19 may be varied with respect to the bin in accordance with the requirements for the indication of storage conditions within individual storage bins.

It will be understood, that while the switch 21 has been described as controlling an indicator or signal circuit, the same is readily adaptable for the control of an electrical circuit associated with an electric motor driven filling apparatus for the bin, such as an auger feed, a continuous belt conveyer, or a continuous bucket hoist mechanism. In controlling such a system, the switch would function to preclude the operation of the associated filling mechanism upon downward displacement of the associated auxiliary receptacle, indicating the full nature of the storage bin.

In view of the foregoing it will be seen that the present invention provides a highly useful and mechanically efficient indicator system for storage bins adapted for the reception of granular solids, the same functioning to indicate, between limits, the level of materials within the associated storage bin. The present invention is further characterized by its structural simplicity, its rugged construction, and its positive action.

While I have disclosed what I now deem to be a preferred form of the present invention, it will be manifest that various modifications as to details of construction and design may be accomplished without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. Apparatus for indicating storage conditions within a storage bin for granular materials, comprising an auxiliary receptacle mounted adjacent the bin between the upper and lower ends thereof for resilient movement in a substantially vertical plane, a conduit joining the upper portion of the bin with said receptacle, said conduit being disposed in a downwardly inclined position so as to transfer materials contained in said bin substantially at the upper level thereof to said receptacle by gravity, said receptacle being downwardly movable in response to the weight of materials introduced therein by way of said conduit, a second conduit joining said receptacle with the lower portion of the bin, said second conduit being disposed in a downwardly directed position whereby materials contained in said receptacle may be returned to the bin by gravity when the level of materials within the bin is below the level of said second conduit, and an indicator control switch engageable with said receptacle and responsive to the vertical movement thereof for controlling an indicator circuit.

2. Apparatus for indicating storage conditions within a storage bin for granular materials, comprising a vertically arranged auxiliary receptacle mounted adjacent the bin between the upper and lower levels thereof for resilient movement in a vertical plane, a downwardly directed conduit disposed within the bin at a predetermined level in the upper portion thereof and communicating with said receptacle for transferring granular materials disposed at that level to said receptacle by gravity, said receptacle being downwardly movable in response to the weight of materials introduced thereto by way of said conduit, a second downwardly directed conduit joining said receptacle with the bin at a second predetermined

5

level within the lower portion of the bin whereby materials introduced to said receptacle may be returned to the bin by gravity when the level of materials within the bin is below the level at which the second conduit joins the bin, and a switch engageable with said receptacle and responsive to the vertical movement thereof for controlling a level-indicating mechanism.

3. Apparatus for indicating levels of granular materials within a storage bin, comprising a vertically arranged auxiliary receptacle mounted adjacent the bin for resilient movement in a vertical plane, a generally downwardly directed conduit disposed at a given level within the storage bin and communicating with said receptacle for transferring materials contained within the bin and disposed at the level of said conduit to said receptacle, said receptacle being downwardly movable in response to the weight of materials introduced thereto by way of said conduit, a second conduit joining said receptacle at its lower end with said bin at a level below the level of said first conduit for returning materials to the bin by gravity when the level of materials within the bin is below the level of said second conduit, and a switch disposed adjacent said receptacle and responsive to the vertical movement thereof for controlling a signal device.

4. Apparatus for indicating levels of granular materials within a storage bin, comprising a vertically arranged auxiliary receptacle mounted adjacent the bin for resilient movement in a vertical plane, a generally downwardly directed conduit disposed at a given level within the storage bin and communicating with said receptacle for transferring materials contained within the bin and disposed at the level of said conduit to said receptacle, said receptacle being downwardly movable in response to the weight of materials introduced thereto by way of said conduit, a flexible conduit joining said receptacle at its lower end with said bin at a level below the level of said first conduit for returning materials to the bin by gravity when the level of materials within the bin is below the level of said flexible conduit, and a switch disposed adjacent said receptacle and responsive to the vertical movement thereof for controlling a signal device.

5. Apparatus of the character described comprising in combination with a storage bin for granular materials, a vertically arranged auxiliary receptacle mounted adjacent the bin for resilient movement in a vertical plane, a generally downwardly directed conduit disposed at a given level within the storage bin and communicating with said receptacle for transferring materials contained within the bin and disposed at the level of said conduit to said receptacle, said receptacle being downwardly movable in response to the weight of materials introduced thereto by way of said conduit, a flexible conduit joining said receptacle at its lower end with said bin at a level below the level of said conduit for

6

returning materials to the bin by gravity when the level of materials within the bin is below the level of said flexible conduit, and a switch disposed adjacent said receptacle and responsive to the vertical movement thereof for controlling an associated electrical circuit.

6. Apparatus for indicating levels of granular materials within a storage bin, comprising a first conduit communicating with the bin and positioned so as to conduct materials disposed within the bin at the level of said first conduit exteriorly thereof by gravity, a receptacle mounted adjacent the bin and below said first conduit for the reception of materials conducted by the latter and for resilient downward movement in response to the weight of materials introduced therein by way of said first conduit, and a second conduit joined with said receptacle and communicating with the bin at a level substantially below the level of said first conduit, said second conduit being arranged to return materials received within said receptacle to the bin by gravity when the level of materials within the bin is below the level of said second conduit.

7. The combination with a storage bin for granular materials, of a first downwardly inclined conduit communicating with the bin and extending exteriorly thereof for conducting materials disposed within said bin at the level of said first conduit exteriorly thereof by gravity, a resiliently vertically movable open mouth receptacle mounted adjacent said bin and directly below one end of said first conduit for the reception of granular materials conducted from said bin by said first conduit, said receptacle being movable downwardly in response to the weight of materials deposited therein by way of said first conduit, and a second downwardly inclined flexible conduit joined with said receptacle and communicating with said bin at a level below said first conduit, said second conduit providing for the gravitational return of materials from said receptacle to said bin when the level of granular material contained within said bin is below the level of said second conduit.

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