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HOPPER FOR STORING BINS

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Fig. 1.

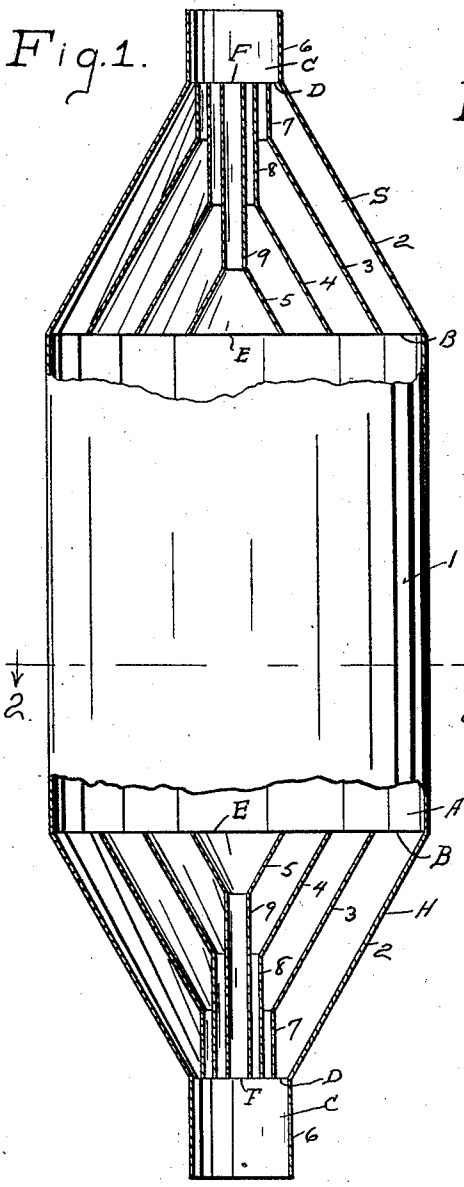


Fig. 2.

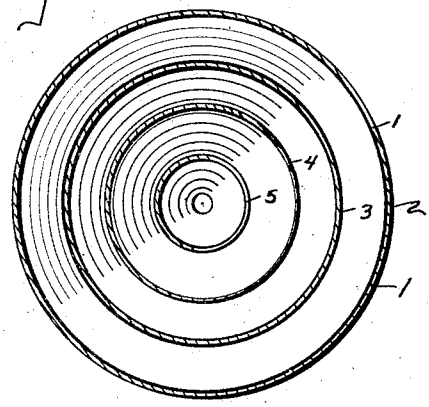
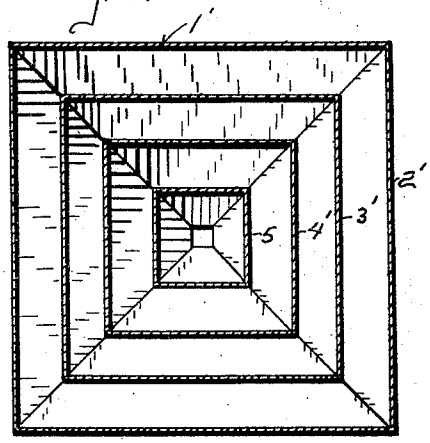


Fig. 3.



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HOPPER FOR STORING BINS.

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This invention relates to hoppers for storing bins.

When delivering material stored in bins having ordinary hoppers or spouts, the center and upper portions of the material in the bins passes out before certain of the lower portions are delivered. Consequently, when bins are continually replenished and rarely emptied, certain of the grain will remain in the bins for long periods of time.

Therefore, the principal object of this invention is to provide for storing bins, a hopper designed to deliver from a storing bin, a stream of divided material, the particles of material being distributed uniformly throughout the cross sectional area of such stream, thereby causing such material to leave the bins in substantially the order in which the particles were received.

To more specifically state the object, the grain first received by a bin will be first delivered therefrom and the grain last received will be last delivered by reason of the peculiar manner in which the hopper, hereinafter described, operates.

A further object is to provide a spout for feeding grain into a storing bin and adapted to spread the grain in a uniform stream throughout the cross sectional area, thereby to arrange the supply of grain with a substantially level surface. In so distributing the supply, accomplishment of the object first mentioned is facilitated.

Before passing on to the description of this invention, it may be well to mention that the first and second objects can be accomplished by identically the same device. One object being accomplished by reversing the operation of the device from that by which the other object is accomplished.

In the drawings:

Fig. 1 is a fragmentary sectional elevation of a storing bin showing in section the hopper as applied thereto for delivering to and from the bin a quantity of grain.

Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a horizontal sectional view similar to Fig. 2 showing a slightly modified form of bin and hopper.

Like parts are identified by the same reference characters throughout the several views.

In applying a hopper of the design herein disclosed to the bin 1, it is important that such hopper be used for delivering material from such bin for the reason that grain will be delivered simultaneously from all portions of the bin and substantially in the order in which it is received by the bin. It is, however, optional with the individual as to the use of such hopper as a spout for delivering such material to the bin.

The hopper H and spout S shown in Fig. 1 are identical in construction, each comprising a plurality of frusto-conical bell portions 2, 3, 4 and 5, each portion having integral tubular sections 6, 7, 8 and 9, respectively. Each of the bell portions are substantially concentric and spaced apart to provide annular openings communicating with the space in the bin. Each of the tubular portions are substantially concentric and spaced apart to provide annular openings each communicating with corresponding annular openings between the bell portions, the tubes 7, 8 and 9 terminating at their outer ends in a plane passing through the integral connection of bell portion 2 and tube 6.

In applying this invention as a hopper or spout to storing bins, it has been found that certain mathematical proportions should be maintained in order that the stream of grain delivered to or from bins should be uniform throughout the cross sectional area of such bins. To illustrate: the cross sectional area A of the bin 1 shall be in proportion to the cross sectional area of the opening B between bells 2 and 3 as the cross sectional area C of the space in tube 6 is to the cross sectional area of the opening D between tubes 6 and 7. To further illustrate, area A is to area E as area C is to area F.

When a hopper of the type disclosed herein is used as a spout to deliver grain to a storing bin and the proportions indicated are maintained, such grain will be spread in the bin to form a substantially horizontal surface on such grain. When the hopper is used to deliver grain from the bin and the proportions are substantially as indicated above, grain adjacent the walls of the bin will be fed therefrom at a rate substantially equal to the rate at which grain at the center of the bin will be fed and consequently all of the grain will be removed from the bin regardless of whether or not such grain is continually replenished.

A hopper constructed as indicated in Fig. 3 will operate in substantially the same man-

ner as the hopper shown in Fig. 2. In other words, the geometrical shape of a storage bin and hopper does not alter the manner in which the hopper operates, provided the proportions of the hopper are maintained as has previously been noted.

From the foregoing description, it is evident that the invention disclosed herein may be alternatively used as a spout for delivering grain to a storage bin or as a hopper for delivering grain from a storage bin; that when the invention is used as a spout, the grain is uniformly spread throughout the cross sectional area of the bin; and that when the invention is used as a hopper, the grain is simultaneously taken from all parts of the bin, thus preventing any of the grain from remaining in the bin when the supply is being continually replaced.

I claim:

1. The combination with a bin for storing grain, of a hopper, said hopper comprising a plurality of concentric hopper portions each spaced from adjacent portions to provide annular openings through which grain may pass.

2. The combination with a bin for storing grain, of a hopper for said bin, said hopper comprising a plurality of frusto-conical bell-shaped portions and a plurality of tubular portions each associated with a bell portion, each of said bell portions and tubular portions being spaced from like portions to provide a plurality of annular openings through which grain may pass.

3. The combination with a bin for storing grain, of a spout adapted to deliver grain uniformly and simultaneously to all parts of said bin, and a hopper adapted to deliver simultaneously from all parts of said bin adjacent said hopper, grain stored therein, said spout and hopper each comprising a plurality of concentric hopper portions each spaced from adjacent portions to provide annular openings through which grain may pass.

4. The combination with a bin for storing grain, of a spout adapted to deliver grain uniformly and simultaneously to all parts of said bin, and a hopper adapted to deliver simultaneously from all parts of said bin adjacent said hopper, grain stored therein, said spout and hopper each comprising a plurality of frusto-conical bell-shaped portions and a plurality of tubular portions each associated with a bell portion, each of said bell portions and tubular portions being spaced from like portions to provide a plurality of annular openings through which grain may pass.

5. In a device of the character described, the combination with a plurality of concentric frusto-conical bell-shaped sections spaced apart to provide annular openings, of a plurality of concentric tubular portions spaced apart to provide annular openings, each of said tubular sections comprising a continuation of a bell-shaped section.

6. In a device of the character described, the combination with a plurality of concentric frusto-conical bell-shaped sections spaced apart to provide annular openings, of a plurality of concentric tubular portions spaced apart to provide annular openings, each of said tubular sections comprising a continuation of a bell-shaped section, the annular openings between adjacent tubular portions being relatively smaller than the annular openings between said bell-shaped sections.

7. The combination with a storing bin, of a spout for delivering grain to said bin, and a hopper for delivering grain from said storing bin, said spout and hopper each comprising an outer frusto-conical bell-shaped section and an outer tubular portion connected with said bell-shaped section, a plurality of inner frusto-conical bell-shaped sections concentric with said outer section, each of said sections being spaced apart to provide a plurality of annular openings communicating with said bin, and a plurality of inner tubular portions each connected with an inner bell-shaped section and concentric with said outer tubular portion, each of said tubular portions being spaced apart to provide openings having a relatively smaller area than corresponding openings between said bell-shaped sections and the inner tubular portions terminating adjacent the plane of connection of said outer bell-shaped section and tubular portion, the cross sectional area of the bin space being substantially in proportion to the cross sectional area of either of the annular openings between said bell-shaped sections as the cross sectional area of the space in the outer tubular portion is to the cross sectional area of a corresponding annular opening between said tubular portion.

8. The combination with a storing bin, of a hopper for delivering grain from said storing bin, said hopper comprising an outer frusto-conical bell-shaped section and an outer tubular portion connected with said bell-shaped section, a plurality of inner frusto-conical bell-shaped sections concentric with said outer section, each of said sections being spaced apart to provide a plurality of annular openings communicating with said bin, and a plurality of inner tubular portions each connected with an inner bell-shaped section and concentric with said outer tubular portion, each of said tubular portions being spaced apart to provide openings having a relatively smaller area than corresponding openings between said bell-shaped sections and the inner tubular portions terminating adjacent the plane of connection of said outer bell-shaped section

and tubular portion, the cross sectional area of the bin space being substantially in proportion to the cross sectional area of either of the annular openings between said bell-shaped sections as the cross sectional area of the space in the outer tubular portion is to the cross sectional area of a corresponding annular opening between said tubular portions.

9. The combination with a storing bin, of a hopper for delivering grain from said storing bin, said hopper comprising an outer frusto-conical bell-shaped section and an outer tubular portion connected with said bell-shaped section, a plurality of inner frusto-conical bell-shaped sections substanitally concentric with said outer section, each of said sections being spaced apart to provide a plurality of annular openings communicating with said bin, and a plurality of inner tubular portions each connected with an inner bell-shaped section and substantially concentric with said outer tubular portion, each of said tubular portions being spaced apart to provide openings having a relatively smaller area than corresponding openings between said bell-shaped sections, the cross sectional area of the bin space being substantially in proportion to the cross sectional area of either of the annular openings between said bell-shaped sections as the cross sectional area of the space in the outer tubular portion is to the cross sectional area of a corresponding annular opening between said tubular portions.

10. The combination with a storing bin, of a spout for delivering grain to said bin, and a hopper for delivering grain from said storing bin, said spout and hopper each comprising an outer frusto-conical bell-shaped section and an outer tubular portion connected with said bell-shaped section, a plurality of inner frusto-conical bell-shaped sections substantially concentric with said outer section, each of said sections being spaced apart to provide a plurality of annular openings communicating with said bin, and a plurality of inner tubular portions each connected with an inner bell-shaped section and substantially concentric with said outer tubular portion, each of said tubular portions being spaced apart to provide openings having a relatively smaller area than corresponding openings between said bell-shaped sections, the cross sectional area of the bin space being substantially in proportion to the cross sectional area of either of the annular openings between said bell shaped sections as the cross sectional area of the space in the outer tubular portion is to the cross sectional area of a corresponding annular opening between said tubular portions.

11. A hopper for storing bins, said hopper comprising a plurality of concentric portions each spaced from adjacent portions, adjacent portions of said hopper providing at one end of said hopper an annular opening and at the other end of said hopper a relatively smaller annular opening communicating with the first mentioned opening.

12. The combination with a storing bin, of a hopper for said bin, said hopper comprising a plurality of concentric portions to provide a plurality of annular openings communicating with said bin and a plurality of relatively smaller annular openings, each of said smaller openings communicating with a corresponding first mentioned opening.

13. The combination with a storing bin, of a hopper for delivering grain from said storing bin and comprising a plurality of concentric portions each spaced from adjacent portions to provide at one end of said hopper a plurality of annular openings and at the other end of said hopper a plurality of relatively smaller annular openings each communicating with a corresponding first mentioned opening, the cross sectional area of the bin space being substantially in proportion to the cross sectional area of either of the first mentioned annular openings as the cross sectional area of the delivery end of said hopper is to the cross sectional area of a smaller opening corresponding to the first mentioned annular opening.

14. The combination with a storing bin, of a spout for delivering grain to said bin, and a hopper for delivering grain from said storing bin, said spout and hopper each comprising a plurality of concentric portions each spaced from adjacent portions to provide at one end of said hopper a plurality of annular openings and at the other end of said hopper a plurality of relatively smaller annular openings each communicating with a corresponding first mentioned opening, the cross sectional area of the bin space being substantially in proportion to the cross sectional area of either of the first mentioned annular openings as the cross sectional area of the smaller end of said spout or hopper is to the cross sectional area of a smaller opening corresponding to the first mentioned annular opening.

15. A hopper for storing bins and comprising relatively large and small ends, the relatively large end being provided with a plurality of openings and the relatively small end being provided with a plurality of relatively smaller openings each communicating with one of the first mentioned openings, the cross sectional area of the large end being substantially in proportion to the cross sectional area of either of the openings therein as the cross sectional area of the smaller end is to the cross sectional area of the smaller openings therein.

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