July 4, 1950 R. I. PATTERSON 2,513,963

MEANS FOR ELIMINATING DUST FROM GRAIN

Filed June 26, 1947 3 Sheets-Sheet 1

Fig.1

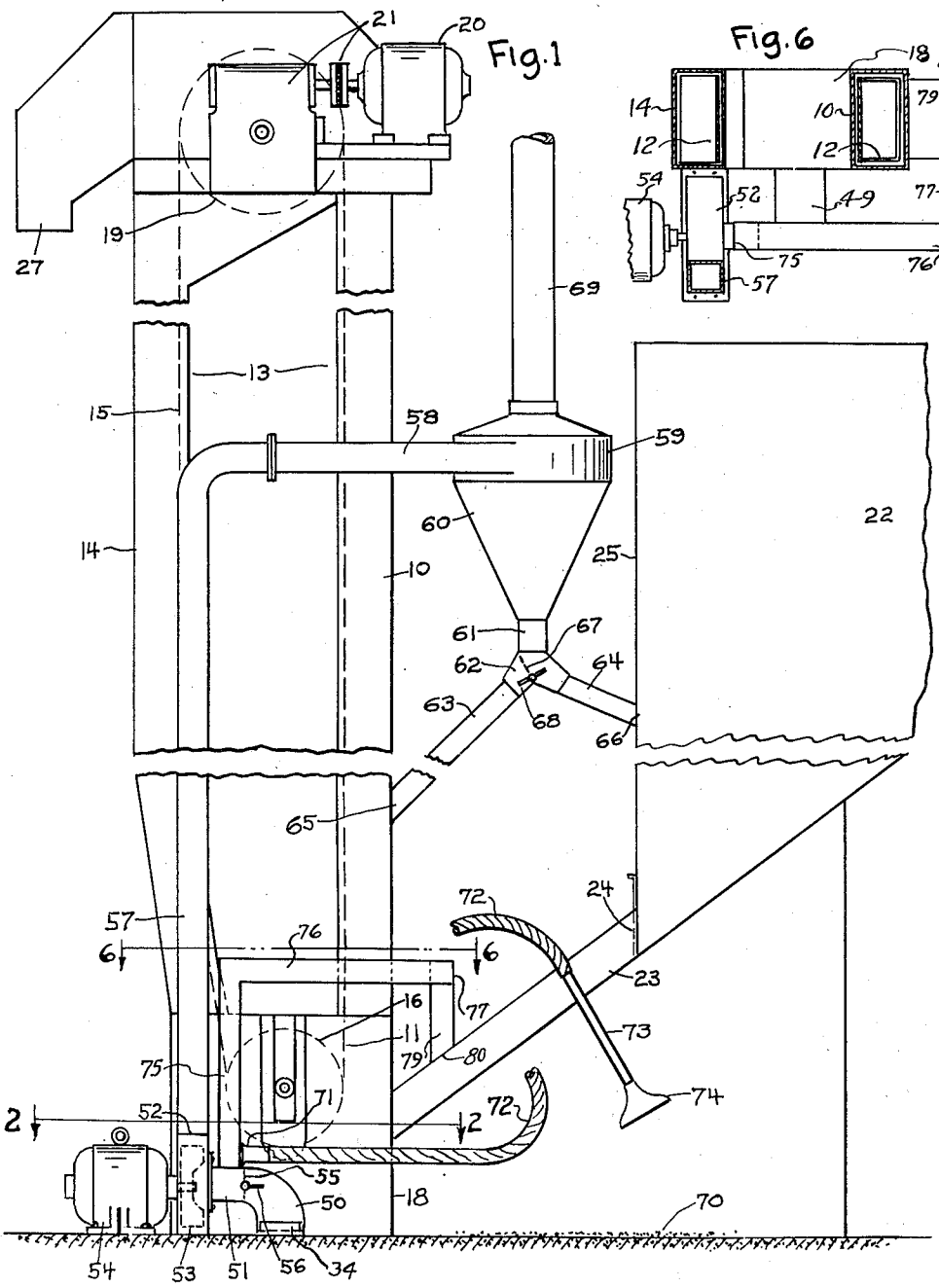


Fig.6

INVENTOR.
Roy I. Patterson
BY
R. A. Whiteley
Attorney

July 4, 1950 R. I. PATTERSON 2,513,963

MEANS FOR ELIMINATING DUST FROM GRAIN

Filed June 26, 1947 3 Sheets-Sheet 2

Fig. 2

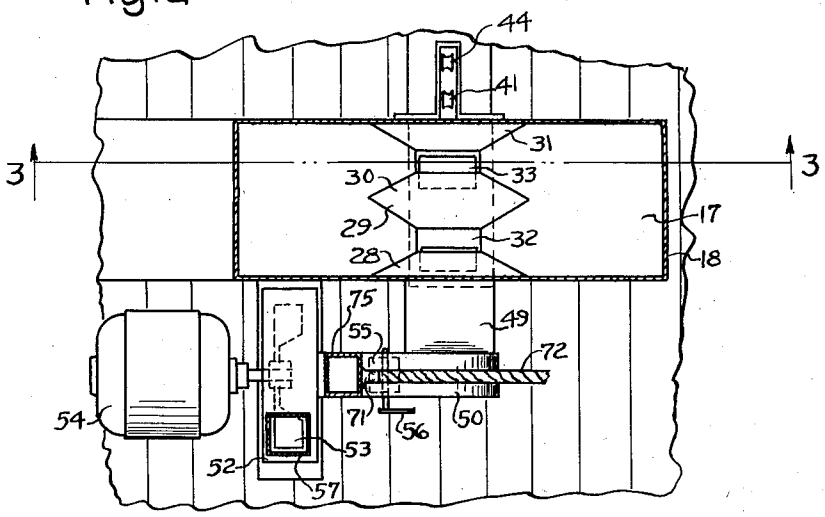
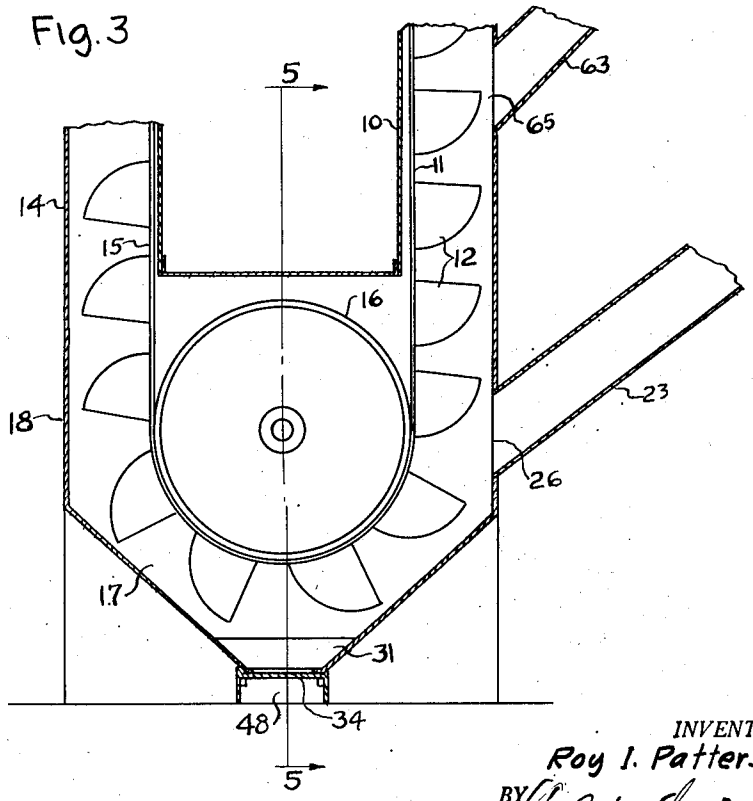


Fig. 3



INVENTOR.
Roy I. Patterson
BY F. A. Whiteley
Attorneu

July 4, 1950 R. I. PATTERSON 2,513,963

MEANS FOR ELIMINATING DUST FROM GRAIN

Filed June 26, 1947 3 Sheets-Sheet 3

FIG. 4.

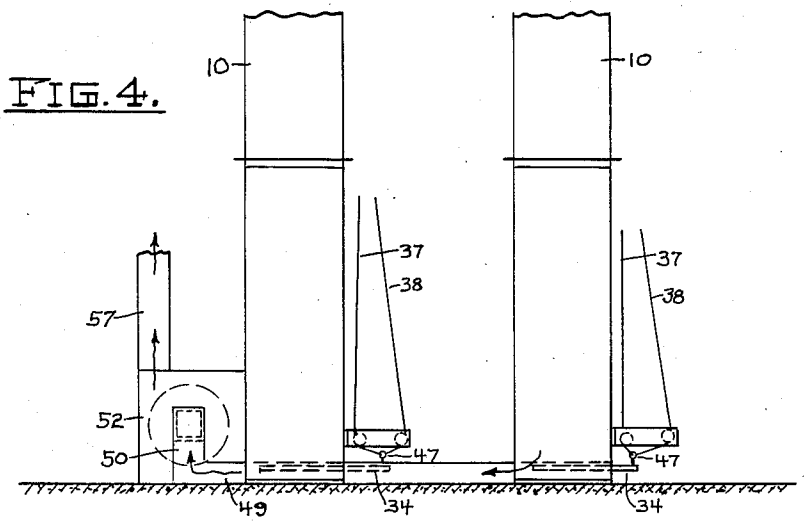
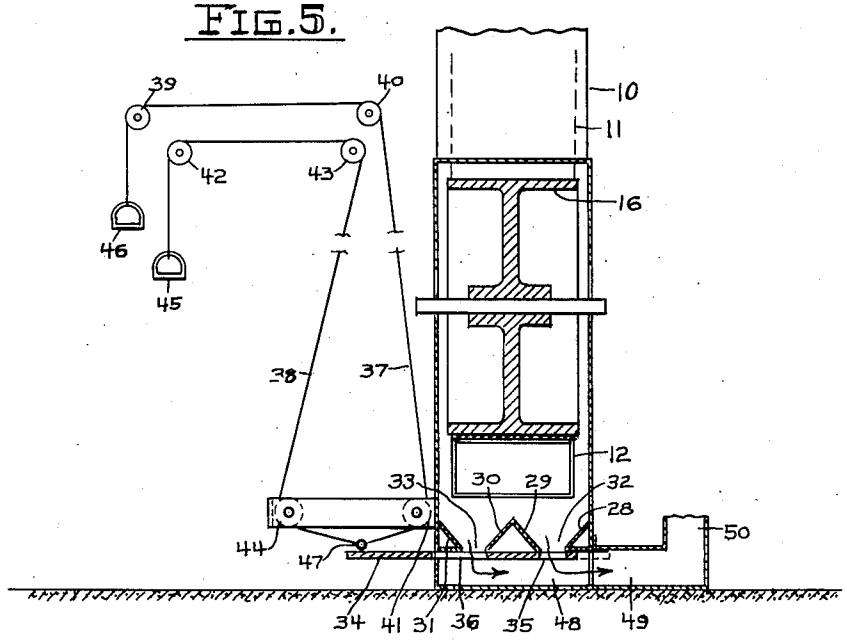


FIG. 5.



INVENTOR.
Roy I. Patterson
BY R. C. Whitelaw
Attorney

Patented July 4, 1950

2,513,963

UNITED STATES PATENT OFFICE

2,513,963

MEANS FOR ELIMINATING DUST FROM GRAIN

Roy I. Patterson, Minneapolis, Minn.

Application June 26, 1947, Serial No. 757,248

4 Claims. (Cl. 209—147)

1

My invention relates to means for cleaning the boot and eliminating dust from grain as it is fed to an elevator leg. The invention has for its object to provide a boot hopper with bottom openings, which may be opened or closed by a slide, in conjunction with means for creating a stream of air through said openings to withdraw grain, dust and the like therefrom; and the invention further provides a connection to said air moving means to relieve back pressure in the elevator leg and pass a regulated stream of air through the grain going into the boot hopper where the grain is agitated as it enters the buckets of the elevator while it is operating to lift the grain. This stream of air with grain, dust, chaff and the like either from the bottom of the hopper or from the grain inlet to the hopper is moved to a separator where dust, chaff and the like is separated from the grain and discharged to any desired point, preferably outside of the elevator.

Grain as it is delivered to the boot hopper of an elevator leg not infrequently clogs the boot, and even where the boot is not clogged it is desirable at intervals to clean out the boot, also in a small country elevator there is ordinarily no means for providing for cleaning of the grain as it goes into the elevator bins with extraneous matter in it.

I have discovered a simple but effective method, which, by the use of a single air moving and separating device will act both to clean out the grain from the boot hopper and to remove dust, chaff and the like from the grain as it goes up the elevator leg to be distributed to the storage bins. This arrangement consists primarily of blower mechanism for creating a strong current of air sufficient to move grain, and in connecting said blower mechanism at one side to a standard cyclone separator and at the other side either to the bottom of the boot through openings unclosed by damper slide mechanism or for connecting with the conduits conveying the grain to the boot.

In either case the blower moves grain, dust-laden air and the like into the separator which discharges the air and any dust carried by it out of doors while the grain will be taken from the separator and discharged either into the receiving bin or into the leg itself.

It is a principal object of my invention, therefore, to provide means for creating a strong current of air together with means for opening the bottom of an elevating leg boot and means for conducting the current of air from within

2

the leg through the opening in the boot to a separator from which the air, and the dust carried thereby, goes out doors and the grain may be delivered to the storage bin or to the elevator leg itself as desired.

It is a further object of my invention to cause the strong current of air to be drawn through grain within the elevator leg casing at or near the point at which it is being loaded, said air to be discharged, with dust and other extraneous matter taken from the grain and with some particles of the grain, into a separator, from which the air, dust and other extraneous material is discharged and the grain is carried and conveyed to the grain bin or directly within the elevator leg casing.

It is a further object of my invention to provide separating means of the cyclone type so that any dust taken up with the grain will be discharged with the air from the system and the grain particles will be recovered and discharged into the receiving bin or the elevator leg casing.

It is a further object of my invention to provide air control means connected with an opening or openings in the bottom of the boot hopper comprising a valve slide which may be suitably adjusted to regulate the volume of air drawn through to produce efficient withdrawal and cleaning of the boot hopper and relief from plugging and to clean out the boot hopper.

It is a further object of my invention to provide, in connection with the vacuum producing means, a pickup member for gathering grain from the floor adjacent the boot hopper and carrying it through the dust separator apparatus to return it to the grain holding bin from which it is fed to the boot hopper, freed from dust which may have been picked up with the grain.

The full objects and advantages of my invention will more fully appear in connection with the detailed description thereof given in the appended specification, and the novel and important advantageous features of my invention will be particularly pointed out in the claims.

In the drawings illustrating the application of my invention in one of its forms:

Fig. 1 is a somewhat compressed elevation view of my invention showing the parts in relation to an elevator leg.

Fig. 2 is a somewhat enlarged sectional plan view taken on line 2—2 of Fig. 1 viewed in the direction of the arrows.

Fig. 3 is an enlarged sectional plan view taken on line 3—3 of Fig. 2.

Fig. 4 is a schematic end elevation view on a reduced scale showing the invention applied to a plurality of elevator legs.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 3.

Fig. 6 is a sectional view taken on lines 6—6 of Fig. 1.

As illustrated, a casing 10 encloses an endless chain 11 moving a series of buckets 12 up the elevating side of an elevator leg indicated generally at 13 in Fig. 1. The casing 14 contains the descending run 15 of the belt 11 on its return trip with the buckets inverted.

The belt 11 goes over a bottom pulley 16 within loading chamber 17 in the boot hopper 18. The belt 11 carrying the buckets 12 goes over a top pulley indicated in dotted lines at 19, Fig. 1, which pulley is driven by a motor 20 through well known head drive means 21. As the belt 11 is driven the buckets 12 move from their inverted position through the lower part of chamber 10 to their upper or lifting position as shown at the right of Fig. 3.

Grain is fed from a bin 22 down a sloping chute 23, the feed being controlled by a gate 24 through the side wall 25 of the bin 22. The grain enters the boot chamber 17 through an opening 26 as indicated in Fig. 3.

A considerable part of the grain so introduced into the chamber 17 is loaded on the buckets 12 and is carried up to be discharged from the leg through the discharge chute 27, Fig. 1. Some of the grain, however, falls to the bottom of the chamber 17 where there are sloping guide walls 28, 29, 30, and 31 directed into downwardly opening ducts 32 and 33, see particularly Fig. 5.

These ducts are adapted to be opened or closed by a slide damper 34, which is provided with a somewhat narrow opening 35 and a second opening 36 double the width of the opening 35, with an intervening imperforate portion.

The damper 34 is operated to slide back and forth by means of cords 37 and 38 running respectively over sets of pulleys 39, 40, 41, 42, 43, and 44, suitably mounted and supported. The cords 37 and 38 are provided with handles 45 and 46 by means of which they are operated. These cords are connected at 47 with the slide 34. As shown, Fig. 5, the cords 37 and 38 are connected at 47 to extend in opposite directions therefrom.

It follows that by pulling on either one or the other of the handles 45 and 46 the slide may be moved along its guide from the position of Fig. 5, in which both bottom ports or openings 32 and 33 are fully open, to successive positions in which port 32 is closed more or less but port 33 remains fully open, or in which port 32 is also closed more or less until both ports 32 and 33 are fully closed.

The ports 32 and 33 open into a chamber 48 which extends into a passageway 49 having connected therewith a curved passageway 50. The latter has a discharge extension 51 which opens into the center of a blower casing 52. In the casing 52 is a blower fan 53 operated by a motor 54.

A damper 55 controlled by an arm 56 on the damper shaft and shown in dotted lines in Fig. 2 may regulate the volume of air drawn from the blower casing. The blower discharges into a vertical casing 57, Figs. 1, 2, and 4. The casing encloses a duct which is extended at right angles to a horizontal casing 58 and discharges tangentially into the upper drum 59 of a cyclone separator 60.

The separator 60 is of standard construction and comprises a cone which has its sloping walls extended downwardly to enter a cylindrical member 61 toward the bottom of the cone as clearly shown in Fig. 1. From the member 61 extends a cylindrical passageway which opens into a V-member 62 from which extends two tubes 63 and 64 respectively.

The conduit 63 goes through an opening 65 in the side of the upward moving elevator leg casing 10, see Fig. 3. The tube 64 discharges through an opening 66 to the interior of bin 22. A valve plate shown in dotted lines at 67 can be swung into either of two positions by means of finger pieces.

In one position, as shown in Fig. 1, this directs the discharge from the passageway through member 61 into the bin 22, from which the grain is joined with other grain in bin 22 and returns to the elevating leg chamber 17 as shown in Fig. 3.

In the other position of valve 67, the grain is caused to move through the conduit 63 to deliver directly to the elevating leg 10, where most of the return will be gathered up by the ascending cups 12.

From the cyclone separator 59—60 at the upper center thereof, a pipe 69 conveys the air from pipe 58 to a point of discharge which normally would be outside of the building where the apparatus is housed. This discharged air will carry with it dust, chaff, fine particles of various sorts which it is desirable to have cleaned from the grain before it is elevated by the elevator leg to be delivered to the storage bins.

In operating the elevator leg in delivering grain to the bin 22 and in connection with the handling of the grain generally, there is usually some spillage of grain on the floor indicated generally at 70 in Fig. 1. Heretofore it has been found difficult to recover this spilled grain for two reasons; first, it is hard to pick up with a shovel and the like and usually in doing that dust and dirt is ordinarily taken with it.

To obviate this difficulty I provide a nipple 71 extending outwardly from a conduit casing extending upwardly from casing 51. To this nipple is suitably attached an extension tube 72. At the other end of tube 72 is a rigid handle tube 73 to which is attached a broad suction head 74. The suction head 74 is adapted to be pushed over the floor 70, and spilled grain on the floor will be picked up, passed through the passageway 50 and blower casing 52, from which it is projected through the pipe 57 to the separator 59, 60.

The above described means is operative to remove grain from the boot hopper and thoroughly clean out the boot hopper and also pick up any grain which may be scattered over the floor about the boot hopper. This is a highly valuable function, since the boot hopper sometimes becomes completely clogged and always accumulates more or less dust and dirt, which heretofore could only be removed by time-consuming and expensive opening up of the hopper itself. Furthermore the grain which is taken from the boot hopper or picked up from the floor is thoroughly cleaned before it goes back either to the receiving bin or into the elevating leg itself.

My invention goes further, however, in that it is well adapted to clean the grain itself as it is fed to and is being agitated by the loading in the ascending buckets of the elevating leg. To effect this a vertical conduit 75 opens directly into the chamber of casing 51. The conduit 75

connects with a horizontal conduit 76, which in turn is extended in a conduit 77. The conduit 77 extends horizontally at right angles to conduit 76 to a point in the vertical planes of the feed chute 23. A conduit 79 extends from the end of conduit 77 vertically downward and enters an opening into the top of feed chute 23 at 80, Figs. 1 and 3.

By this means when the damper slide 34 is positioned to close both of the openings 35 and 36 from the bottom of the boot hopper, the air moved by the blower 53 is drawn through opening 26 from the interior of elevator boot chamber 17 over and across the stream of grain moving from conveyor 23 into the loading boot chamber 17 and agitated by the loading action.

This gives two important results, first it relieves the back pressure within the elevator casing caused by the incoming grain filling the successively rising buckets, and second it takes from the grain dust, chaff and other extraneous matter, which gives a superior grain product going to the storage bins.

In both operations, that is where the air stream is used to clean the grain and other matter from the boot hopper and where it operates to clean the grain as it is fed to the boot hopper, the grain is moved into the separator 60 and from there follows the course selected by damper 68 either to go back to the receiving bin 22 or into the direct elevating casing 10 of the elevator leg. Any dust which is picked up along with the grain will, of course, be driven with the grain to the separator 59, 60 where the dust will be removed and be discharged through the discharge pipe 69.

The advantages of my invention will appear from the foregoing detailed description thereof, the obvious and very important advantage is that, whenever the boot hopper either becomes clogged with grain and for other reasons needs to be cleaned, it can be done in a very short time merely by shifting the slide damper 34 to unclose the openings 35 and 36 more or less, to the extent desired, and that with the grain being drawn out of the boot hopper will go any accumulation of dust, chaff and other undesirable material, which is effectively removed from the grain with very little added expense for power, handling and the like.

A further advantage of my invention arises out of the adaptation of the strong air current provided for cleaning the boot hopper to a circulation of said air current through the boot hopper and over the incoming grain, both to relieve back pressure in the elevator leg and to clean the grain from dust, chaff and other extraneous material.

A further advantage of my invention comes from the fact that wastage of grain is quite effectively prevented by using the same air current which cleans the boot hopper or cleans the grain as it is moved from the receiving bin to the elevator leg. The pick-up means provided gathers scattered grain on the floor of the elevator and the separator removes from it the dust and other extraneous matter which may be picked up with the grain before the grain is returned to the receiving bin or the elevator leg.

I claim:

1. In combination with a grain elevating leg, a loading boot having a bottom wall associated therewith, means forming an opening through said bottom wall from the boot, means forming

a chamber below the opening and the bottom wall, a separator, a conduit leading from said chamber to the separator, and air moving means in said conduit for drawing air through the boot and air and grain from the chamber to convey the grain to the separator and there to cause removal of dust therefrom.

2. In combination with a grain elevating leg, a loading boot having a bottom wall associated therewith, means forming an opening through said bottom wall from the boot, means forming a chamber below the opening and the bottom wall, a separator, a conduit leading from said chamber to the separator, and air moving means in said conduit for drawing air through the boot and air and grain from the chamber to convey the grain to the separator and there to cause removal of dust therefrom, said separator including a duct for conveying the dust to a point of discharge.

3. In combination with a grain elevating leg, a loading boot having a bottom wall associated therewith, means forming an opening through said bottom wall into the boot, means forming a chamber below the opening and the bottom wall, a valve for opening and for closing more or less said opening, a separator, a conduit leading from said chamber to the separator, and air moving means in said conduit for drawing air through the boot and air and grain from the chamber when the valve has been moved to any opening position to convey the grain to the separator and there to cause removal of dust therefrom.

4. In combination with a grain elevating leg, a loading boot having a bottom wall associated therewith, means forming an opening through said bottom wall from the boot, means forming a chamber below the opening and the bottom wall, a separator, a conduit leading from said chamber to the separator, air moving means in said conduit for drawing air through the boot and air and grain from the chamber to convey the grain to the separator and there to cause removal of dust therefrom, a storage bin, separate chutes extending from the bottom of the separator to the storage bin and to the elevator leg respectively, and a damper selectively causing the grain to move through one or the other of said chutes.

ROY I. PATTERSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
261,630	Roberts et al.	July 25, 1882
844,033	Munn	Feb. 12, 1907
1,630,780	Budd et al.	May 31, 1927
1,659,088	Dowall et al.	Feb. 14, 1928
1,766,941	Prouty	June 24, 1930
1,827,326	Moore	Oct. 13, 1931
1,963,375	Osgood	June 19, 1934
2,217,538	Carson	Oct. 8, 1940
2,299,623	Harper	Oct. 20, 1942
2,415,503	Lorenzen	Feb. 11, 1947

FOREIGN PATENTS

Number	Country	Date
564,839	Germany	Nov. 23, 1932
55,402	Sweden	Oct. 23, 1923