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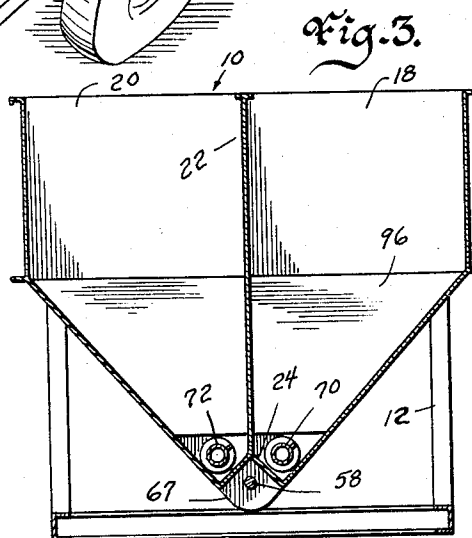
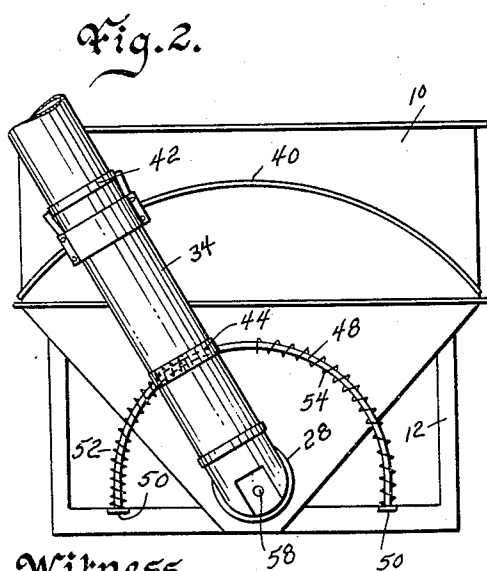
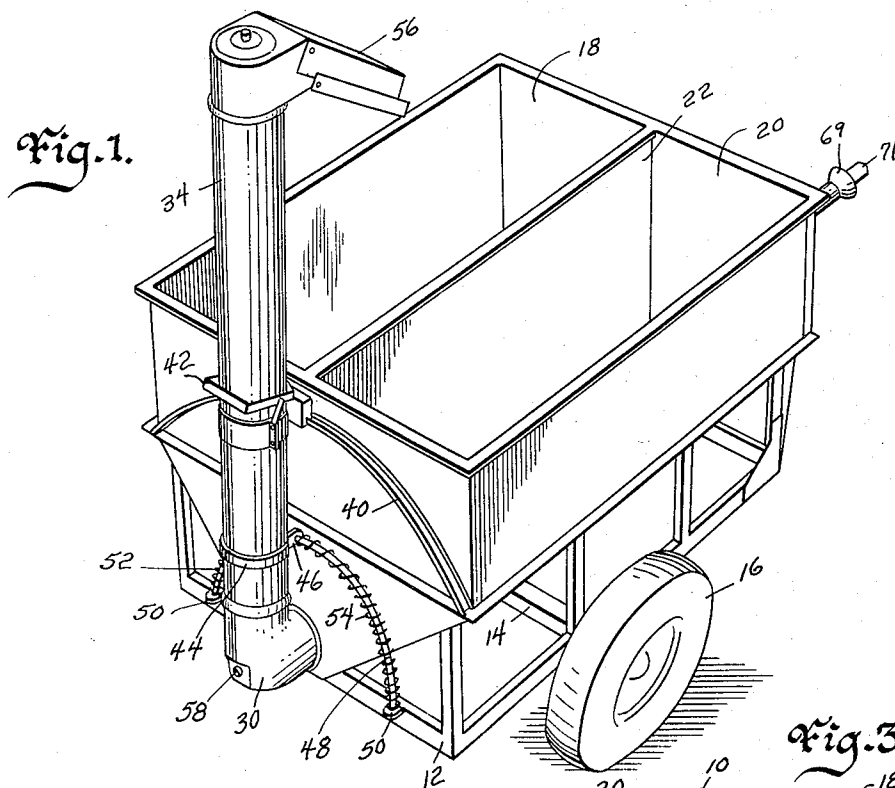
P. E. HEIDER

2,960,320

MIXING DEVICE

Filed June 9, 1958

2 Sheets-Sheet 1



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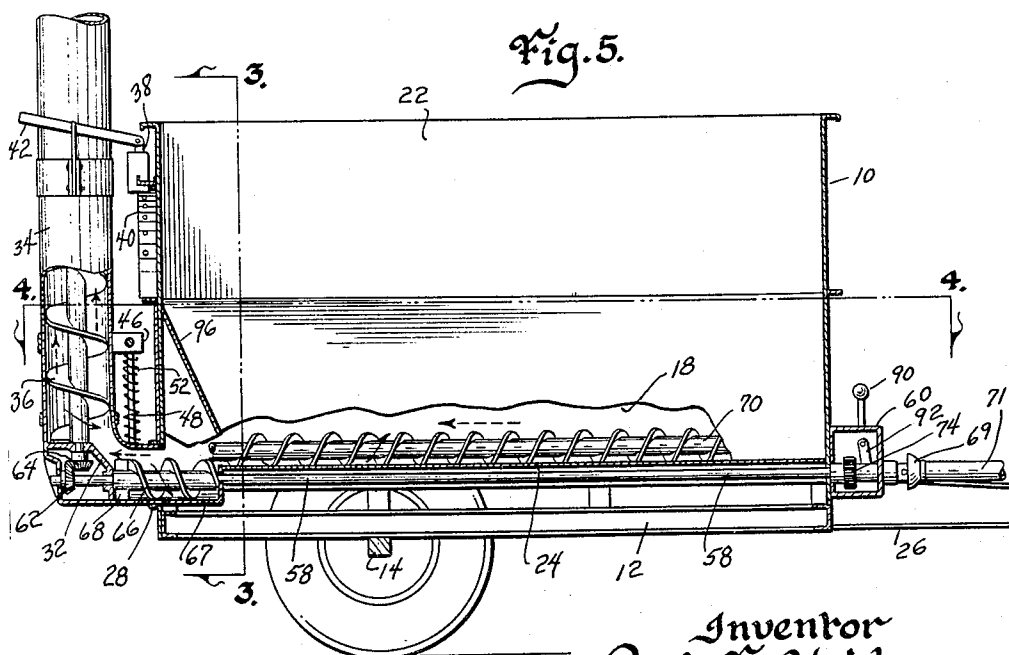
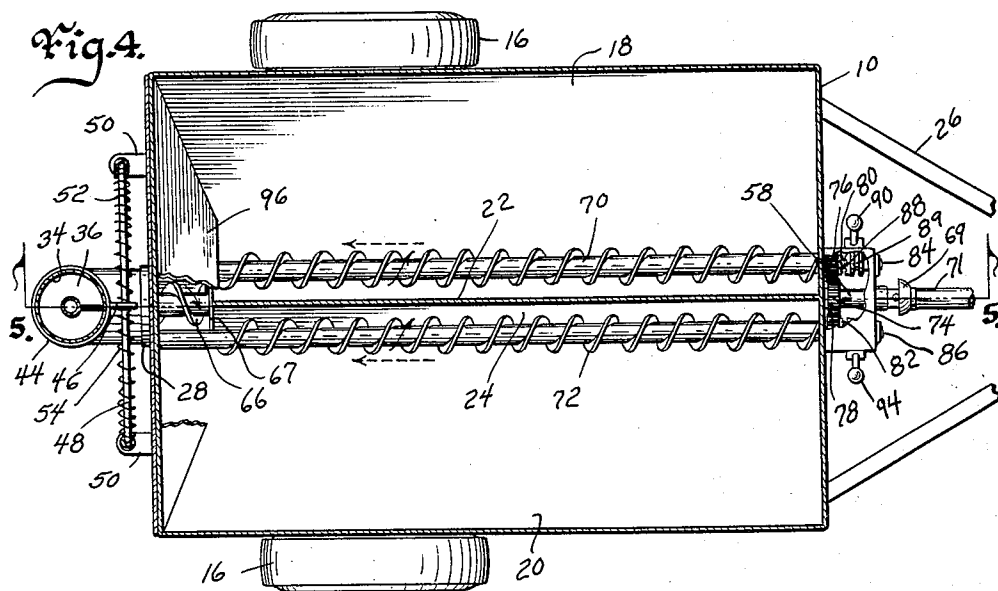
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MIXING DEVICE

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6 Claims. (Cl. 259-97)

This invention is a novel mixing device featuring two compartments each of which incorporates material advancing means that move materials within the compartments to a common elevating means at a point where the two compartments are adjacent to each other. The common elevating means can discharge material into either of the two compartments. Means for directing the flow from the common elevating structure into either of the compartments includes pivoting the elevating means so as to discharge the flow from the elevating means into either of the two compartments. This pivoting elevating means has novel counterbalancing structure that eliminates nearly all of the physical effort that would otherwise be necessary in controlling the angle of the elevating means when it is any position other than vertical. Also featured in this invention is a compartment shape and positioning in relation thereto of the material advancing means that places a vertical or nearly vertical wall adjacent to the material advancing structure which is of the end feeding type. That is to say the material advancing structure advances material only from the point farthest from its delivery end that materials are presented to it. The vertical wall adjacent the material advancing means prevents what is known in the materials handling field as bridging. If bridging occurs, the materials feed only irregularly or perhaps not at all. Further featured structure is the completely independent operation of the two material advancing means in the two compartments in relation to the elevating means and in relation to each other. While the structure that makes this independence possible is not particularly novel in themselves, their combination with the other elements of this mixing device provides a flexibility of operation that is new.

Accordingly it is the principal object of this invention to provide a novel mixing device; one that:

- (1) Is highly efficient and adapted to being portable.
- (2) Will feed evenly at all times and in each phase of its operation.
- (3) Is very flexible in use and does not require a particular sequence in filling and commencing of operations.
- (4) Does not require great physical strength or dexterity from its user.

The foregoing specifically stated objects are the main ones of this invention, as I see it. It is my intention to include as objects hereof any such as may be apparent to one who is skilled in the materials handling art after he has read this specification and examined the drawings herewith illustrating the best practical embodiment of the device known to me.

The accompanying drawings are briefly described as follows:

Fig. 1 is a perspective view of the device shown incorporated into a farm wagon or trailer.

Fig. 2 is a fragmentary rear end elevation of the device with broken lines showing hidden parts.

Fig. 3 is a sectional view of the device in fragment and taken on the line 3-3 of Fig. 5.

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Fig. 4 is a longitudinal section of the device taken on the line 4-4 of Fig. 5 and with portions of the device broken away to show internal parts.

Fig. 5 is a longitudinal section of the device taken on the line 5-5 of Fig. 4 and with portions of the device broken away to illustrate more fully the construction of it.

In the drawings where any one numeral is used to designate only one part or parts that are identical, the device is shown illustratively in the form of a farm wagon. A hopper 10 which is conveniently made in a rectangular shape for this purpose is supported on a frame 12 to which an axle 14 is secured to carry the wheels 16. The box is divided longitudinally into two compartments 18 and 20 by a central partition 22. This partition 22 is supported by the V-bottom 24 of the main portion of the hopper 10. This is clearly shown in the sectional view Fig. 3. It is also secured to the ends of the hopper 10. At the forward end of the wagon, the frame 12 extends forward to form a towing tongue 26 that is conventional and therefore shown only in part. At the rear end of the hopper 10 is an opening at its central bottom and surrounded by the collar 28. To this collar is pivotally secured the boot 30 that contains the gear box 32 and supports the elevating mechanism comprising the housing tube 34 and the auger of conventional construction 36. Since the boot is pivotally mounted to the collar 28, the elevating mechanism may be pivoted by releasing the lock 38 from the track 40 that results when the handle 42 is pulled down. As this elevating mechanism is rather heavy, it is very useful to provide means for aiding the operator to control the extent to which it is pivoted when the lock is released. This aid to the operator is provided by the counterbalancing structure now to be described.

The elevator counterbalancing structure is most clearly seen in Figures 1, 2 and 4 and comprises the band 44 clamped about the housing 34 to which is secured rigidly the lug 46. Lug 46 is pierced, and curved element 48 passes through it. Element 48 is rigidly secured to the frame 12 of the wagon by the brackets 50. A pair of coil springs 52 and 54 embrace the curved element 48 and engage the lug which cannot slide along the curved element without compressing the spring on the side to which the elevating structure is being swung. The springs thus counterbalance a large percentage of the weight of the elevating mechanism when it is in any position other than vertical with the lock released. Of course, as soon as lock 38 is reinserted in one of the holes of track 40, the weight of the elevating mechanism is taken by the lock. At the risk of being obvious, I point out that the curved element is a portion of a circle with its center the center of the pivot for the elevating mechanism. The elevating mechanism has an additional discharge direction controlling means in the swinging spout 56 that can be directed into either compartment when the elevating mechanism is in a vertical position. In some cases, however, where the elevating mechanism is very tall, it is more convenient to pivot the elevating means than it is to swing the spout. This is particularly true if the operator has no tool at hand long enough to reach the spout and the operator is not physically tall enough to reach the spout directly. Hence, the swinging of the spout is considered a secondary and the pivoting of the elevating means is the primary means for directing materials flowing from the elevating means into the desired one of the compartments of the hopper 10.

Extending under the V-bottom 24 of the hopper 10 is the drive shaft 58 that is appropriately mounted rotatably in the gear box 32 at one end and the clutch box 60 at the other. Within the gear box 32 are the beveled gears 62 and 64 that serve to connect the drive shaft 58

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to the elevating auger 36. At the rear end of the hopper 10 and extending through the collar 28 is the short materials advancing means 66 that is secured to the drive shaft 58 and rotates with it, therefore, and the main elevating auger. Element 67 closes the end of the V-bottom 24 of the hopper 10 at the front of auger 66 and provides a channel for the short auger 66 to operate and carry materials in. A kicker element 68 is also secured to the drive shaft 58 and also rotates with it. This short section of flighting, as augers are sometimes called, and the kicker may be thought of as being a portion of the elevating mechanism to which it is most closely related. Whenever the drive shaft 58 is rotated, it actuates all of these parts just described. At the front of the clutch box 60, drive shaft 58 is secured by means of a conventional universal joint 69 to an element 71 that makes it convenient to connect the drive shaft to a suitable source of power (not shown) such as the power take off of a tractor that would also be used to tow the wagon.

In the bottom of each of the compartments 18 and 20 are the suitable, end feeding, materials advancing means such as augers 70 and 72 respectively. These augers are of the same diameter throughout their respective lengths which gives them the characteristic of feeding from the point on their length that is farthest from their delivery end at which any materials are presented for advancing. This is a characteristic of straight (as distinguished from tapered) augers and is important to a good mixing apparatus. Others may know of different forms of material advancing means that have this characteristic, and any material advancing means that will end feed may be used in the compartments. Since the augers feed from their remote ends in reference to their point of delivery, and as the compartments empty always move the most remote material to auger 66 first, the hopper is emptied in what might be described as a vertical sweep across or down the length of the hopper compartment. For this reason, materials to be mixed that are placed in the compartment in layers are drawn off in a mixed condition. Thus the various layers are mixed together by the very fact that they are advanced by the augers 70 and 72 to the short auger 66. Rotation of the compartment augers 70 and 72 is achieved by a gear 74 that is secured to the drive shaft 58 in clutch box 60 meshing with the gears 76 and 78 that are fixed to the clutch members 80 and 82 and rotatably mounted on the shafts 84 and 86 of the augers 70 and 72 respectively. Each of the compartment augers 70 and 72 is provided with a clutch element that is splined to the countershaft for that auger and positioned as shown at 88 in Fig. 4 on the shaft 84. It, the splined clutch element in each case, has secured to it a collar 89 for receiving the usual clutch yoke. This clutch element may be slid on shaft 84 by any suitable structure such as the lever 90 (Figures 4 and 5) and the yoke 92 (Fig. 5) to cause the clutch element 88 to mesh with the one that is rigidly secured to the gear 76 so that the auger 70 will be connected to the drive shaft for rotation with it. Clutch lever 94 controls identical mechanism for the auger 72. Thus either, neither and both of the augers 70 and 72 may be connected to be rotated by the drive shaft 58. The gearing is such that the three augers turn as shown by the solid line arrows in several of the figures and materials are advanced or elevated as shown by the broken line arrows.

The augers 70 and 72 are of such dimensions that their combined materials moving ability equals that of the short auger 66 which in turn has a capacity that is equal to that of the elevating auger 36. This equalization of materials advancing ability or capacity as between the two compartment augers and the elevating system provides a measure of flexibility to the structure that would not otherwise be possible as will be explained under operation. Since the short auger 66 also has the characteristic of the end feed, it is necessary to prevent vertical gravity feed of the short auger at the rear of the hopper compartments.

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This objective is achieved by the shield 96 that prevents any materials except those fed by the two compartment augers from reaching the short auger 66. The shield extends out far enough that materials falling vertically off the end of the shield will not reach the short auger, as can be seen plainly in the Figures 4 and 5.

Operation

There are several different ways in which the device may be used to mix materials such as agricultural products. Perhaps the most obvious of these methods is to place several different materials that are to be used in a composite feed, for example, into compartment 20 in layers simply piling one in on top of another and spreading them into more or less even layers. Then the drive shaft 58 is energized and the short auger and the rest of the elevating system are rotated. As soon as these elevating and immediate elevator feeding units are cleared of any materials that may have found their way into that area during the filling period, and the inertia of the elevating system has been overcome, the auger 72 may be started by moving the clutch lever 94 so as to engage the two portions of the clutch it controls into operational engagement. As the auger rotates in compartment 20, it carries material from the front end of the compartment along the auger under the materials in compartment 20 nearer to auger 66 and presents this material from the front of the compartment to auger 66. This auger advances the material into the boot where kicker 68 through centrifugal action throws the material up into the elevating auger 36. Prior to starting the elevating, the elevating housing 34 is adjusted to direct the flow from the elevator into the compartment 18. Spout 56 may be swung to do this same thing if it proves more desirable. As the materials from the compartment 20 are directed into compartment 18, they are mixed by reason of the fact that the auger 72 end feeds as pointed out herebefore. As the structure depends on gravity to keep materials falling down onto the augers in the compartments, it is important that the augers 70 and 72 are located adjacent to the partition 22. Many grains will do what is known as bridging or forming an arch across a considerable space when the angle of the compartment in which they are confined deviates from the vertical toward the horizontal sufficiently. For example, the angle formed between the two outside walls of the hopper 10 could be bridged by many materials if they were confined in the hopper without the partition. It is very useful to the free flowing of materials to the augers 70 and 72, therefore, that each is bordered on one side by the vertical center partition 22. A vertical wall simply does not offer enough friction to the materials to cling to it to permit bridging to take place. The vertical wall removes one support from the bridging area and assures freely feeding action. If the materials are to be mixed more thoroughly than a single transfer from one compartment to another is likely to have done, the spout 56 may be swung over to compartment 20 or the elevator pivoted that way, auger 70 started and the material retransferred into compartment 20 this time. When the material in the hopper has been mixed as much as seems appropriate for the particular end result desired, the material may be discharged as desired.

As it makes no difference into which compartment the materials to be mixed are placed in the first instance, once a batch of material has been mixed, the empty compartment may be filled with an unmixed batch and a full wagon may then be taken to some remote point of use such as feed lot or the like. After the mixed lot is discharged, the unmixed batch may then be mixed in turn and discharged without the need to return to a place where the feed materials are stored to refill.

Another general class of mixing that can be done with this structure is encountered when both the hopper compartments are emptied into the elevating mechanism to-

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gether. This would produce an even mix of fifty percent each of the two materials in the two compartments. As every movement of layered materials in a single hopper produces some mixing, it may be possible in some cases to achieve adequate mixing by simply discharging the material from the hopper into some place of use.

I have disclosed my invention as being one that will accomplish at least the main objectives of my invention as set out above by describing and illustrating the best practical embodiment of my invention known to me. I believe it is clear from the foregoing description how the invention will accomplish the objects thereof. In the claims that follow, I set out with the particularity required by statute those structures and sub-combinations of structures that I believe define my invention.

I claim:

1. In a mixing device; a hopper having an opening at one end; a boot pivoted about the opening of said hopper; a clutch box secured to the end of said hopper opposite to that having the opening; a drive shaft rotatably supported by said boot and said clutch box near the bottom of said hopper; a short auger secured to said drive shaft and extending from said boot into said hopper through the opening therein only a few inches; a V-bottom covering said drive shaft from said clutch box to said short auger; a partition secured to and extending the length of said hopper along said V-bottom to which it is also secured; a shield secured to said hopper and said partition and extending into said hopper beyond the end of said short auger; a pair of augers rotatably supported by said clutch box and the end of said hopper having said opening approximately parallel to and on opposite sides of said partition; a gear secured to said drive shaft; gears rotatable on said pair of augers in said clutch box and meshing with said gear secured to said drive shaft; a clutch for each of said pair of auger gears permitting independent engagement of each auger with the gear rotatably mounted on it; an elevating means secured to said boot and geared to said drive shaft; means for pivoting said elevating means for directing flow of materials therefrom into said hopper on either side of said partition, a counterbalance means for supporting a majority of the weight of said elevating means when it is in a position other than vertical comprising; a curved element that is rigidly secured to said hopper adjacent said elevating means; said curved element comprising a portion of a circle with its center at the center of the pivoting of said boot and elevating means; a pierced lug secured to said elevating means and embracing said curved element; and a pair of compression springs on said curved element between the ends thereof and said pierced lug.

2. In a mixing device; a hopper; a vertical partition dividing said hopper into two compartments; end feeding material advancing means in each of the compartments of said hopper adjacent and approximately parallel to said partition; said end feeding material advancing means advancing materials to points in the compartments of said hopper that are adjacent to each other; a material elevating means secured to and communicating with said hopper at the point to which said material advancing means advance materials; said material advancing means being the sole source of materials to said elevating means; means for connecting said elevating means to a source of power; means secured to said material advancing means for operating either, neither and both of them selectively and simultaneously with said elevating means; means secured to said elevating means to permit at least pivoting it in relation to said hopper for directing the discharge therefrom into either of the compartments of said hopper, a curved element secured to said hopper adjacent to said elevating means; said curved element comprising a portion of a circle with its center at the center of the pivoting of said elevating means; a pierced lug secured to said elevating means and embracing said curved element; and a pair of compression springs on

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said curved element between the ends thereof and said pierced lug.

3. In a mixing device; a hopper; a partition dividing said hopper into two compartments; end feeding material advancing means in each of the compartments of said hopper; said end feeding material advancing means advancing materials to points in the compartments of said hopper that are adjacent to each other; a material elevating means secured to and communicating with said hopper at the point to which said material advancing means advance materials; said material advancing means being the sole source of materials to said elevating means; means for connecting said elevating means to a source of power; means secured to said material advancing means for operating either, neither and both of them selectively and simultaneously with said elevating means; means secured to said elevating means to permit at least pivoting it in relation to said hopper for directing the discharge therefrom into either of the compartments of said hopper, a curved element secured to said hopper adjacent to said elevating means; said curved element comprising a portion of a circle with its center at the center of the pivoting of said elevating means; a pierced lug secured to said elevating means and embracing said curved element; and a pair of compression springs on said curved element between the ends thereof and said pierced lug.

4. An elevating wagon box structure comprising; a hopper having an opening in one end thereof, an elevating means pivoted around the opening of said hopper whereby materials discharged from said elevating means may be directed as desired, material advancing means in the bottom of said hopper for advancing materials through said opening and to said elevating means, a curved element rigidly secured to said hopper adjacent said elevating means, said curved element comprising a portion of a circle with its center at the center of pivoting of said elevating means, a pierced lug secured to said elevating means and embracing said curved element, and a pair of compression springs on said curved element between the ends thereof and said pierced lug.

5. An elevating wagon box structure comprising; a hopper having an opening in one end thereof, a partition extending longitudinally through said hopper, an elevating means pivoted around the opening of said hopper whereby materials can be discharged from said elevating means on either side of said partition, material advancing means in the bottom of said hopper for advancing materials through said opening and to said elevating means, means for selecting from which side of said partition materials will be advanced by said material advancing means, a curved element rigidly secured to said hopper adjacent said elevating means, said curved element comprising a portion of a circle with its center at the center of pivoting of said elevating means, a pierced lug secured to said elevating means and embracing said curved element, and a pair of compression springs on said curved element between the ends thereof and said pierced lug.

6. In a mixing device; a hopper; elevating means secured to and communicating with said hopper; a short material advancing means operably mounted in said hopper near and feeding said elevating means; a longitudinal partition secured in said hopper and dividing it into two compartments; an end feeding material advancing means operably secured to said hopper near the bottom of each of the compartments of said hopper and extending to said short material advancing means; a shield extending from the end of said hopper adjacent said elevating means beyond the end of said short material advancing means; a drive shaft secured to said short material advancing means and said elevating means for connecting them to a source of power; means for connecting said material advancing means in the compartments of said hopper selectively to said drive shaft; and means secured

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to said elevating means for directing the discharge therefrom into either of the compartments of said hopper selectively, said elevating means being pivoted to said hopper; a counterbalance means for supporting a majority of the weight of said elevating means when it is in a position other than vertical comprising; a curved element rigidly secured to said hopper adjacent said elevating means; said curved element comprising a portion of a circle with its center at the center of the pivoting of said elevating means; a pierced lug secured to said elevating means and embracing said curved element; and a pair of compression springs on said curved element between the ends thereof and said pierced lug.

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