Sept. 1, 1925. 1,551,623

A. J. SACKETT

FERTILIZER BATCHER

Filed May 19, 1925 2 Sheets-Sheet 1

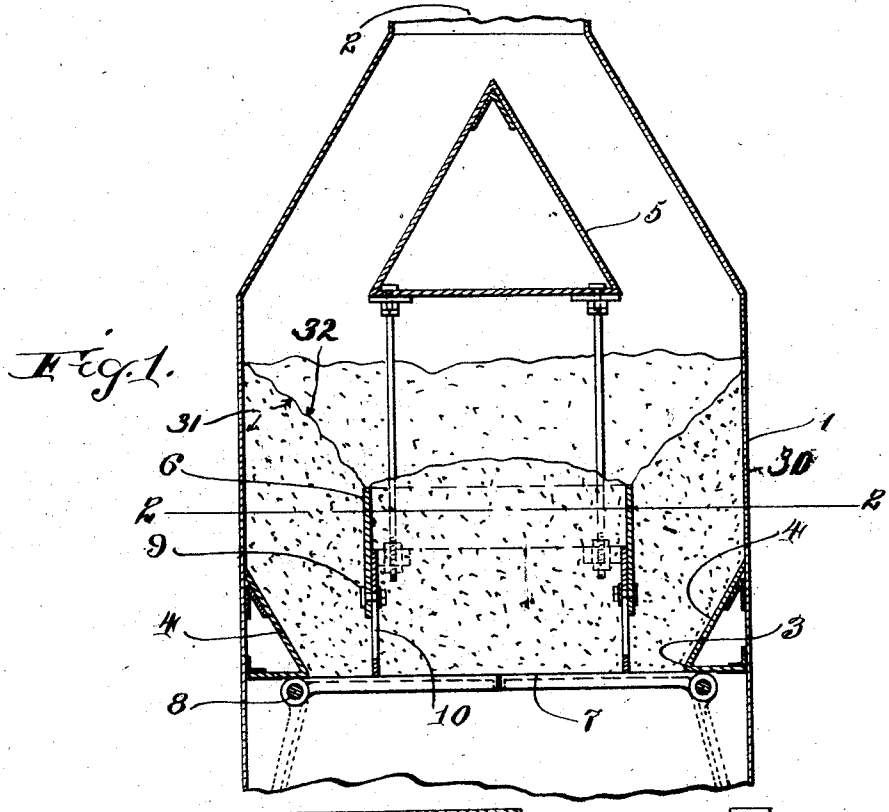


Fig. 1.

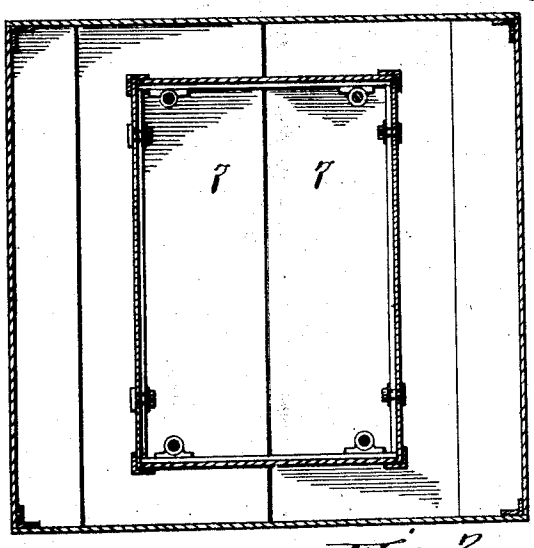


Fig. 2.

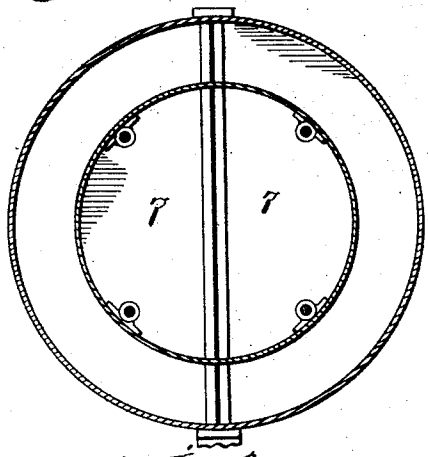


Fig. 3.

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FERTILIZER BATCHER

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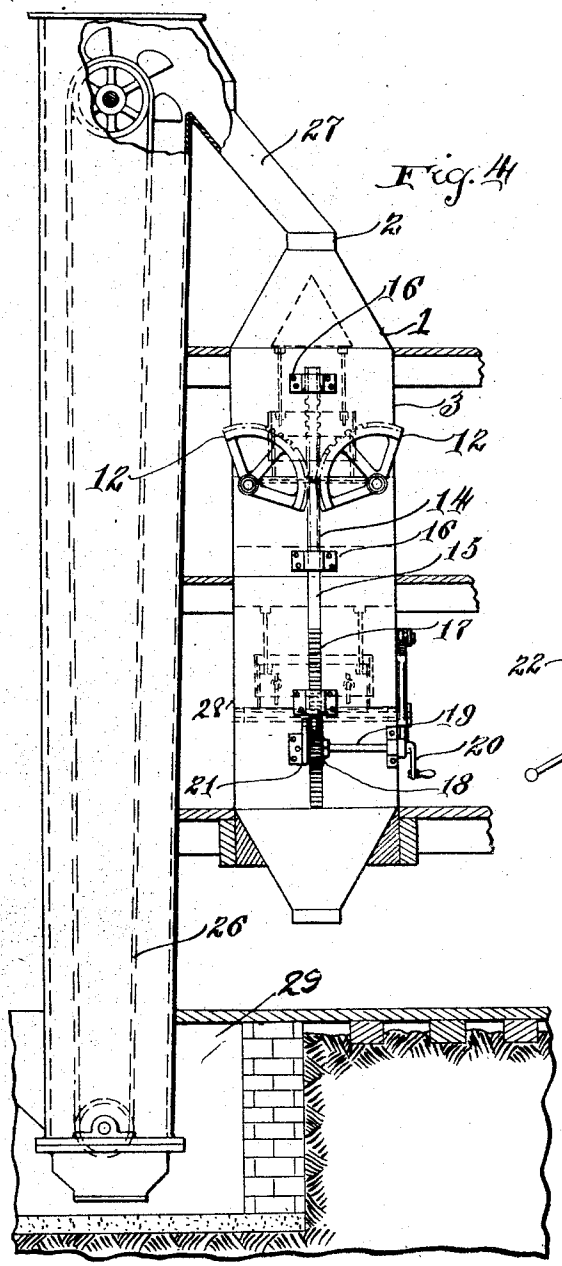


Fig. 4

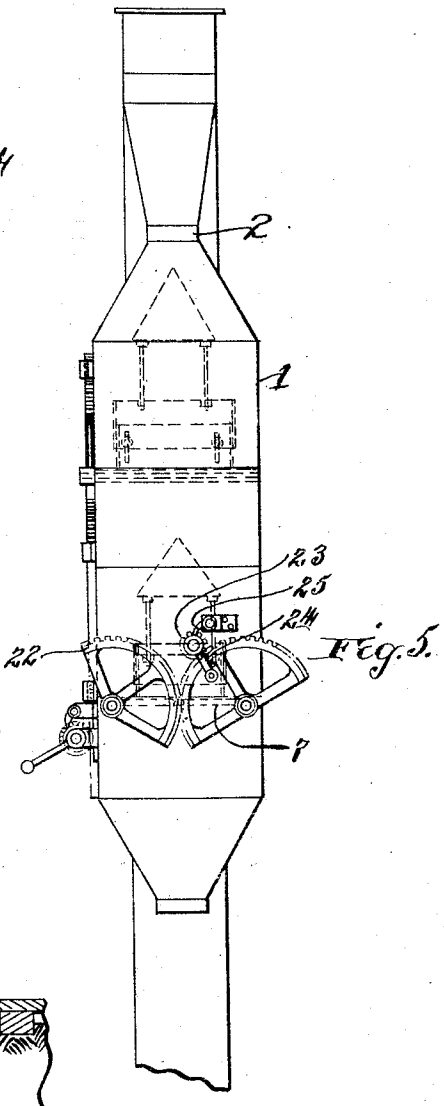


Fig. 5.

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UNITED STATES PATENT OFFICE.

AUGUSTUS J. SACKETT, OF BALTIMORE, MARYLAND.

FERTILIZER BATCHER.

Application filed May 19, 1925. Serial No. 31,352.

To all whom it may concern:

Be it known that I, AUGUSTUS J. SACKETT, a citizen of the United States of America, residing in the city of Baltimore, State of Maryland, have invented certain new and useful Improvements in Fertilizer Batchers, of which the following is a specification.

In the manufacture of commercial fertilizers, various comminuted solid materials of different specific gravities are mixed mechanically either before or after the final grinding. At present, owing to the difficulty incident to producing a product containing the various ingredients uniformly distributed by any other means, this mixing operation is performed by hand usually by a number of men with shovels in a pit from which the finished product is carried by an elevator to a grinder where the final grinding operation is performed.

Under present conditions any operation requiring hand labor is expensive. Further, the maintenance of such a mixing pit in the average fertilizer factory, which is generally on the waterfront, is an important item on account of the difficulty incident to excluding water from the pit.

The mixing operation referred to is ordinarily termed "batching," as the ingredients necessary to a batch of fertilizer of predetermined quantity and proportions, are ordinarily measured out, mixed in the pit and fed to the grinder. Therefore, the present apparatus which receives the constituents of the batch measured out in accordance with the previous practice, either before or after grinding, and mixes them, is termed a batcher or mixer, and while it has been designed for the purpose of mixing fertilizer ingredients, it is capable of use in any capacity where dry, comminuted materials are mixed under similar circumstances.

The apparatus is further what may be termed a static mixer in that with the exception of such motion as may be found desirable for adjustment of the parts and the opening and closing of the gate or valve which regulates the flow of material therethrough, it has no moving parts, the mixing being performed by a series of vanes, baffles or walls arranged for this purpose in accordance with the invention.

In the performance of the mixing operation, various ingredients in predetermined quantities as stated are poured into the hopper or mixing chamber which has a valve at the bottom, the valve being in accordance with the present preferred operation closed during the introduction of the ingredients and opened to release them when the total charge has been introduced and is ready for grinding or for mixing and delivery, in case the final grinding has been previously performed. Under ordinary circumstances in the absence of the mixing baffles, and with reasonable regard to the difference in weights of the materials, the heaviest material naturally having a tendency to move by gravity a little faster than the lighter materials, the ingredients first introduced would when the material has all been discharged, appear at the bottom centre of the heap if the material be caught as delivered instead of being passed onward to a grinder, but by means of the improved apparatus described herein, the materials introduced are so delivered that the cross-section of the heap or body of material discharged and consequently each transverse cross-section of the stream of material as discharged contains the various ingredients in substantially the proportions in which they were introduced.

The mixer of batcher in the preferred form comprises as aforesaid a hopper or mixing chamber in the bottom of which is a valve or gate, and a plurality of baffles, termed for convenience, a centre baffle, the hopper baffles and the inclined side baffles. The centre baffle is between the feed opening which as shown is at the top, and the valve opening which as shown is at the bottom. This baffle has one or more baffle surfaces, the centre baffle as shown comprising two baffle surfaces converging toward the centre of the feed opening so that the bulk of the material as introduced is diverted from the direct line from the feed opening to the delivery valve or gate. The passage through the valve opening of the material thus diverted is further restricted by baffles which are substantially parallel to the direct line from the feed opening to the valve opening, and which for convenience have been designated the hopper baffles and in its preferred form as shown the batcher or mixing chamber is also provided at the sides near the bottom with walls inclined downwardly toward the valve opening which arrangement tends to give a complete discharge and prevent the holding over of material in the

batcher from one mixing operation to the next. These are referred to herein as side baffles.

The baffles or walls referred to as hopper baffles are spaced downward from the centre baffle, and in the operation of the mixer, it being understood that the valve at the bottom of the chamber is closed during the introduction of the materials, the ingredients first introduced being deflected immediately on entering, accumulate at the side or sides of the chamber until the space between the outside walls and the upright or hopper baffles, begins to overflow these walls, when the space at the centre of the chamber within the hopper baffles gradually fills with material which flows or roils down the surface of the material thus accumulated, forming a fairly uniform mixture of the ingredients later introduced, and when the valves are opened, the materials from the centre and sides being released almost simultaneously, the release of the materials in the side compartments first introduced being preferably slightly restricted to assist in mixing, pass downward together with the result, as shown by experiment, that the various ingredients which may be of different specific gravities introduced successively appear in the heap of material which may be caught under the mixer or passed to the grinder in portions which in any cross-section of the heap or of the stream as discharged correspond almost exactly to the proportions in which these ingredients were introduced.

The mixer is preferably operated by gravity, though the materials may be fed to it in any manner found desirable, and while it operates as a single unit with a fair degree of satisfaction, any desired number of the units may be placed in series, repeating the mixing operation as many times as such repetition is found desirable, the mixing operation being performed in a comparatively small area with the minimum of expense, the mixers or batchers when more than one is used, being placed in a vertical line, i. e., one over the other, the materials being fed thereto by an ordinary power elevator or conveyor, dispensing entirely with hand labor in mixing the materials.

In the accompanying drawings I have illustrated a batcher or mixer embodying the features of my invention in the preferred form, the same being shown in connection with an elevator by which the materials may be fed to advantage.

In the drawings—

Figure 1 is a vertical central section through a single unit of the batcher or mixer.

Figure 2 is a horizontal section on the line 2, 2 of Figure 1, showing the casing, etc., as of rectangular cross-section.

Figure 3 is a similar section which may be considered as taken on the same line, 2, 2, Figure 1 showing the apparatus as circular in cross-section.

Figure 4 is a side elevation of a complete mixer or batcher with an elevator for feeding the same.

Figure 5 is a front view, i. e., an elevation taken from the right in Figure 4.

Referring to the drawings by numerals, each of which is used to indicate the same or similar parts in the different figures, the batcher or mixer as shown comprises a chamber or casing 1 which may be cylindrical or rectangular or otherwise shaped to suit the convenience of the fertilizer manufacturer. This casing or hopper as shown has a feed opening 2 at the top of reduced cross-sectional area as compared to the greatest horizontal cross-sectional area of the casing, and a valve or gate opening 3 at the bottom which is shown as of but slightly less area than the cross-sectional area of the chamber, the area of the valve opening being slightly reduced by downwardly and inwardly inclined walls or baffles 4 at the sides referred to herein as side baffles. The baffle 5 which will be termed the centre baffle is interposed between the feed opening 2 and the valve or gate opening 3, the same being inclined downwardly and outwardly toward the sides 4 and preferably having a plurality of surfaces converging toward the feed opening, and as aforesaid inclined downwardly toward the sides of the chamber or hopper 1, the said baffle being spaced well up away from the valve opening 3 at the bottom of the chamber to provide ample room for the accumulation of the material to be mixed below the baffle and for the passage of the materials betwen the baffle 5 and the hopper baffles 6 which are preferably disposed in the direction of a line from the feed opening to the valve opening. As shown, these hopper baffles or upright walls 6 extend upward from the plane of the valves or gates 7 about halfway to the bottom of the main baffle 5, though the spacing of these baffles 6 both from valves 7 and the main baffle 5 is a matter of design to be determined by the conditions presented, as are likewise the details of form, proportions and arrangement of the entire apparatus. As shown these baffles 6 are made adjustable as to their width or height in the direction of feed, each being in the form of two plates connected by bolts 9 engaging slots 10.

The valves or gates 7 as shown are pivoted at the sides on horizontal pins or shafts 8 to swing downwardly from the centre at which point they meet. As shown these valves 7 extend entirely across the hopper in the direction of the shafts 8, but in the direction at right angles thereto they are spaced inwardly from the line of the ex-

treme outside walls on account of the inclined walls or side baffles 4 at the bases of which the hinge pins 8 are located. While the arrangement of the gates or valves as shown is regarded as effective, they may be widely varied within the scope of the invention, as may other details described herein, and the combinations of details and features.

Referring now to Figures 4 and 5, which show an installation of two batchers in series, one over the other, it will be noted that the valves 7 are actuated by segmental gears 12, one on each shaft or pin 8, which segments in the instance of the upper batcher 13 are engaged by the teeth of an upright rack 14 which is between the segmental gears, having teeth on its opposite surfaces to mesh with the respective segments 12, 12 and this rack is formed on a rod 15 which is shown as sliding vertically in bearings 16 on the casing. The lower portion of the rod 15 is provided with rack teeth 17 engaged by a pinion 18 on a shaft 19 which may be rotated by a hand crank 20 to operate the valve 7 of the upper mixer. The pinion 18 is locked in any desired position by a pawl 21. The valve 7 of the lower unit 28 is controlled by intermeshing segments 22 on the hinge pins or shafts 8 thereof, one of which segments as shown is engaged by a pinion 23 rotated by a hand crank 24 independently of the crank 20 and locked against reversal by a pawl 25. The upper unit is fed by an elevator 26 of any suitable type, which discharges through a pipe 27 into the feed opening 2 at the top of the upper batcher which in turn discharges into the lower batcher 28.

The operation of the batcher will be clearly understood from the preamble and description. The ingredients for each batch are measured and introduced into the pit 29 in any manner or sequence which is found convenient, and the valve or gate 7 of the batcher or of each successive unit of the batcher being closed, the operation of the elevator transfers the ingredients of the entire batch to the batcher casing 1. The material first introduced is deflected by the centre baffle 5, so that the bulk of it falls between the hopper baffles 6 and the outside walls 30 of the casing 1, but part of it may enter within the hopper baffles at this time. When this space between the hopper baffles and the outside casing has been filled and heaped up to the angle assumed by the material as shown at 31 in Figure 1, the material later introduced completing the batch rolls down the top surface of the material at 32 thus deposited and enters the enclosed space within the hopper baffles 6. In this connection it is of particular importance to note that the hopper baffles 6 intersect the valve opening.

When the entire batch has been introduced into the casing or batcher 1, and it should be noted in this connection that the batcher must be of such proportions as to receive and contain at one time a suitable load or charge comprising all the ingredients of a single batch of fertilizer, the valves 7 are opened and practically simultaneous discharge from the entire cross-section of the batch takes place, the materials at the sides which is first introduced and the materials at the centre, the bulk of which was later introduced, being discharged simultaneously and completely mixed to the extent that a cross-section of the heap, if the materials be caught directly beneath the batcher, contains the various ingredients introduced substantially in the proportions introduced, and that each cross-section of the stream of material from the batcher likewise contains the various materials in corresponding proportions, reference being to horizontal sections.

It will be further noted that the height of hopper baffle 6 has an important bearing on the mixing operation and on the size of the charge accommodated. As the filling of the central compartment between the hopper baffles, though it progresses to a slight extent before the outer compartment between the hopper baffle 6 and the outside walls 30, is completed, is accomplished in the main after this outer compartment is filled and heaped to the maximum angle of rest assumed by the material. For this reason the walls 6 are made adjustable as to their height which permits them to be adjusted to some extent to the size of the batch being treated and further to produce the most complete and satisfactory mixing effect, and the base of the incline of baffle 5 is spaced away from the sides of chamber 1.

The invention may also be treated in its broad conception as a method of mixing comminuted materials which consists in introducing the materials to be mixed into an enclosure having a transverse partition, causing the material to overflow the partition and accumulating considerable portions of the material on both sides of the partition and then releasing the material from both sides of the partition simultaneously.

I have thus described specifically and in detail a single embodiment of my invention in order that the method and operation of the same may be clearly understood; however, the specific terms herein are used descriptively rather than in a limiting sense, the scope of the invention being defined in the claims.

What I claim and desire to secure by Letters Patent is:

1. A fertilizer mixer or batcher comprising an outer casing having a feed opening at the top, a discharge opening at the bottom, a gate or valve controlling the discharge

opening, a baffle near the top having surfaces inclined from the centre toward the sides, and an upright hopper baffle intersecting the discharge opening.

2. A fertilizer batcher comprising a chamber to contain the batch having feed and discharge openings, a baffle near the feed opening inclined from the feed opening toward the side wall of the chamber and toward the discharge opening, a valve for closing the discharge opening and a second baffle in the chamber intersecting the discharge opening and spaced away from the first-named baffle.

3. A fertilizer batcher comprising a chamber to contain the batch having feed and discharge openings, a baffle near the feed opening inclined from the feed opening toward the side wall of the chamber and toward the discharge opening, a valve for closing the discharge opening and a second baffle in the chamber intersecting the discharge opening and spaced away from the first-named baffle, the latter baffle being substantially in line in the direction of discharge with the edge of the first-named baffle which is spaced from the side of the chamber.

4. A fertilizer batcher comprising a chamber to contain the batch having feed and discharge openings, a baffle near the feed opening inclined from the feed opening toward the side wall of the chamber and toward the discharge opening, a valve for closing the discharge opening, and a second baffle in the chamber intersecting the discharge opening and spaced away from the first-named baffle, the second-named baffle being adjustable toward and from the first baffle.

5. A fertilizer batcher comprising a chamber to contain the batch having feed and discharge openings, a baffle near the feed opening inclined from the feed opening toward the side wall of the chamber and toward the discharge opening, a valve for closing the discharge opening and a second baffle in the chamber intersecting the discharge opening and spaced away from the first-named baffle, the side baffles near the valve opening.

6. The method of mixing comminuted materials which consists in introducing the materials to be mixed into an enclosure having a transverse partition causing the material to overflow the partition, accumulating considerable quantities of the material on both sides of the partition, and then releasing the material simultaneously from both sides of the partition.

7. The method of mixing comminuted materials which consists in depositing the materials in one side of the partition, causing them to overflow the partition and accumulate on both sides of the partition, and releasing the material from both sides of the partition simultaneously.

8. The method of mixing comminuted materials which consists in depositing the materials in one side of the partition, causing them to overflow the partition and accumulate on both sides of the partition, and releasing the material from both sides of the partition simultaneously, slightly restraining the release of material on the side of the partition on which the materials are first deposited.

9. A fertilizer batcher having a mixing chamber with a discharge opening at the bottom, means for closing the discharge opening, an upright partition intersecting the discharge opening, and means for depositing comminuted material to be mixed on one side of said partition, permitting it to overflow the partition so that the material can be thus accumulated on both sides of the partition and released simultaneously by opening the closing means.

10. A fertilizer batcher having a mixing chamber with a discharge opening at the bottom, means for closing the discharge opening, an upright partition intersecting the discharge opening, and means for depositing comminuted material to be mixed on one side of said partition, permitting it to overflow the partition so that the material can be thus accumulated on both sides of the partition and released simultaneously by opening the closing means, and means for slightly restricting the discharge on the deposit side of the partition.

Signed by me at Baltimore, Maryland, this 18th day of May, 1925.

AUGUSTUS J. SACKETT.