

(No Model.)

4 Sheets—Sheet 1.

W. I. STEVENS.
FERTILIZER DISTRIBUTER.

No. 582,241.

Patented May 11, 1897.

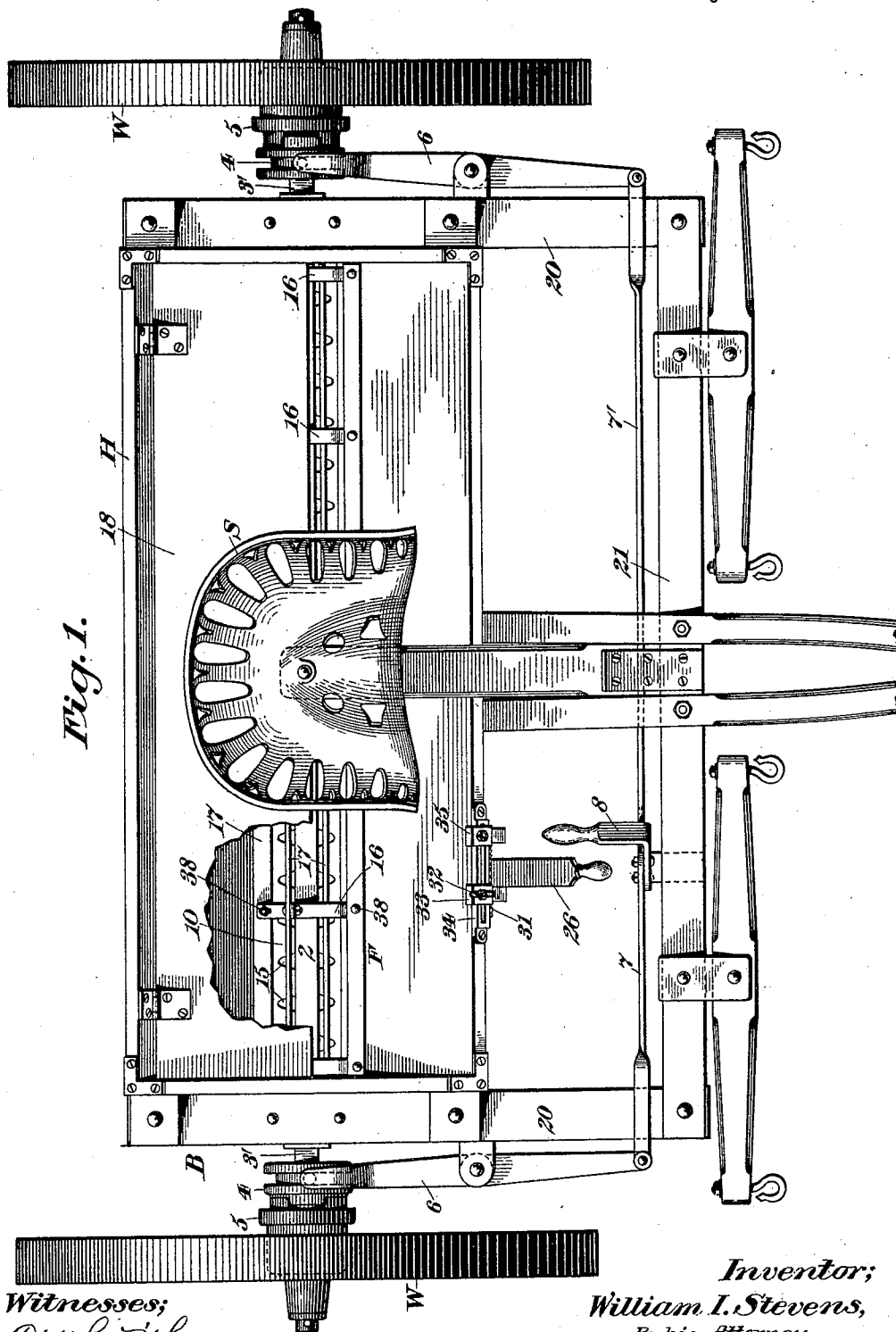


Fig. 1.

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(No Model.)

4 Sheets—Sheet 2.

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Fig. 2.

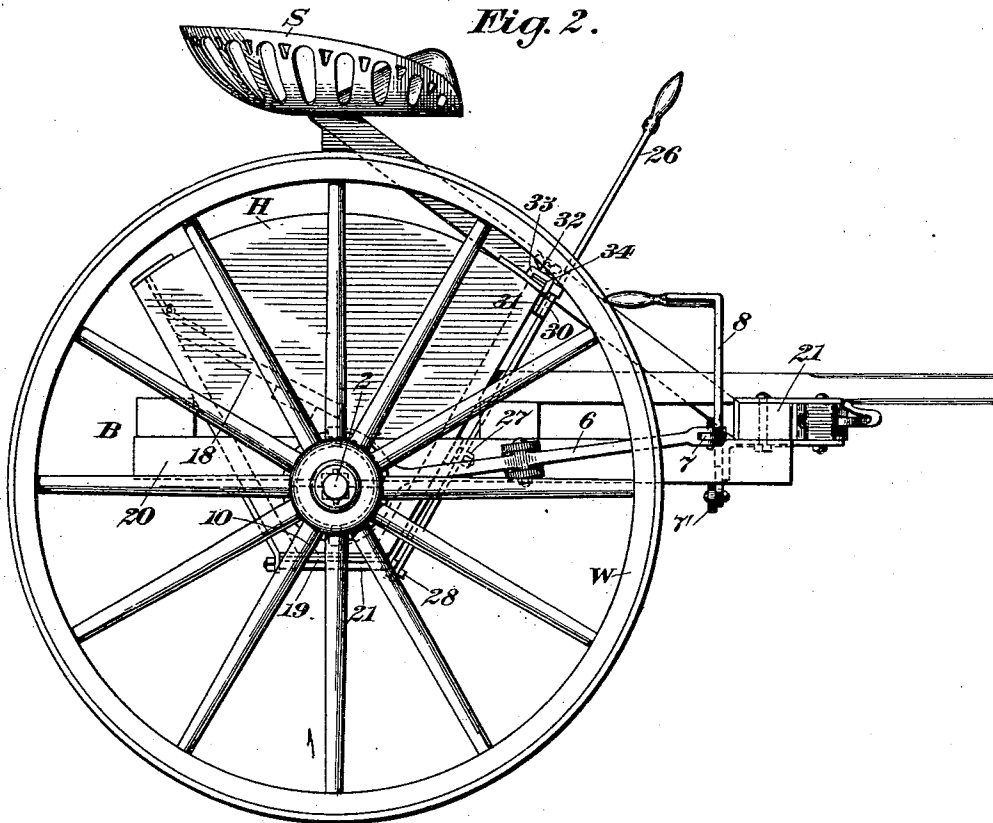


Fig. 3.

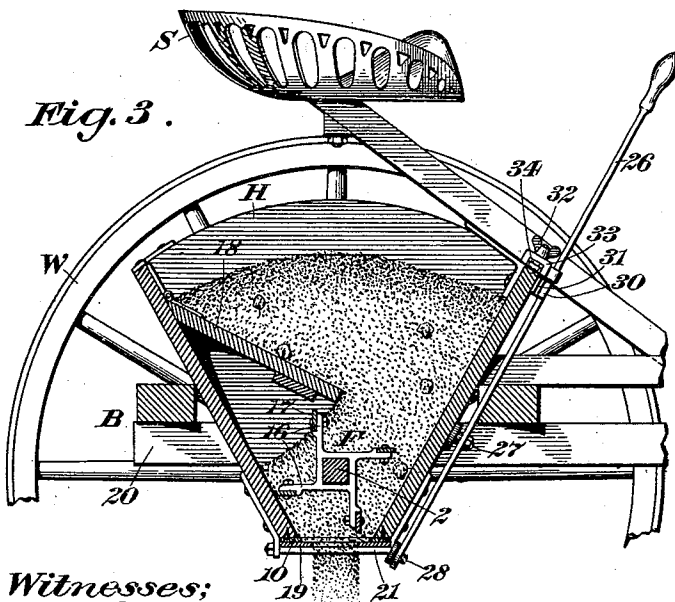
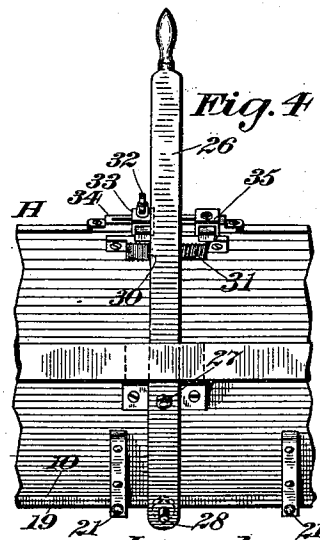


Fig. 4.



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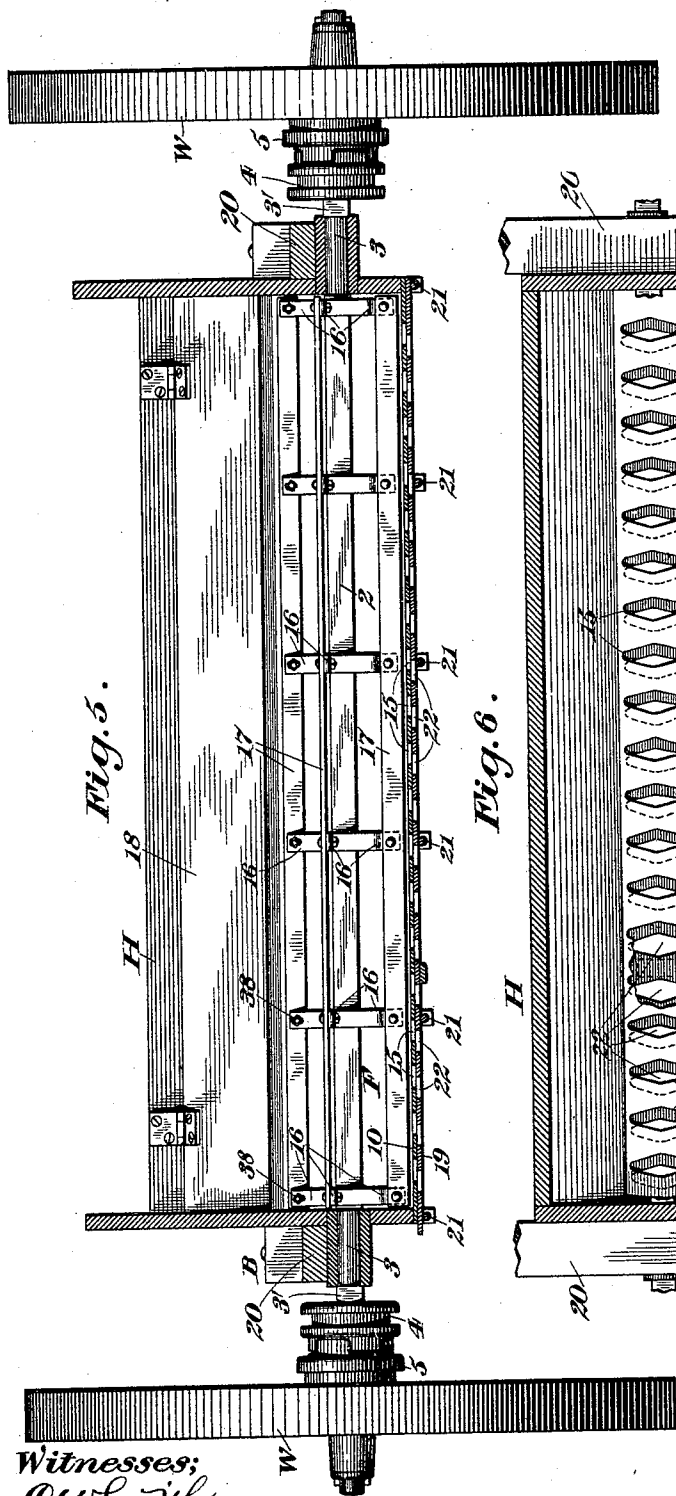


Fig. 5.

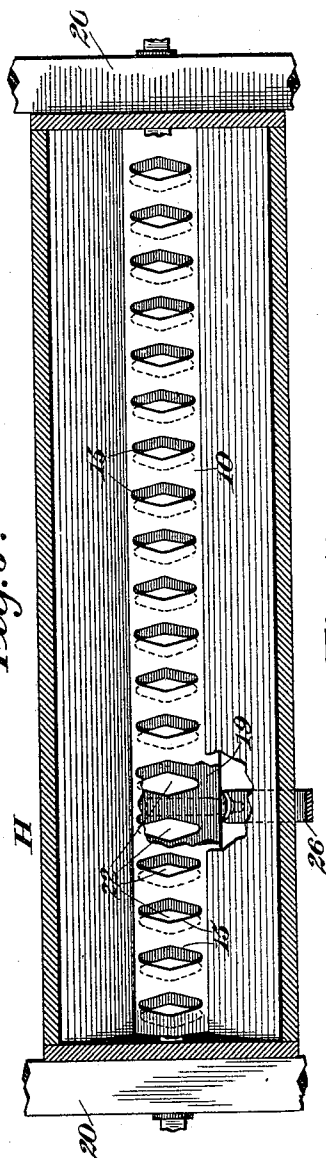


Fig. 6.

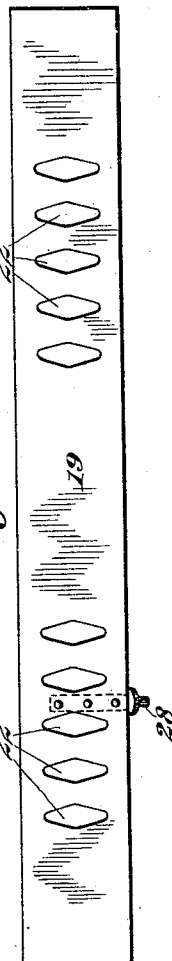


Fig. 7.

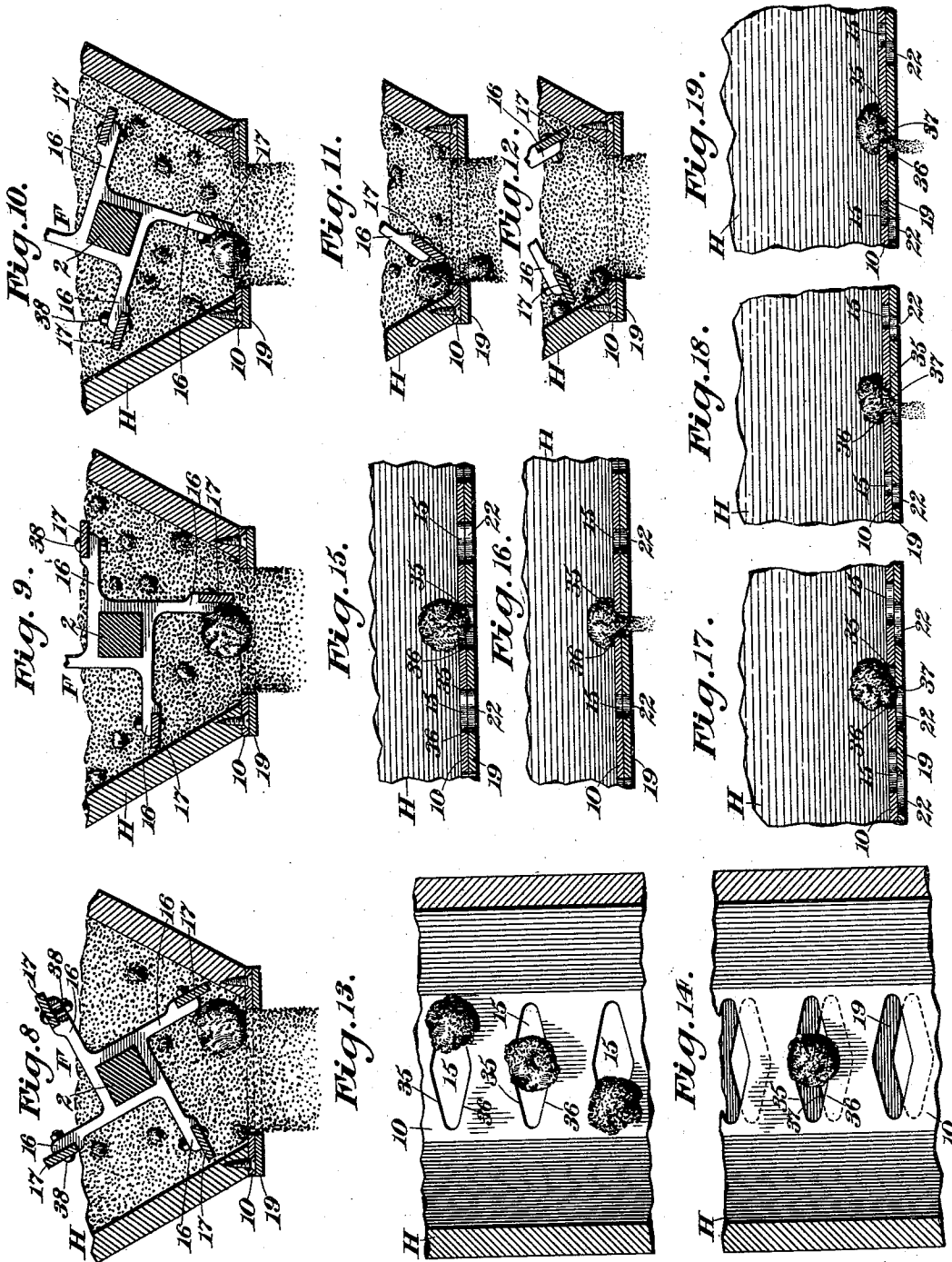
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UNITED STATES PATENT OFFICE.

WILLIAM I. STEVENS, OF HOCKANUM, CONNECTICUT.

FERTILIZER-DISTRIBUTER.

SPECIFICATION forming part of Letters Patent No. 582,241, dated May 11, 1897.

Application filed February 27, 1897. Serial No. 625,332. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM I. STEVENS, a citizen of the United States, residing in Hockanum, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Fertilizer-Distributers, of which the following is a specification.

This invention relates to improvements in fertilizer-distributers; and it has for its main object the provision of an improved power-machine of this class by means of which all kinds of fertilizing material, whether in a finely-divided state or in a lumpy condition and whether dry or damp and thereby liable to become lumpy, may be spread finely and fed from the machine without clogging the operative parts thereof.

Another object of the invention is to provide, in connection with such a distributing-machine as that above specified, means for varying the areas of the openings through which the fertilizer passes, this regulation being effected either while the machine is in action or before work is begun therewith, it being obvious that this regulation of the areas of the feed-openings permits the material to be distributed at any desired rate, so that any desired amount of fertilizer may be spread per acre of land covered.

Another object of my present invention is to provide, in connection with a suitable hopper having feed-openings for delivering the fertilizer therefrom, a rotary feeder mounted in the hopper of the distributor adjacent to the bottom thereof and constructed in the form of an open frame, through which the material in the hopper may pass readily to the feed-openings. This feeder will preferably be a skeleton frame comprising a rotary carrier having arms projecting therefrom and having attached thereto, adjacent to their outer ends, feed-bars substantially parallel with each other and in position to pass close to the openings in the bottom of the hopper when the machine is in action, and thus positively feed the fertilizer through the openings and at the same time break up any lumps that may be admixed with the material or which may be formed by the packing together of the fine particles of the fertilizer when in a damp condition.

In the drawings accompanying and forming

part of this specification, Figure 1 is a plan of a fertilizer-distributor constructed in accordance with my present invention and having parts thereof broken away to illustrate the construction more clearly. Fig. 2 is a side elevation of the same. Fig. 3 is a sectional side elevation of a portion of the machine, illustrating the manner in which the feeder cooperates with the openings in the bottom of the hopper for feeding the fertilizer there-through. Fig. 4 is a detail front elevation of an operating device and locking means therefor for shifting a cut-off plate for regulating the areas of the feed-openings in the bottom of the hopper. Fig. 5 is a transverse section of a portion of the machine, illustrating the main driving-shaft, the feeder, and the hopper, the section being taken substantially in the central vertical plane of the hopper. Fig. 6 is a sectional detail of the hopper, showing the feed-openings in the bottom thereof and a cut-off slide having corresponding openings for regulating the areas of the feed-openings through which the fertilizer passes. Fig. 7 is a detail of a modification of the cut-off slide to adapt the machine for use as a double-row fertilizer-distributor. Figs. 8 to 12, inclusive, are sectional detail end elevations, on an enlarged scale, illustrating the manner in which the rotary feeder reduces large lumps and feeds the crushed particles thereof through the openings in the bottom of the hopper, the views illustrating the crushing action of the feed-bars of the feeder at different points in the rotation of the latter. Fig. 13 is a sectional plan, on a similar scale, illustrating the manner in which a large lump drops into a feed-opening at successive points thereof, this view illustrating the maximum width of feed-opening in the bottom of the trough. Fig. 14 is a similar view showing the action upon a lump with a reduced feed-opening. Figs. 15 and 16 are sectional front elevations of a portion of the hopper and the cut-off slide, showing the manner in which the converging sides of the feed-openings shear a lump, as seen from the front of the machine. Figs. 17, 18, and 19 are similar views illustrating a reduced feed-opening and showing the manner in which a lump is reduced by the shearing action at successive points in the length of said opening.

Similar characters designate like parts in all the figures of the drawings.

My improved fertilizer-distributor is intended to be mounted in the well-known manner upon a suitable wheeled vehicle, and the body of this vehicle is designated herein in a general way by B. Although this body may be of any desired form, it will usually consist of an oblong frame, at the ends of which will be supported wheels W.

The hopper or trough that is intended to contain the fertilizer is indicated in a general way by H and is supported upon the body B in any desired manner—as, for instance, by being bolted thereto. In this case the bottom of the hopper extends below the body of the machine and has openings in its ends through which the main shaft of the vehicle is intended to be passed. The journals for the ends of this shaft, which shaft is designated by 2, are indicated at 3 3 at opposite ends of the body B. (See Fig. 5.) Outside of the journals 3 3 the shaft 2 may be square, as shown at 3' 3', and on these squared portions of the shaft coupling members are mounted, in this instance for the purpose of connecting the driving-wheels W with the driving-shaft and disconnecting them therefrom. These coupling members are designated by 4 4 and cooperate with complementary coupling members 5 5 in fixed relation with the hubs of the two driving-wheels.

For the purpose of actuating the coupling members 4 4 to carry them into or out of engagement with the complementary members 5 5 a pair of shifting levers is illustrated at 6 6, these levers being pivotally supported by the end frames 20 20 of the body portion of machine and being connected at their forward ends by means of connecting-rods 7 and 7' with an operating-lever 8 in front of and slightly below the usual seat S for the operator.

It will be noticed that one of the connecting-rods is joined to the lever 8 above the pivotal point of the latter, while the other rod is joined to such lever below this pivotal point, so that when the operating-lever is shifted in one direction or the other the coupling members 4 4 will be simultaneously operated in opposite directions to carry them into engagement with the coupling members 5 5 or uncouple them from the latter. The lever 8 may be conveniently pivoted on the forward frame-piece 21, as shown clearly in Figs. 1 and 2.

The hopper or trough H, in which the fertilizer is contained, may, as before stated, be of any suitable construction, but in this instance is in the form of a long trough having a somewhat contracted outlet through which the fertilizer is to be fed. The bottom of this hopper may be closed, in the manner shown most clearly in Figs. 3 and 5, by means of a feed-plate, such as 10, preferably of sheet metal and having a series of elongated slots therein disposed with their major axes

transverse to the feed-plate. In this case, besides having these openings elongated, they are also shaped in such a manner that their sides converge from the minor axes of the openings toward the ends of the major axes thereof. This will be clear by reference particularly to Fig. 6, in which these openings, which are indicated by 15, are substantially diamond-shaped, with slightly-curved ends, and are therefore each of differential widths. For the purpose of feeding fertilizer from the trough through these feed-openings 15 I preferably make use of a rotary feeder, which will be secured to the shaft 2 so as to turn slowly therewith. In the preferred construction this feeder, which is designated by F, is in the form of an open or skeleton frame having arms 16, projecting from the shaft 2 and having secured to their outer ends feed-bars, indicated herein by 17.

It will be noticed by referring to Fig. 3 that four of the arms 16 project from the shaft 2 at different points in the length thereof, so as to properly brace the feed-bars, and that these arms are not disposed radially to the shaft, but are tangent thereto. The object and advantages of this construction will be pointed out hereinafter.

It will be noticed that the open-frame feeder permits the material in the trough to pass freely therethrough, as the arms 16 and the feed-bar 17 form a skeleton frame, leaving a very large open space between the bars and the shaft 2, through which the fertilizer may pass. It will also be clear that by employing a feeder of this construction the material in the hopper will be positively fed toward and through the feed-openings in the bottom of the trough, as there will always be material in the path of the feed-bars and the arms 16 or within the open space of the feeder and in position to drop down toward the bottom of the trough and into the path of the feed-bars.

For the purpose of removing from the feeder as much of the weight of the fertilizer as is possible, and in order also to prevent holding back of the feed-bars by the superimposed mass after these bars have passed beyond the rear ends of the feed-openings 15, I prefer to provide an apron or delivery-board, such as 18, (see Fig. 3,) hinged to the inner rear side of the hopper H in such a manner as to support a considerable portion of the mass in the trough, and particularly that portion of the contents that is in the rear of the central vertical longitudinal plane of the trough. It will be noticed by reference to Fig. 3 that this organization leaves a considerable clear space at the rear of the feeder F, and that but little resistance is opposed to the rotation of the feeder by the material in the rear of such central vertical plane.

For the purpose of regulating the amount of fertilizer to be spread by the distributor I employ, in connection with the feed-plate 10, a regulating or cut-off plate, which is indicated at 19, and may advantageously be in the form

of a long strip of sheet metal, which will in this case be held in position by suitable guides or bolts, such as 21, and will have therein feed-openings corresponding to those in the feed-plate 10. These feed-openings in the cut-off plate are designated herein by 22 and are substantially similar in contour to those indicated at 15. Moreover, the feed-openings 22 are so positioned that all of the openings in the cut-off plate may register with the corresponding feed-openings in the feed-plate 10, but, as will be obvious, the cut-off plate should be capable of longitudinal movement in order to regulate the areas of the openings through which the fertilizer effects its exit from the hopper.

Any suitable operating device may be employed for effecting this shifting movement of the regulating or cut-off plate 19, but in this case I prefer to employ an operating-lever, such as 26, pivoted on the forward side of the hopper and in position to be shifted readily by the operator mounted on the seat S. The pivot of the lever 26 is indicated in Fig. 4 at 27, and the lower end of the lever may be connected to the regulating-plate in any desired manner—as, for instance, by means of a pin 28, passed through an opening in the lower end of the lever. This pin may, if desired, be formed, as shown in Fig. 3, by bending down the forward end of one of the bolts 21, which form guides for supporting the cut-off plate.

As it will be clear that some means should be provided for holding the lever in any desired adjusted position in order to prevent a change in the area of the feed-openings after the cut-off plate has been properly adjusted, I have shown in the drawings of the present case locking means for positively securing the lever 26 in any position to which it may be shifted. This locking device comprises as its essential features a tooth on the lever 26, a rack for engaging said tooth, and a clamping device for holding the tooth of the lever in engagement with the rack. This tooth is indicated in Fig. 4 by 30 and the rack by 31. It will be noticed that the teeth of the rack converge toward the pivot 27 of the rod in order to engage the tooth 30 properly.

The clamping device consists in this instance of a clamping-screw 32, seated in an adjustable stop 33 in position to engage the lever and limit the movement thereof. In this case a slotted plate is shown at 34 on the upper edge of the forward side of the hopper, with which the clamp-screw and clamping-block cooperate. In order to limit the throw of the shifting lever in the opposite direction, a fixed stop, such as 35, will be employed.

In Figs. 8 to 12 of the drawings I have illustrated in detail the manner in which the rotary feeder F cooperates with the feed-plate and the rear walls of the hopper to feed the material through the feed-openings. As before stated, the feeder is carried by the main shaft of the machine, and as the machine

will be drawn forward with a relatively slow speed it will be apparent that the feeder will rotate at a slow rate of speed and will gradually force the fertilizer toward the feed-openings 15 and through the same. If now the material be in a damp condition or lumpy, the compacted masses of fertilizer as they reach the bottom of the hopper will be engaged by the feed-bars of the feeder and forced forward in straight lines into the openings 15 and along the same. It will be clear now that if a large lump is at the forward end of one of these openings 15, as shown in Fig. 8, it will be carried to the rear by the feed-bar from the forward narrow end of the feed-opening toward and into the wide central portion thereof, whereupon it will drop into the feed-opening and a portion of the lump will project below the side edges of the opening. As the feeder slowly rotates, the feed-bar will continue to force the lump toward the rear of the bottom of the trough, and the converging side edges 35 and 36 of the walls of the opening will engage the lump and cut off by a shearing action the portion that projects through the opening. This operation will be clear by reference to Figs. 10 to 12, inclusive, in which the lower portion of the lumpy mass of fertilizer has been sheared off and crushed and fallen through the feed-opening, leaving only a small piece of the lump within the hopper, and this piece is further reduced in size by the feed-bar crushing the same against the rear wall of the trough. This shearing and crushing action will be made very clear by reference to Figs. 13 to 16, inclusive, in which the successive positions of the lump are shown from above and also from the front of the machine.

In Figs. 14 to 19, inclusive, I have illustrated the manner in which one of the lumps is sheared when the feed-openings in the bottom of the hopper are reduced in area by the shifting of the regulating-plate 19. In this case when a lump of material is forced by a feed-bar into the opening in the feed-plate 10 it is carried along toward the wide portion of the elongated opening until it reaches the position shown in Figs. 14 and 17, whereupon that portion of the lump that is below the upper side of the feed-plate is reduced and sheared off by the action of the opposing converging shearing edges of the feed-openings in the feed-plate and the cut-off plate. In this instance there is not only a shearing and crushing action, but as three separate holding edges (designated herein in Figs. 17, 18, and 19 by 35, 36, and 37, respectively) are in engagement with the lump the mass is wedged firmly between these holding-walls and held in place therebetween while being forced forward by the feeder. Hence in this case there are two separate shearing actions, one of which takes place between the walls 35 and 36 of the feed-plate and the other between the wall 36 of the feed-plate and the coacting wall 37 of the cut-off plate, thus

crushing the lump in two separate planes and positively assuring the proper comminution thereof.

It will be noticed by referring to Fig. 14 especially that when the cut-off plate is shifted to reduce the size of the free feed-opening through which the fertilizer may pass the contour of such opening is not materially modified, but remains substantially unchanged, as the openings in the two plates are so shaped that when the cut-off plate reduces the areas of the openings the major and minor axes thereof are shortened, in practically the same ratio throughout the movement of the cut-off plate, from a full opening to the point of final cut-off. If these openings were not of the form described herein, the shifting of the regulating-plate would not only reduce the areas of the feed-openings, but would so alter the contours thereof as to make them practically useless for properly feeding the fertilizer from the hopper in regulated quantities. Moreover, by the use of elongated openings having their major axes transverse to the axis of rotation of the feeder and having their sides converging from their minor axes toward the ends of their major axes it will be clear that any lumps which may be present in the hopper will be carried down in the manner hereinbefore stated and will drop (as they are forced forward by the feed-bars from the forward to the rearward ends of the feed-openings) farther and farther into such openings until they reach the central points thereof, when they will project through the feed-plate, and upon their further advance toward the rear of the trough the feed-bars will hold them in position and the walls of the feed-openings will positively reduce the downwardly-projecting portions by a cutting or shearing action at the sides of the openings. It will be clear that this method of reducing the lumps in the mass is not possible when employing square or substantially rectangular openings having parallel side walls and a relatively long end wall. It will also be obvious that by disposing the feed-bars at the ends of arms secured at a tangent to the main shaft 2 these bars will not project in radial lines from the axis of said shaft, but will also be disposed tangentially, and while effective to thoroughly break up and loosen the mass of material within the hopper will not be subjected to the strain that would be imposed upon them if they were placed radially relatively to the axis of the main shaft. Hence each of these bars, if it engages a very large lump and thereby meets with an extraordinary resistance, will be resisted only by the portion of the mass above the upper side of the feed-plate and substantially at the extreme upper side of the lump, as will be clear by reference to Figs. 10 to 12, inclusive, and hence will not dig so deeply into a lump as it would if it were disposed in a radial direc-

tion. Each of these feed-bars is preferably adjustably secured to the arms 16 by means of slot-and-bolt connections, as shown at 38, so as to permit the feed-bars to run closer to or farther from the walls of the trough, if desired, in using fertilizers of different kinds.

I have demonstrated by actual practice that a machine constructed in the manner herein described has great advantages over those heretofore employed, as such a machine will successfully spread any desired amount of fertilizer per acre of land whether the material is in a finely-divided state or be exceedingly coarse and wet and have large lumps commingled therewith, as by means of the peculiar construction of the openings in the feed-plate, especially when used in connection with a feeder having an open frame of the character described, all large lumps contained in the trough will be slowly but surely forced along the openings in the feed-plate and positively sheared off and reduced to powder by the action of the feed-bars and the converging walls of the feed-openings.

Having described my invention, I claim—

1. In a fertilizer-distributor, the combination, with a rotary feeder mounted in the hopper, of a hopper having elongated feed-openings therein disposed with their major axes transverse to the axis of rotation of the feeder and having their sides converging from the minor axes of the openings toward the ends of the major axes thereof.

2. In a fertilizer-distributor, the combination, with a rotary feeder mounted in the hopper, of a hopper having a series of elongated feed-openings therein disposed with their major axes transverse to the axis of rotation of the feeder and having their sides converging from the minor axes of the openings toward the ends of the major axes thereof; and a cut-off plate having a series of feed-openings in position to register with the corresponding feed-openings in the hopper and movable transversely to said last-mentioned feed-openings to regulate the areas of these feed-openings, substantially without altering the contour thereof.

3. In a fertilizer-distributor, the combination, with a hopper having a series of elongated feed-openings in the bottom thereof, the sides of which feed-openings converge from the minor axes thereof toward the ends of their major axes, of a rotary feeder mounted in the hopper, with its axis of rotation transverse to the major axes of the feed-openings, and consisting of an open frame having feed-bars substantially parallel with, and remote from, the axis of the feeder and adapted to cooperate with the feed-openings, to positively feed the fertilizer therethrough.

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