F. A. WEGNER.

GRAIN DRIER.

APPLICATION FILED APR. 30, 1913.

1,191,753.

Patented July 18, 1916.

3 SHEETS—SHEET 1.

Fig. 1.

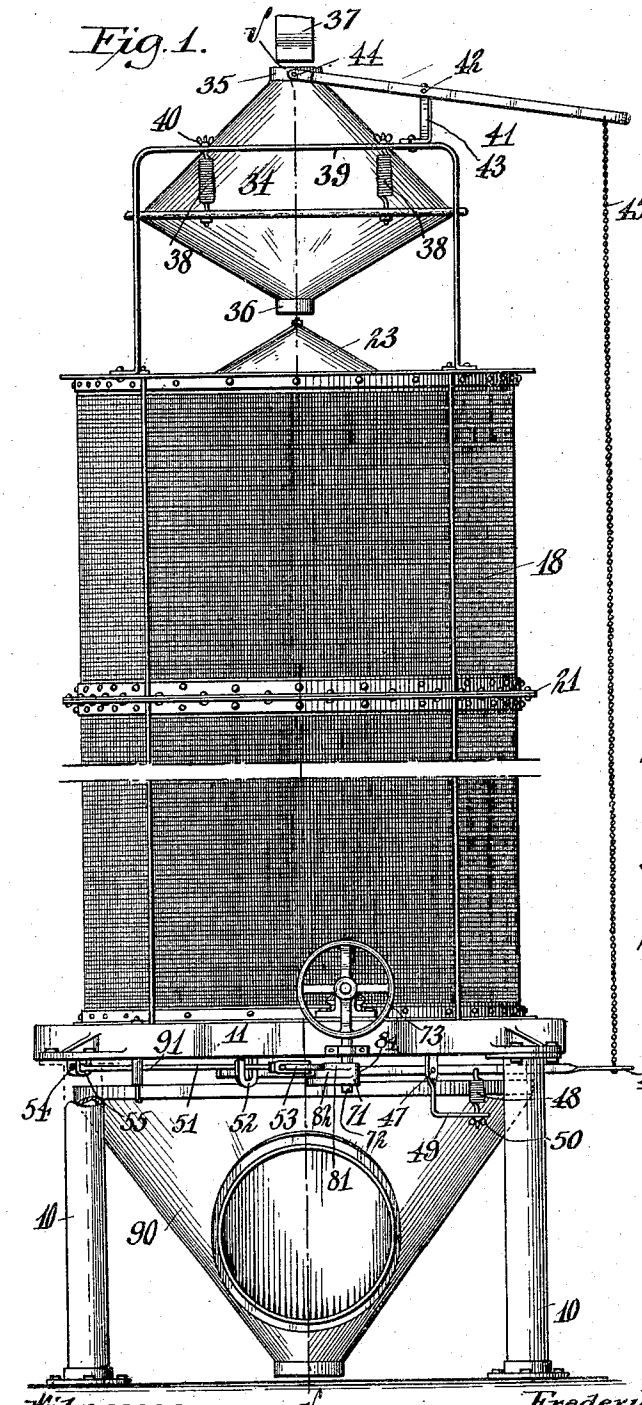


Fig. 5.

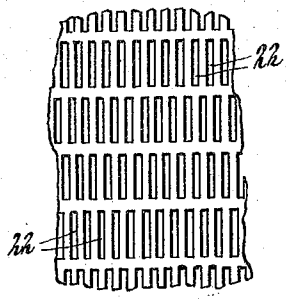


Fig. 6.

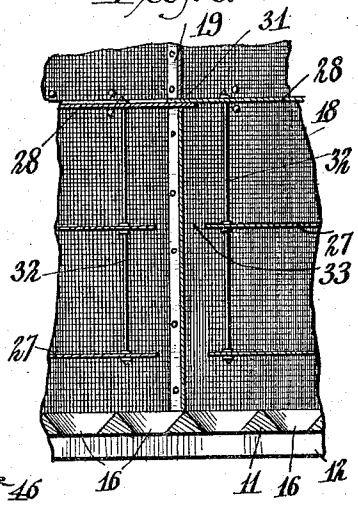
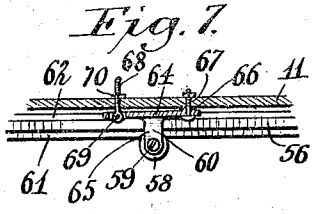


Fig. 7.



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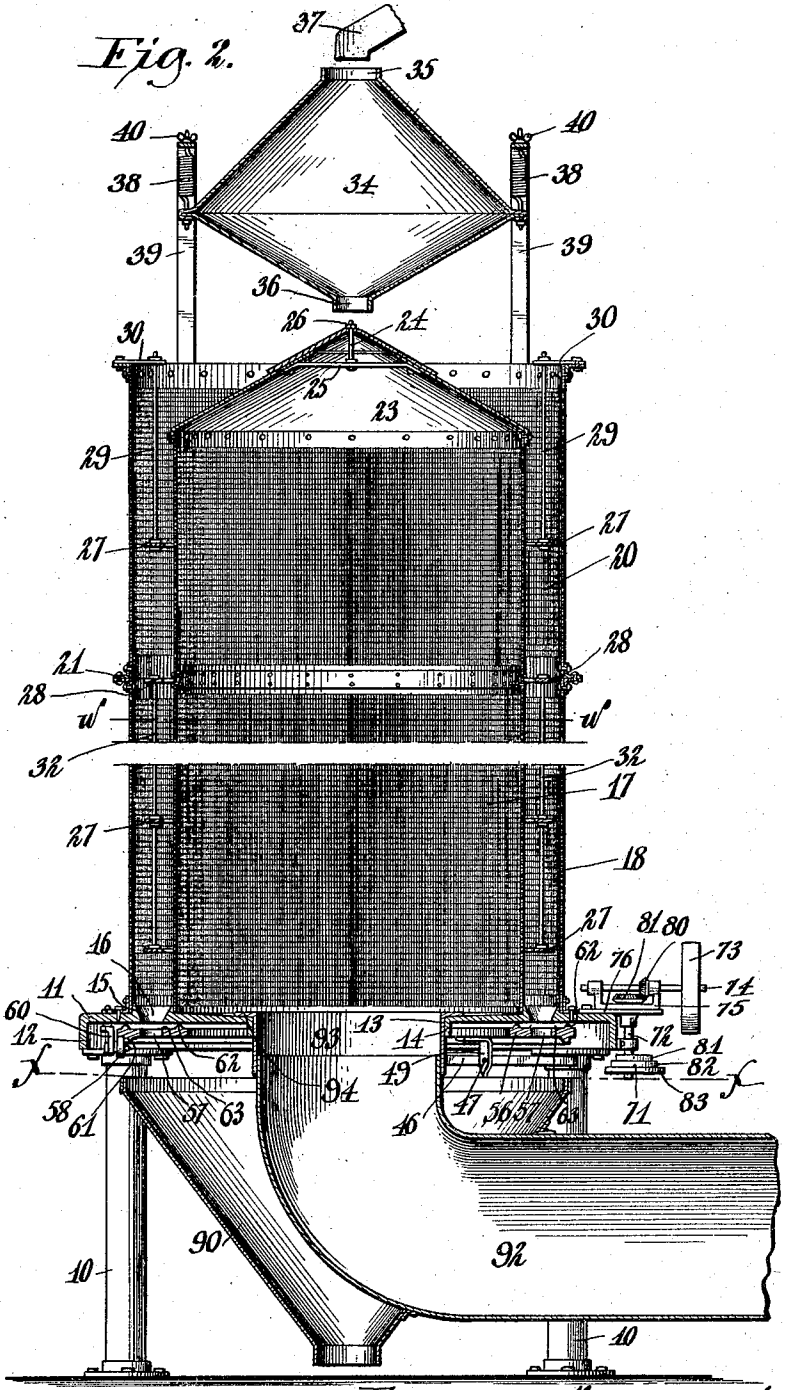
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

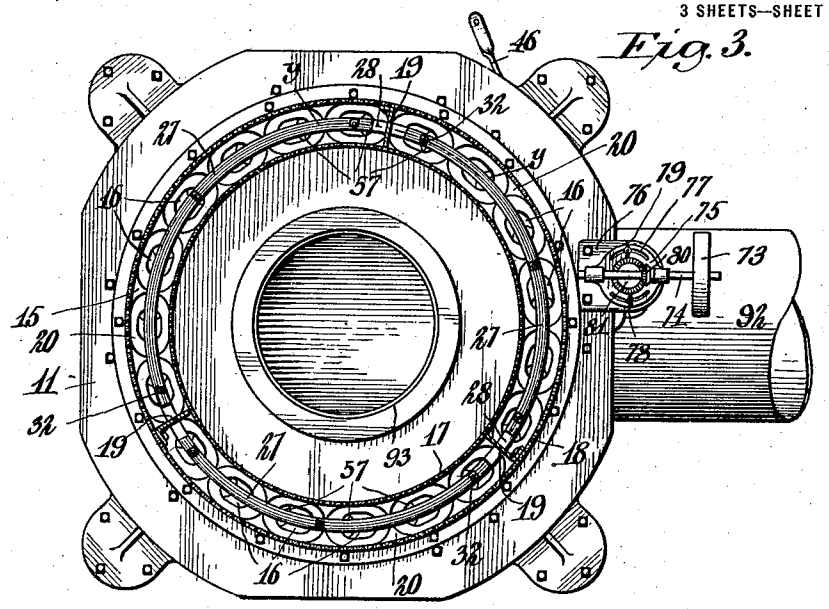
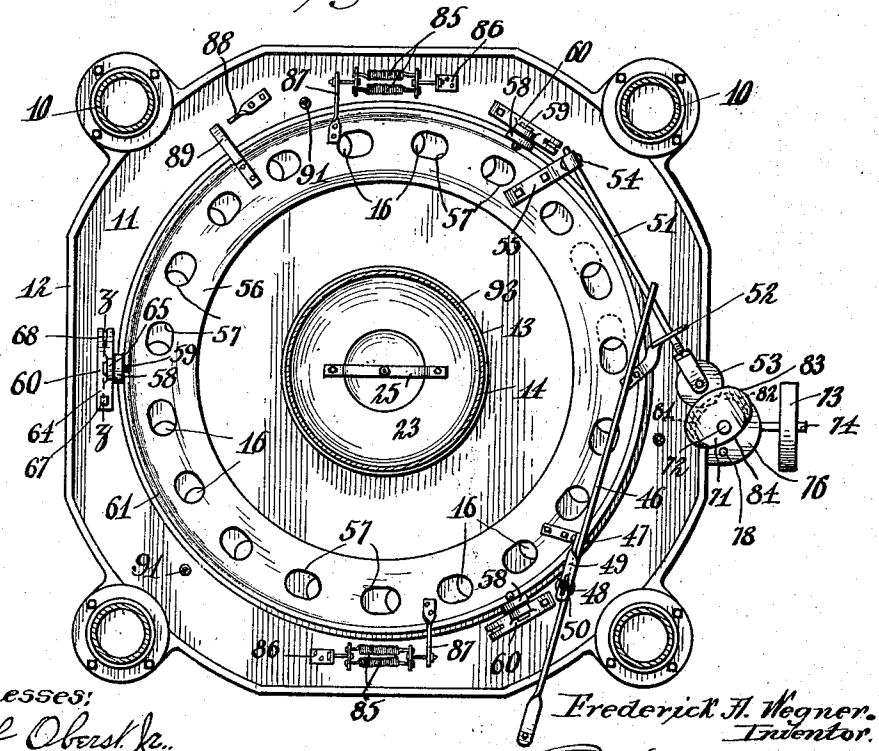


Fig. 4.



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UNITED STATES PATENT OFFICE.

FREDERICK A. WEGNER, OF BUFFALO, NEW YORK.

GRAIN-DRIER.

1,191,753. Specification of Letters Patent. Patented July 18, 1916.

Application filed April 30, 1913. Serial No. 764,665.

To all whom it may concern:

Be it known that I, FREDERICK A. WEGNER, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Grain-Driers, of which the following is a specification.

My invention relates to grain driers and the like, and it has for its object to provide simple means whereby the grain discharged from the grain chambers of the drier may be regulated in its flow by the amount of grain deposited in the feeding hopper of the drier.

Another object of my invention is to provide means for controlling the discharge of the grain from the drier accordingly as it may be fine or coarse.

Further objects are to simplify the construction of grain driers now in use, and to so construct the apparatus that when once adjusted for the particular kind or condition of grain used it will operate automatically without further attention.

With these and further objects in view, the invention consists in the novel features of construction and in the arrangement and combination of parts to be hereinafter described and more particularly pointed out in the subjoined claims.

My invention will be more fully described hereinafter with reference to the accompanying drawings in which one embodiment of the invention is illustrated and in which,—

Figure 1 is a side elevation of my improved grain drier embodying this invention. Fig. 2 is a central vertical section taken on line *v—v*, Fig. 1. Fig. 3 is a horizontal section taken on line *w—w*, Fig. 2. Fig. 4 is a horizontal section taken on line *x—x*, Fig. 2, looking up. Fig. 5 is an enlarged view of a portion of the foraminous material used in the construction of the casing. Fig. 6 is a vertical section taken on line *y—y*, Fig. 3. Fig. 7 is an enlarged vertical section taken on line *z—z*, Fig. 4.

Referring now to the drawings in detail like numerals of reference refer to like parts in the several figures.

The reference numeral 10 designates the posts or standards by means of which the apparatus is supported, and secured thereto by means of bolts or otherwise is the bottom plate 11 of the apparatus which is provided with an apron or depending flange 12 and has also a central opening 13 provided with an annular depending flange 14. This bottom plate is provided with an annular raised portion 15 through which is formed a circular series of discharge openings 16 which are tapered downwardly, as clearly shown in Figs. 2 and 6, and are preferably of substantially oval formation. The wide or upper ends of said openings extend to the opposite side or edge walls of said annular raised portion, as shown in Figs. 2 and 3, and each discharge opening has its tapering wall meeting the tapering walls of adjacent openings. Resting upon the bottom 11 are the inner and outer casings 17, 18, respectively, which are spaced apart by the annular raised portion 15 and by a number of vertically-disposed spacing bars 19, best shown in Fig. 3. The outer casing therefore bears against the outer side or edge of the annular raised portion 15 while the inner casing bears against the inner side or edge of said raised portion, and owing to the tapered walls of the openings 16 being arranged as described, very little flat surface remains on the upper face of said raised portion for lodgment of grain thereon. The space between the inner and outer casings forms parti-circular grain chambers 20 which are separated by the spacing bars 19, and each of these casings is formed in sections connected, as at 21, the number of sections employed depending on the desired capacity of the apparatus.

Both casings are formed of any suitable foraminous material preferably of the type and style shown in Fig. 5, in which the material shown is sheet metal having annular rows of perforations 22, the perforations of each row being offset with reference to adjoining rows, but it is clear that any other material capable of allowing passage of air therethrough may be employed, if desired. The inner casing is constructed of the same material as the outer and is closed at its upper end by a conical cap or head 23 formed in two sections, both constructed of sheet metal, one section being of frusto-conical formation and riveted to the upper end of the inner casing; said section having its upper end open, and the other being in the form of a cone adapted to rest upon said frusto-conical section and being secured thereto by means of a bolt 24 fastened onto a cross bar 25 secured in said frusto-conical section and passing through the apex of the cone with a nut 26 secured to its projecting end. The apex end of the conical head is therefore easily removable and if desired

may be made of hardened steel or other material capable of enduring considerable wear but which when worn may be replaced with another by removing the nut 26. In each of the sections of the casing is arranged one or more baffle plates 27 and similar baffle plates 28 are arranged at the points of connection of said sections, said last-mentioned baffle plates serving, however, to support the baffle plate or plates arranged in the corresponding section. The baffle plate or plates in the uppermost section of the apparatus are supported by means of rods 29 suspended from arms 30 secured to the upper end of said section, and all baffle plates of the apparatus are of parti-circular contour so as to conform to the parti-circular grain chambers 20 in which they are located. The baffle plates 28 are somewhat longer than the plates 27, as clearly shown in Fig. 6, and rest upon the spacing bars 19 of the section in which they are located, as at 31, the adjacent ends of the spacing bars 28 in adjoining grain chambers overlapping, as best shown in Fig. 6. The baffle plates 27 in all but the uppermost section of the apparatus are secured to rods 32 suspended from the baffle plates 28, and preferably such baffle plates have their ends terminating short of the spacing bars 19 separating adjoining grain chambers, as shown at 33, Fig. 6. The spacing supports are somewhat narrower than the grain chambers so as to provide passages along opposite edges of the same. The upper end of the outer casing 18 is open and the apex of the conical cap or head 23 of the inner casing extends slightly above the outer casing.

34 designates a hopper which tapers downwardly and upwardly from an intermediate point and has both ends open, as at 35, 36, the opening 35 being the inlet through which the grain is fed from a leg 37, and the opening 36 being the outlet and allowing the grain to drop upon the conical cap or head of the inner casing to be directed thereby radially in all directions into the grain chambers 20. The grain passes down through said chambers and in its downward course is broken up by the baffle plates 27, 28, so as to prevent its clogging within said grain chambers.

The feed hopper 34 is supported by a number of springs 38 at different points around its circumference, said springs being suspended from brackets or supports 39 secured to the outer casing 18. The tension of said springs is regulated by means of thumb screws 40 or similar devices threaded onto the threaded ends of the springs which project through said brackets or supports.

A controlling lever 41 is pivotally secured between its ends, as at 42, to a bracket 43 or otherwise, and the inner end of said arm is bifurcated and pivoted to the upper end of the hopper 34, as at 44. To the outer end of said controlling lever is secured a chain or similar device 45 which extends downwardly therefrom and has connection with a shifting lever 46 arranged beneath the bottom plate 11, said shifting lever being pivotally secured between its ends, as at 47, and having its outer end normally held in depressed position by a spring 48 secured thereto with one end and having its other end passed through a bracket 49 or secured to some other fixed point. One end of said spring terminates in a threaded straight extremity which passes through said bracket and also a thumb screw 50 threaded thereon, whereby the tension of the spring may be regulated.

The shifting lever has its inner end engaging an actuating rod 51 which is guided for lengthwise movement in a suitable guide 52 secured to the underside of the bottom plate, one end of said rod having a roller 53 mounted thereon and its other end being pivotally secured, as at 54, to a bracket or arm 55 secured to and extending outwardly from a feed regulating annulus 56. Said annulus 56 is positioned beneath the bottom plate 11 and has a series of openings 57 arranged therein which conform in number to the discharge openings 16 in the bottom plate and in size to the lower ends of said discharge openings. Said feed regulating annulus is supported upon a series of rollers 58 rotatable on studs or axles 59 secured to brackets 60 adjustable on the bottom plate 11, as best shown in Fig. 7, and in order to retain said annulus in proper position it has an annular rib 61 on its underside outside of which the rollers 58 travel, and it also has on its upper face a pair of ribs 62 arranged on opposite sides of the series of openings 57 therein, thus providing an annular depression 63 on the upper face of said annulus which may be diminished or increased in depth of raising or lowering the supporting rollers 58. For this purpose each of the brackets has a flat portion 64 from which depends a lug or arm 65 for securing its supporting roller thereto, and near one end of said flat portion, on its upper face, is a teat or projection 66 which bears against the underside of the bottom plate and is retained in such position by a bolt 67 passing through said flat portion and said bottom plate. The opposite end of said flat portion is provided with a bolt 68 having pivotal connection therewith, as at 69, said bolt passing upwardly through the bottom plate 11 and having a nut 70 adjustable thereon so as to cause the entire bracket 60 to swing on the teat or projection 66 as its fulcrum, thus raising or lowering the supporting rollers 58 and consequently raising or lowering the feed regulating annulus so as to increase or diminish the depth of the

annular depression 63 in the top of said annulus, which is most desirable for properly feeding different kinds of grain. By supporting the feed regulating annulus on the rollers it may be given an oscillating rotatable movement, and for this purpose a cam 71 is provided which is secured to a vertical cam shaft 72 mounted in a bearing secured to the edge of the bottom plate 11 and against which cam the roller 53 is adapted to travel. Said cam shaft 72 is rotated by any suitable driving mechanism, but is herein shown as driven by a belt pulley 73 secured to a shaft 74 mounted in a turntable 75 adjustable on the bottom plate 11, or a part secured thereto, as at 76, said turntable having for this purpose segmental slots 77 through which are passed bolts 78 having thumb nuts 79 secured thereto for securing the turntable in any desired position, thus enabling the belt pulley to be positioned at any angle necessary for driving the same from another pulley. The shaft 74 has secured thereto a bevel gear wheel 80 which is in mesh with a bevel gear wheel 81 secured to the cam shaft 72. In this manner the rotary movement of the belt pulley is imparted to the cam and serves to actuate the rod 51. When the feed regulating annulus is oscillated it serves to open the feed discharge openings 15 in the bottom plate and close the same intermittently, the extent to which said discharge openings are opened depending on the range of movement of said annulus, and in order that this may be varied I preferably employ a stepped cam having cam faces 81, 82, 83, forming substantially three separate cam parts of different sizes so that the extent of movement of the rod 51 may be changed as required, and as it is intended that this change is to be in proportion to the amount of grain within the feed hopper 34 the shifting of the roller 53 on said rod from one cam to the other or entirely out of engagement with said cam is controlled by the shifting lever 46. Said lever bears against the underside of the actuating rod 51 and is adapted to raise the same from one cam part to another of different diameter, and when said shifting lever is actuated reversely the actuating rod 51 gravitates and allows its roller 53 to move along the straight or unstepped side 84 of said cam so as to assume a position corresponding with that in which the shifting lever 46 is placed.

In order to hold the roller against the cam 71 (which may be either a plain cam or a step cam) I employ springs 85 having connection at one of their ends to the bottom plate 11, as at 86, and at their other ends to an arm 87 extending from the feed regulating annulus. These springs tend to hold the annulus at the end of its movement in one direction, which is controlled by a stop 88 secured to the underside of the bottom plate 11 and the arm 89 secured to said annulus. The grain passing through the openings 57 in the feed regulating annulus, enters a hopper 90 supported by arms or other suitable means 91 fastened to the bottom plate 11, which hopper may lead to feeding tubes (not shown) or may deliver the grain directly to the point desired.

92 designates an air tube through which hot air for drying the grain may be introduced into the apparatus, or when the apparatus is used as a wheat conditioner moist air may be driven through the wheat, as desired. This air tube enters the side of the hopper 90 and has its inner end bent or curved at a right angle so that its axis is coincident with the axes of the casings 17, 18, said inner end entering a short sleeve 93 passed through the central opening 13 of the bottom plate 11 and having an outwardly directed flange 94 at its upper or inner end which is adapted to bear against the upper side of said bottom plate.

The operation of my apparatus is as follows:—Grain to be dried or otherwise treated is fed into the feed hopper 34 through the leg 37, or in any other suitable manner, and passed therefrom through the outlet 36 from which it is directed onto the conical cap or head of the inner or what may be termed air casing, and thence to the grain chambers 20 in which it gravitates to the bottom. In its downward course through the grain chambers the grain is prevented from clogging by the baffle plates 27, 28. Air in the desired condition is passed into the inner or air casing 17 through the air tube 92 and passes through the perforations in the walls thereof and through the grain traveling downwardly through the grain chambers 20, thence finally out through the perforations in the outer casing 18. The discharge of the grain from the grain chambers is so controlled that a suitable amount of grain is retained in said chambers at all times, the downward passage of the grain being so regulated that the hot or other air will have the desired effect on the grain in its passage through said chambers and be discharged from the lower ends in the desired condition, and as the passage of air is somewhat restricted by the walls of the two casings and the grain between the two, the pressure within the inner or air casing acts against the flange 94 on the short sleeve 93 and retains the same in connected condition with the inner end of the air tube 92. The rotation of the cam 71 causes the actuating rod 51 to oscillate the feed regulating annulus and intermittently open and close the discharge opening 16 in the bottom plate of the casings, with the assistance of the springs 85. Normally the hopper 34 is held in its uppermost position by the springs 38, and

when in this position the spring 48 attached to the shifting lever 46 draws the outer end of said lever to its lowermost position, which raises the inner end thereof to its uppermost position and causes the actuating rod 51 to be elevated so as to bring the roller 53 thereof out of contact with the cam 71, thus retaining the roller substantially the same distance from the axis of the cam shaft as the flat or unstepped side 84 of said cam is positioned from said axis, which positions the feed regulating annulus so that the openings therein are completely out of registration with the feed openings 16 in the bottom plate 11. When the grain within the hopper 34 reaches a certain weight, it causes the controlling lever 41 to actuate the shifting lever 46, which then permits the actuating rod 51 to swing downwardly on its pivot so as to bring the roller 53 thereof in a position in which it co-acts with the smallest cam part of the cam. When, however, the grain is fed into the hopper 34 in larger quantities than the feed regulating annulus permits the discharge of the grain from the drier, the increased weight of the grain in said hopper causes the outer end of the controlling lever to be raised to a sufficient degree to cause the lower end of the shifting lever to move downwardly to an extent sufficient to bring the roller 53 in line with the next larger cam part of the cam, thus causing the actuating rod 51 to increase its range of movement and correspondingly increase the oscillating strokes of the feed regulating annulus, thereby opening the discharge opening 16 in the bottom plate to a greater extent and allowing a freer discharge of grain from the drier. The movement of the feed regulating annulus is further increased as the weight in the hopper 34 increases, and consequently the discharge of the grain from the drier is always in proportion to the extent to which feed hopper 34 is lowered by the weight of the grain therein.

Having thus described my invention, what I claim is,—

1. In an apparatus of the kind described, the combination of a casing having a grain inlet at its upper end, and a series of discharge openings at its lower end, and a single regulating and controlling device provided with a series of openings to be brought into position to permit discharge of grain from said discharge openings, said device controlling the discharge of grain through said openings in proportion to the feeding of grain into said casing.

2. In an apparatus of the kind described, the combination of a casing having a grain inlet and an annular series of grain discharge openings, a spring-supported receptacle delivering grain into said inlet and adapted to be moved vertically in accordance with the weight of the grain therein, a single regulating and controlling device provided with an annular series of openings and being rotatable in a horizontal plane, and means between said spring-supported receptacle and said regulating and controlling device to actuate the latter and to control the discharge of grain through said discharge openings.

3. In an apparatus of the kind described, the combination of a casing having an outer wall and an inner wall separated from said outer wall to provide a grain chamber between the two and an air chamber within said inner casing, said air chamber being closed at both ends and having an air inlet at its lower end, both walls of said casings being constructed of foraminous material, said grain chamber being open at its upper end and closed at its lower end and having a series of discharge openings at said lower end, a regulating device beneath said discharge openings having openings therethrough adapted to be intermittently brought into position to permit the passage of grain therethrough.

4. An apparatus of the kind described comprising an outer casing and an inner casing separated from said outer casing to provide a grain chamber between the two, said inner chamber being closed at opposite ends and having an air inlet at its lower end and said grain chamber being closed at its lower end and having a series of discharge openings at said lower end, said casings having their side walls constructed of foraminous material, a feed hopper yieldingly mounted in a plane above said casings and adapted to feed grain into said grain chamber, a regulating device normally closing the discharge openings of said grain chamber, means for actuating said regulating device, and operative connection between said feed hopper and said regulating device to control the quantity of grain to be discharged from said grain chamber within any given period of time.

5. An apparatus of the kind described comprising an outer cylindrical casing and an inner cylindrical casing, said casings having their side walls formed of foraminous material and being separated to provide a grain chamber therebetween, said inner casing having a conical cap secured to its upper end and having its lower end closed and provided with an air inlet, a feed hopper yieldingly mounted and arranged above said conical cap to deliver grain thereon, means for regulating the discharge of grain from said grain chamber, and operative connection between said feed hopper and said regulating means whereby the latter is caused to permit the discharge of grain from said grain chamber in proportion to the weight of the grain within said feed hopper.

6. An apparatus of the kind described comprising an inner and an outer casing separated from each other to provide a grain chamber, said inner casing being closed at its upper end by a conical cap and the lower ends of both casings being closed by a bottom plate having a central opening and a series of discharge openings in line with said grain chamber, an air tube connected to said central opening, a grain discharge regulating device movable beneath said discharge openings and having openings therein corresponding in number to said discharge openings, mechanism for moving said grain discharge regulating device to open and close said discharge openings intermittently, a feed hopper yieldingly mounted above said conical cap, and operative connection between said feed hopper and said discharge regulating device to cause the latter to move in proportion to the movement of said feed hopper so as to open the discharge openings of said grain chamber to a greater or lesser degree accordingly as said feed hopper raises or lowers.

7. An apparatus of the kind described comprising two cylindrical casings constructed of foraminous material and separated from each other to provide an intervening annular grain chamber, a bottom plate closing the lower ends of said casings and having an air inlet opening into the inner casing and an annular series of discharge openings at the lower end of said grain chamber, an annulus beneath said discharge openings having openings corresponding in number to said discharge openings and being normally out of registration with the same, means for oscillating said annulus, means for controlling the range of movement of said annulus, a spring-supported feed hopper above said conical cap, and operative connection between said feed hopper and said means for oscillating said annulus to govern the range of movement of said annulus.

8. An apparatus of the kind described comprising an outer casing and an inner casing, each having its side walls formed of foraminous material and being constructed of superposed sections, said casings being separated from each other to provide an intervening grain chamber, baffle plates within said grain chamber, means for feeding grain into said chamber, and means for controlling the discharge of grain from said grain chamber.

9. An apparatus of the kind described comprising two cylindrical casings having their cylindrical walls formed of foraminous material and being separated from each other by an annular intervening grain chamber, said casings being closed at their lower ends and said inner casing being closed at its upper end, said grain chamber having an annular series of discharge openings at its lower end, an air tube connected with the lower end of said inner casing, baffle plates arranged in said grain chamber, a discharge regulating device having a series of openings therein and being adapted to normally close said discharge openings, means for oscillating said regulating device including a stepped cam providing cam parts having different ranges of throw and a roller adapted to engage any one of said cam parts, a yieldingly-supported feed hopper above said inner chamber adapted to feed grain into said grain chamber at all points, and operative connection between said feed hopper and said means for oscillating said regulating device whereby said roller is caused to engage different cam parts of said cam accordingly as the feed hopper raises or lowers under the weight of grain therein.

10. An apparatus of the kind described comprising an outer cylindrical casing having its side walls constructed of foraminous material, an inner cylindrical casing separated from said outer casing to provide an annular intervening space and having its side walls also constructed of foraminous material, a bottom plate closing the lower ends of said casings and having a central opening and annular series of discharge openings at the lower end of said intervening space, vertically-disposed spacing supports separating said annular intervening space into a plurality of grain chambers, means for feeding the grain into the upper ends of said grain chambers, an air tube entering the central opening of said bottom plate, an annulus provided with openings and arranged beneath the said discharge openings, and means for oscillating said annulus.

11. An apparatus of the kind described comprising an outer casing open at its upper end and closed at its lower end and having a series of discharge openings at said lower end, an inner casing spaced from said outer casing to provide a grain chamber, said inner casing being closed at its lower end and having a central opening at said lower end and a conical cap at its upper end formed of two sections, one section being of frusto-conical formation open at its upper end and the other of conical formation closing the open upper end of said frusto-conical section, means for feeding grain onto said cap to deliver the same into said grain chamber, and means for opening or closing said discharge openings.

12. An apparatus of the kind described comprising two cylindrical casings formed of foraminous material and spaced one within the other with an intervening space forming a grain chamber, means for directing air into the inner casing at its lower end, and means to permit the discharge of grain

from the lower end of said grain chamber, said casings being formed of superposed sections and having independently supported baffle plates in the grain chamber of each section.

13. An apparatus of the kind described comprising an inner and an outer cylindrical casing both closed at their lower ends and said inner casing having a conical shaped cap at its upper end, said casings having their cylindrical walls formed of foraminous material and being separated from each other by an intervening space to provide an annular grain chamber, said grain chamber having annular series of discharge openings at its lower end, a regulating annulus beneath said discharge openings having an annular series of openings therein normally out of registration with said discharge openings, a shaft mounted for rotation, a cam secured to said shaft, an actuating rod secured with one end to said annulus and having a roller at its other end engaging said cam and serving to slightly rotate said annulus in one direction, and means tending to retain said annulus at the end of its movement in the opposite direction.

14. An apparatus of the kind described comprising an inner and an outer casing spaced apart to provide an annular intervening grain chamber, said grain chamber being open at its upper end and provided with an annular series of discharge openings at its lower end, means for passing air through said grain chamber, a yieldingly-mounted feed hopper above said inner casing, a controlling-lever fulcrumed between its ends and having one end pivotally secured to said feed hopper, a shifting-lever fulcrumed between its ends beneath said casing, flexible connection between said levers, an annulus beneath said discharge openings having an annular series of openings therein and normally closing said discharge openings, means for retaining said annulus in normal position, an actuating rod secured to said annulus, means for imparting movement lengthwise to said actuating rod including a cam having cam parts of different throws adapted to actuate said rod, said actuating rod being brought into engagement with the different cam parts by said shifting lever when the latter is actuated by the raising or lowering of said feed hopper.

15. An apparatus of the kind described comprising an outer casing and an inner casing separated from said outer casing by an annular grain chamber, said casings being closed at their lower ends by a bottom plate having an annular raised portion extending upward between said casings and provided with an annular series of discharge openings, an annulus beneath said discharge openings adjustably mounted for oscillation and so as to be movable toward and from said discharge openings, and means for oscillating said annulus.

16. An apparatus of the kind described comprising a grain chamber having a series of grain discharge openings at its lower end, said openings having downwardly tapering walls and having the walls of adjacent openings meeting each other, means for introducing air through said grain chamber at an angle to the flow of grain therethrough, and means for controlling the discharge of grain through said discharge openings.

17. In an apparatus of the kind described, the combination of two casings arranged one within the other and spaced apart to provide an annuar intervening space, said space being divided into a plurality of parti-circular grain chambers, each chamber having a series of discharge openings at its lower end, and parti-circular baffle plates arranged in each grain chamber and being somewhat narrower and shorter than said grain chamber.

18. An apparatus of the kind described comprising two casings arranged one within the other and spaced to form an annular grain chamber, the side walls of said casings being formed of foraminous material, a conical cap secured to the upper end of said inner casing and having a movable apex section, a feed hopper above said conical cap, means for passing air through said grain chamber, and means for controlling the discharge of grain from said grain chamber.

19. An apparatus of the kind described comprising an inner cylindrical casing and an outer cylindrical casing spaced from said inner cylindrical casing to provide an annular grain chamber, said grain chamber being open at its upper end and having an annular series of discharge openings at its lower end, an annulus normally closing said discharge openings and being mounted for oscillating movement beneath said openings, said annulus having an annular series of openings therein, a turntable, a shaft mounted for rotation on said turntable, a cam shaft driven by said shaft, a cam on said cam shaft, an actuating rod connected to said annulus and engaging said cam, and means for retaining said annulus in normal position.

In witness whereof, I have affixed my signature in the presence of two subscribing witnesses.

FREDERICK A. WEGNER.

Witnesses:
EDWARD A. PAUL,
GENEVIEVE E. SORENSEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."