Dec. 1, 1953 G. F. THOMAS 2,661,159

MULTIPLE SCREEN PULVERIZER

Filed June 12, 1951 2 Sheets-Sheet 1

Fig. 1

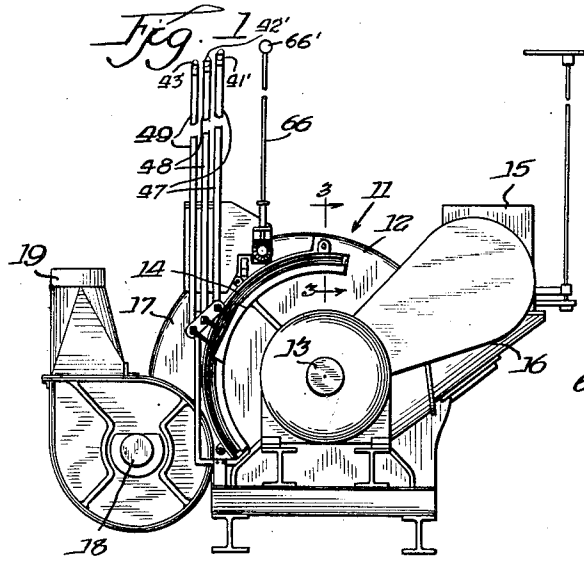


Fig. 3.

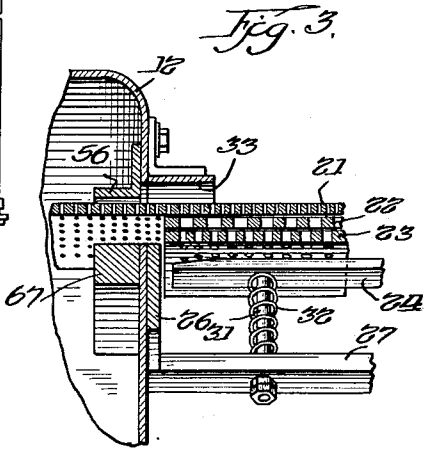


Fig. 4.

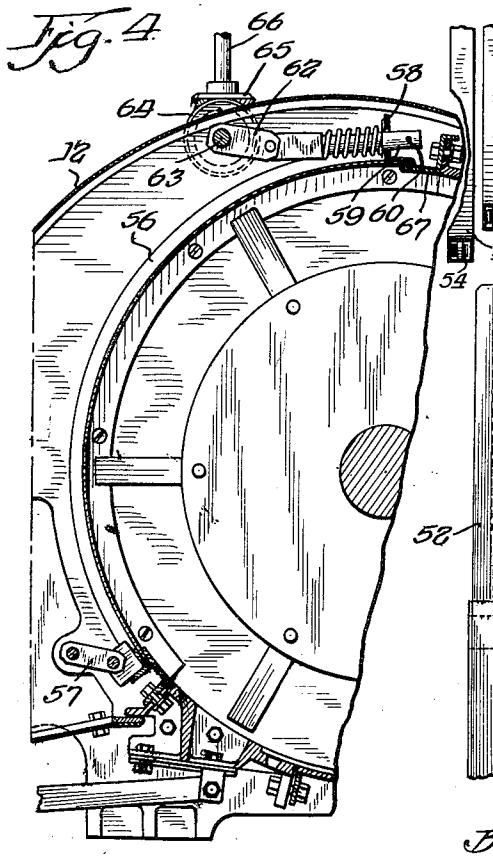
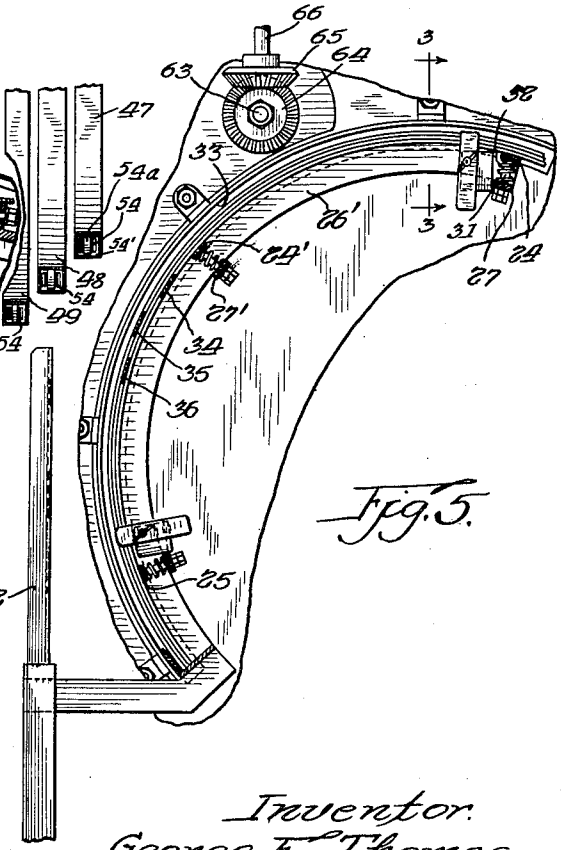


Fig. 5.

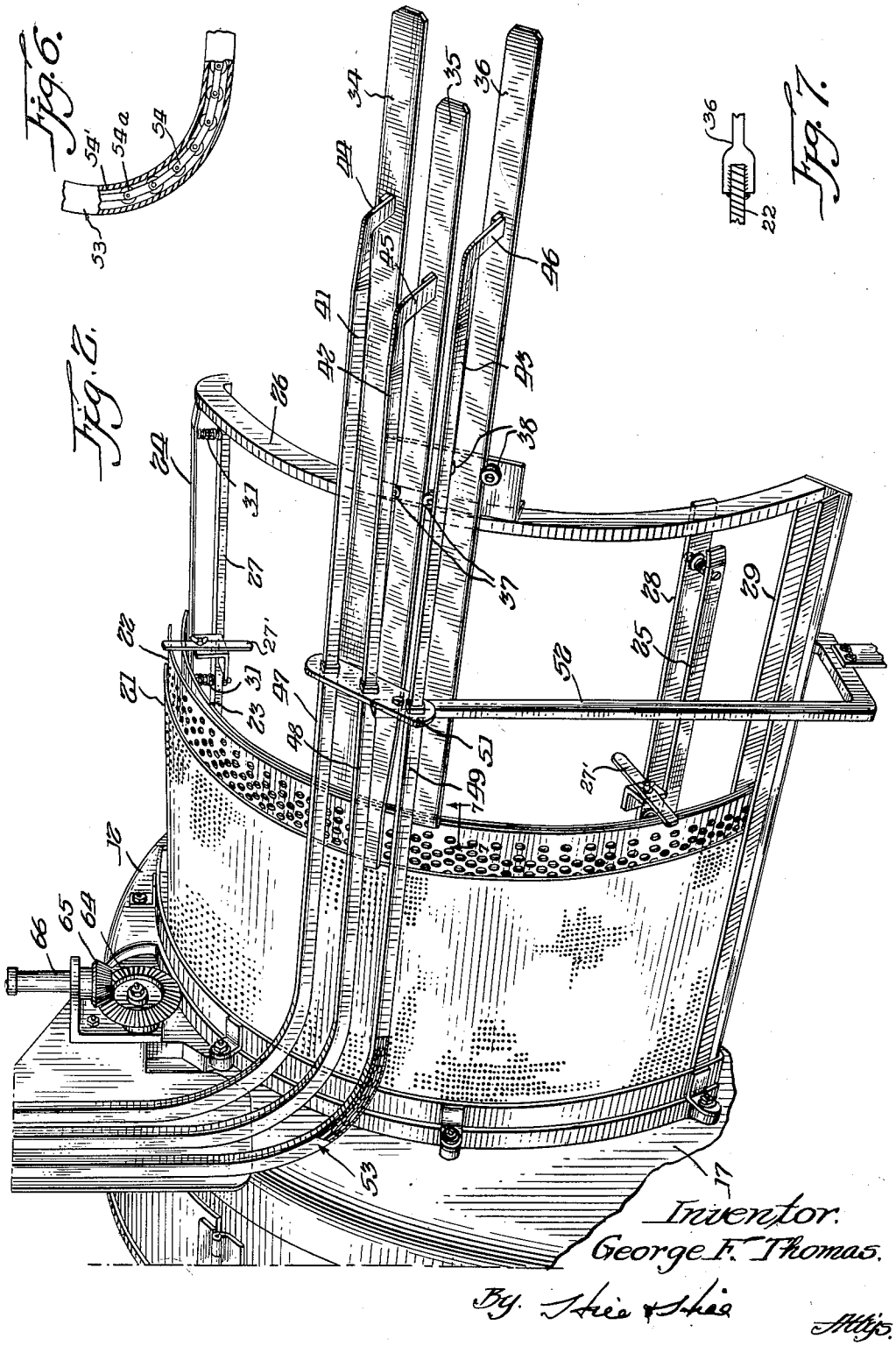


Inventor.
George F. Thomas.
By Hill & Sherman
Attys.

Dec. 1, 1953 G. F. THOMAS 2,661,159

MULTIPLE SCREEN PULVERIZER

Filed June 12, 1951 2 Sheets-Sheet 2



Patented Dec. 1, 1953

2,661,159

UNITED STATES PATENT OFFICE

2,661,159

MULTIPLE SCREEN PULVERIZER

George F. Thomas, Chicago, Ill., assignor to Prater Pulverizer Company, Chicago, Ill., a corporation of Illinois

Application June 12, 1951, Serial No. 232,581

9 Claims. (Cl. 241—89)

1

The present invention relates to a pulverizing or grinding unit.

More particularly, the invention relates to a remotely controlled multiple screen pulverizing unit.

In known pulverizing or grinding units, the ultimate particle size of the material being ground, such as corn, wheat, oats, barley, and other materials, is controlled by the size of mesh screen used in conjunction with the movable pulverizing elements of the unit, such as rotary hammers; and, in order to convert the unit from one type of grinding to a different grind, for example from a coarse to a fine grind, it is first necessary to shut the unit down, and then change screens. This method of controlling the size or grain of the material is laborious and time-consuming, results in a reduced output of the unit, and, in addition, requires the attention of a mechanic in effecting the conversion. Though there are some semi-automatically operating pulverizing units in existence, these units are not too satisfactory in that they require what is quite often critically needed space, and are relatively expensive to manufacture.

It is therefore one object of the present invention to provide a compact pulverizing unit that can be readily converted to produce any desired size grain from the particles of material being worked.

Another object of the invention is to provide an improved pulverizing unit which can be easily and quickly converted from a grinding operation resulting in a first sized grain to an operation producing a different sized grain, while the unit is operating.

Another object of the invention is to provide a pulverizing unit that is capable of being converted from one type of grinding operation to a second from a position remote from the situs of the unit.

A still further object of the invention is to provide an improved, compact multiple screen pulverizing unit which is relatively cheaper to construct and maintain than known pulverizing units of the same general type.

A feature of the invention is the provision of an improved pulverizing unit utilizing a plurality of different mesh screens for controlling the fineness of the grain produced by the unit from particles of material fed thereto.

Another feature of the invention is the provision of a novel, remote control, multiple screen pulverizing unit that can be easily changed from operation with a first mesh screen to operation

2

with a different mesh screen while the unit is operating, and from a position remote from the situs of the unit.

A still further feature of the invention is the provision of a compact multiple screen pulverizing unit wherein the various mesh screens used in the unit to determine the grain or size of the material being worked are selectively inserted into working position through a single opening in one side of the housing of the unit.

Other objects, features, and many of the attendant advantages of this invention will be appreciated readily as the same becomes understood by reference to the following detailed description when considered in connection with the accompanying drawing, wherein similar parts in each of the several figures are designated by the same reference numeral, and wherein:

Fig. 1 is an end elevational view of a multiple screen pulverizer constructed in accordance with the invention;

Fig. 2 is a side perspective view of a portion of the pulverizing unit shown in Fig. 1, and illustrating the novel screen mounting of the unit;

Fig. 3 is a fragmentary sectional view of the housing of the pulverizing unit taken through plane 3—3 of Fig. 1;

Fig. 4 is a fragmentary, enlarged, and elevational view of the case assembly, partly in section, showing the remote control connecting links used to move the screens of the pulverizing unit;

Fig. 5 is a fragmentary cross sectional view of the unit taken through the housing for the rotary cutter portion thereof.

Fig. 6 illustrates, partly in section, the chain within the curved portion of a tubular guide for actuating a coupling link; and,

Fig. 7 illustrates the bifurcated joint between a push rod and a screen connected thereto.

Referring now to Fig. 1 of the drawings, an improved pulverizing unit constructed in accordance with the invention is shown at 11. The unit includes a housing 12 enclosing a means for pulverizing material to be ground. The pulverizing means preferably comprises a plurality of stages of rotary hammers secured to a shaft 13 journalled in housing 12, and cooperate with a selected one of a plurality of multiple screens of different mesh, shown at 14, to provide the desired grinding operation.

In operation, the material to be ground, for example, wheat, barley, oats, etc., is fed into a preconditioning crusher 15 wherein the size of the particles is reduced. From the precondi-

tioning crusher 15 the material is fed through a conveyor, shown broadly at 16, to one side of housing 12, and injected into the interior of the housing where it is acted upon by the rotary hammers or pulverizer means. The rotary hammers serve to drive the material through a selected one of the different mesh screens 14 into an outwardly flared delivery chute portion 17 which is connected to the suction side of an output blower 18 that serves to blow the ground material through an output conduit 19 to a collection apparatus.

As the fineness of the material delivered by output fan or blower 18 is determined by the mesh of the screen 14 used in conjunction with the movable pulverizing means contained in housing 12, it is necessary to change the screens from one mesh to another, in order to convert the unit from delivering particles of one fineness to particles of a different fineness. To accomplish this purpose while the unit is operating, and from a position remote from the situs of the machine, the present invention contemplates the use of a novel screen supporting and selective moving means.

Referring now to Fig. 2 of the drawings, the construction of the novel screen supporting and selective moving means is illustrated. In the present embodiment of the invention, three screens of different mesh 21, 22, 23, are provided; however, if desired, fewer or more screens may be used. The screens 21, 22, and 23 are disposed on a plurality of arcuately spaced, resiliently supported members, two of which are shown at 24 and 25. The resiliently supported members are operatively connected to a supporting frame that comprises a plurality of longitudinally aligned, arcuately-shaped bars 26 joined together by a plurality of longitudinally extending bars 27, 28, and 29. As is best shown in Fig. 3, resiliently supported members 24 are connected to a respective one of the longitudinally extending bars 27, 28 by means of a plurality of vertically extending bolts 31. One end of each of the bolts 31 is secured to one of the members 24 or 25, whichever the case may be, and the remaining end is slidably supported in a bore in one of the longitudinal bars 27 or 28. Surrounding each of the bolts 31 is a coil compression spring 32 having one of the ends thereof abutting against the member 24 or 25, and the remaining end thereof abutting against one of the bars 27 or 28. By this construction, the spring forces members 24 and 25 outwardly and serves to resiliently mount the same. Stop means 27' prevents longitudinal movement of the screens beyond a predetermined position on the resiliently supported members 24 and 25.

As is best shown in Figs. 3 and 5, each of the screens 21, 22, or 23 is aligned with an arcuate opening 33 in the side of housing 12, and is adapted to be slid through the opening 33 into the interior of housing 12 to a cooperating position with the movable pulverizing means contained therein. In order to move a desired one of the screens 21, 22, or 23 into the interior of housing 12, a means for selectively moving any desired one of the screens 21, 22, or 23 includes a plurality of push rods 34, 35, and 36, each one having one of the ends thereof connected to a respective one of the screens 21, 22, or 23 by means of a bifurcated joint, Fig. 7. The push rods 34, 35 and 36 are slidably supported in rollers, two sets of which are shown at 37 and 38, mounted on arcuate bar 26 of the supporting frame. The remaining ends of the push rods 34, 35, and 36 are secured to a respective one of a plurality of coupling links 41, 42, and 43 having a plurality of transversely disposed leg portions 44, 45, and 46 secured to outwardly extending flanges formed on the push rods 34, 35, and 36, respectively. Each of the connecting links 41, 42, and 43 are contained within a plurality of tubular guides 47, 48, and 49, respectively, secured to the supporting frame by means of a bracket 51 and a vertical support 52. The tubular members 47, 48, and 49, together with the respective connecting links they encase, extend to a control platform situated in a position remote from the situs of the unit and the links 41, 42, and 43 are actuated by operating levers or lever control means 41', 42', and 43'. As is best shown in Fig. 4, in places where the tubular guides are bent, as at 53 in Fig. 2, a section of flexible block roller chain 54 is provided between adjacent ends of the straight rods comprising the connecting links in order that the link be longitudinally movable within the tubular guides. The rigid side links 54' permit the chain to be placed in compression to move the chain 54 to the right since the rollers 54a are guided within the curved portion of the tube 53.

By this construction, should it be desired to change any one of the screens while the unit is in operation, the only operations required are that the push rod of the screen then in operating position be moved so as to retract the screen from co-operating position with the movable pulverizing means of the unit, and the push rod of the screen to be inserted in its place moved so as to insert the selected screen through opening 33 into operating position.

In order to secure a selected one of the screens 21, 22, or 23 in working position when the same is inserted within the housing 12, a clamping means for retaining the selected screen in cooperative position with the movable pulverizing means of the unit is provided. As is best shown in Figs. 3 and 4, the clamping means include a plurality of right and left hand, longitudinally aligned, arcuately bent, L-shaped members, one of which is shown at 56, each having the lower end thereof rotatably supported with the housing 12 by means of a pivoted lever arm 57, and having a bracket 58 secured to the upper end thereof. Slidably seated in an aperture in the bracket 58 is a spring-biased pin 59 having a cotter pin, or some similar stop means 60, in one end thereof, and having the remaining end thereof pivotally secured to a lever arm 62. The lever arm 62 is keyed, or otherwise secured to a rotatable shaft 63 that is journaled in housing 12, and has a vertically disposed bevel gear 64 likewise secured thereto. The vertically disposed bevel gear 64 co-operates with a horizontally disposed bevel gear 65 connected to a rotatable shaft 66 that extends upwardly to the previously mentioned control position situated in a location remote from the unit and actuated by lever means 66'.

In order to insert a desired one of the screens in working position within housing 12, for example screen 21, the arcuate clamps 56 must be first backed away from the clamping position, as shown in Fig. 5. The shaft 66, and consequently shaft 63, are turned in a direction so as to rotate lever arm 62 clockwise from its position shown in Fig. 5. Rotation of lever arm 62 in a clockwise direction causes the stop pin

60 of connecting link 59 to engage bracket 58 of clamp 56, and to move the upper end thereof out and away from an arcuately bent backing block 67 supported on the inner surface of housing 12 and bordering the arcuate opening 33. Simultaneously with this action, the lower pivoted arm 57 allows the lower end of each of the clamps 56 to pivot out and away from backing block 67 to the position shown in Fig. 3 of the drawings. Upon the clamping bars reaching the position shown in Fig. 3, a desired one of the screens, for example screen 21, may be inserted through the opening 33 into working position within housing 12 by operating the push rod 47 connected to screen 21. Upon the screen 21 being properly placed within housing 12, the shafts 66 and 63, and consequently lever arm 62, are again operated to rotate lever arm 62 counterclockwise to the position shown in Fig. 5. This results in forcing the clamps 56 downwardly from the position shown in Fig. 3 into co-operation with the inserted screen 21 and backing block 67, and results in rigidly securing the selected screen 21 in working position within housing 12. Because of the resilient support provided for member 24 and the additional screens 23 and 22, these elements are allowed to move downwardly with the selected screen 21 as the same is forced downwardly by L-shaped clamp 56 into engagement with block 67; thereby allowing the screen to be properly aligned when in the set position.

From the foregoing description it can be readily appreciated that the invention provides a remotely controlled, compact, multiple screen pulverizing unit that can be readily converted to produce any desired fineness of grain from particles of material pressed therethrough. By reason of the plurality of screens incorporated in the invention, any desired fineness of grain can be provided by merely changing the screens from one mesh to a screen of a different mesh. The screens may be changed while the unit is operating, and because of the connecting links which extend to a remote control position, the change can be effected from the remotely situated control position. Because each of the different mesh screens are separate structures that can be cut to a width such that it is necessary to provide only one opening in the side wall of the housing of the unit in order to insert the screen therewithin, this feature makes it possible to maintain the integrity of closure of the housing of the unit without requiring any more than a minimum number of sealing devices and, at the same time, incorporate the desirable feature of multiscreen operation.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence, I do not wish to be understood as limiting myself to the exact form, construction, arrangement, and combination of parts herein shown and described, or uses mentioned.

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

1. A multiple screen pulverizing unit comprising a housing, rotary means for pulverizing particles of material enclosed within said housing, a plurality of arcuately shaped movable screens of varying mesh supported on said housing, said screens being operatively mounted and arranged contiguously and concentrically with respect to each other when withdrawn from the unit, said

housing having an arcuate opening therein longitudinally aligned with the peripheral path defined by the outer ends of said rotary pulverizing means, remotely controlled means for selectively moving in either direction any desired one of said screens from the concentric arrangement outside of the unit to its position within the unit through said arcuate opening into co-operation with said rotary pulverizing means, and remotely controlled releasable means for clamping a selected one of said screens in co-operating position with said rotary pulverizing means, said plurality of screens being movable transverse to the line of movement thereof into said housing whereby proper alignment of a selected one of said screens with said rotary pulverizing means may be effected by said releasable means.

2. A multiple screen pulverizing unit comprising a housing, rotary hammers for pulverizing particles of material journaled in said housing, said housing having an arcuate opening in one of the side walls thereof aligned with the peripheral path defined by the ends of said rotary hammers during the travel thereof, a frame supported on said housing, said frame including a plurality of resiliently supported members and support members therefor, a plurality of individually movable arcuately shaped screens of varying mesh disposed in concentric and contiguous arrangement on said resiliently-supported members and aligned with the arcuate opening in said housing, stop means on said frame for preventing longitudinal movement of said screens beyond a predetermined distance on said resiliently supported members, a plurality of push rods, each push rod being connected to one of said screens for selectively moving the same through said opening into said housing to a position adjacent the ends of said rotary hammers, arcuate clamp means on said housing for engaging a selected one of said screens and holding the same in cooperating position with said rotary hammers, means for engaging and disengaging said clamp means with a selected one of said screens, means operatively connecting said engaging and disengaging means to a control lever remotely positioned from said unit, and connecting link means operatively connecting said push rods to operating levers remotely positioned from said unit.

3. A multiple screen pulverizing unit comprising a housing, rotary means for pulverizing particles of material supported within said housing, said housing having an arcuate opening in one wall thereof longitudinally aligned with the peripheral path defined by said rotary means during the travel thereof, a plurality of compressible members supported on said housing, a plurality of arcuately shaped movable screens of varying mesh disposed to overlie each other in concentric arrangement exteriorly of said housing on said compressible members and aligned with the opening in said housing, means connected to each one of said screens for selectively moving the same from said concentric arrangement through said opening into said housing to a position adjacent said rotary pulverizing means, releasable clamp means on said housing for securing a selected one of said screens in co-operating position with said rotary pulverizing means, lever means remotely positioned from said unit and operatively connected to said releasable clamp means for controlling the operation thereof, and connecting link means operatively

connecting said screen selecting means to operating levers remotely positioned from said unit.

4. A multiple screen pulverizing unit comprising a housing, movable means for pulverizing particles supported within said housing, said housing having an arcuate opening therein, a laterally extending frame operatively supported with respect to the side of said housing formed with the arcuate opening, said frame including a plurality of resiliently supported members, a plurality of laterally movable, arcuate, and varying mesh screens concentrically and contiguously disposed with respect to each other on said spring supported members and aligned with the arcuate opening in said housing, said arcuate screens being movable longitudinally with respect to the axis of the movable means, a plurality of push rods, each push rod being connected to one of said screens for selectively laterally moving the same from storage position on the frame through said arcuate opening into use position within said housing to a position adjacent said movable pulverizing means, and releasable clamp means on said housing for securing a selected one of said screens in cooperating position with said movable pulverizing means.

5. A multiple screen pulverizing unit comprising a housing formed with an arcuate opening in a side thereof, movable means for pulverizing particles of material enclosed within said housing, a plurality of individually movable arcuate screens of varying mesh concentrically and contiguously arranged and supported on the exterior of said housing at the side thereof formed with the arcuate opening, and means for selectively laterally moving from storage position longitudinally with respect to the axis of the movable means any desired one of said arcuate screens from its concentric arrangement exteriorly of the housing into use position through said arcuate opening in cooperation with said movable pulverizing means to reduce the particles of material to a desired grain.

6. A multiple screen pulverizing unit comprising a housing, movable means for pulverizing articles of material supported within said housing, said housing having an arcuate opening in one wall thereof, a plurality of individually movable screens of varying mesh concentrically and contiguously arranged and supported exteriorly of said housing with respect to the wall formed with the arcuate opening and adapted to be selectively inserted from storage position longitudinally with respect to the axis of the movable means through said arcuate opening into said housing to a use position adjacent to and cooperating with said movable pulverizing means, means for selectively laterally moving from storage position any desired one of said screens from its concentric arrangement exteriorly of the housing into cooperating use position with said movable pulverizing means, and releasable clamp means on said housing for securing a selected one of said screens in cooperating position with said movable pulverizing means.

7. A multiple screen pulverizing unit comprising a housing, rotary means for pulverizing particles of material supported within said housing, said housing having an arcuate opening in one wall thereof longitudinally aligned with the peripheral path defined by said rotary means during the travel thereof, a plurality of compressible

members laterally supported with respect to the wall of said housing provided with the arcuate opening, a plurality of arcuately shaped, movable screens of varying mesh disposed contiguously in concentric arrangement on said compressible members and aligned with the arcuate opening in said housing, means connected to each one of said screens for selectively laterally moving the screens longitudinally with respect to the axis of the rotary means from concentric arrangement for storage exteriorly of the housing through said arcuate opening into said housing to a use position adjacent said rotary pulverizing means, and releasable clamp means on said housing for securing a selected one of said screens in cooperating position with said rotary pulverizing means.

8. A multiple screen pulverizing unit comprising a housing having a wall formed with an arcuate opening, movable means for pulverizing particles of material enclosed within said housing, a plurality of individually movable arcuate screens of varying mesh laterally supported in concentric arrangement contiguously to each other with respect to said housing and adapted for movement through said arcuate opening, remotely controlled means for selectively laterally moving any one of said screens from their concentric arrangement in storage into cooperation with said movable pulverizing means and substantially parallel to the axis thereof to reduce the particles of material to a desired grain, and remotely controlled means for clamping a selected one of said screens in cooperating position with said movable pulverizing means.

9. A multiple screen pulverizing unit comprising a housing, movable means for pulverizing particles of material supported within said housing, said housing having a wall formed with an opening therein, a plurality of individually movable screens of varying mesh complementally formed to the opening and supported exteriorly of the wall of said housing formed with the opening and adapted to be individually inserted longitudinally with respect to the axis of the movable means through said opening from their respective contiguous overlying positions exteriorly of said housing into said housing to a use position adjacent to and cooperating with said movable pulverizing means and parallel to the axis thereof, means for selectively longitudinally moving any desired one of said screens into or out of cooperating position with said movable pulverizing means and moving said screens parallel to the axis of the movable means, releasable clamp means on said housing for securing a selected one of said screens in cooperating position with said movable pulverizing means, and means for controlling the operation of said releasable clamp means and said selective moving means from a position remote from the situs of said unit.

G. F. THOMAS.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,227,090	Hughes	Dec. 31, 1940
2,258,537	Calkins	Oct. 7, 1941
2,360,892	Rench	Oct. 24, 1944
2,488,714	Delk	Nov. 22, 1949