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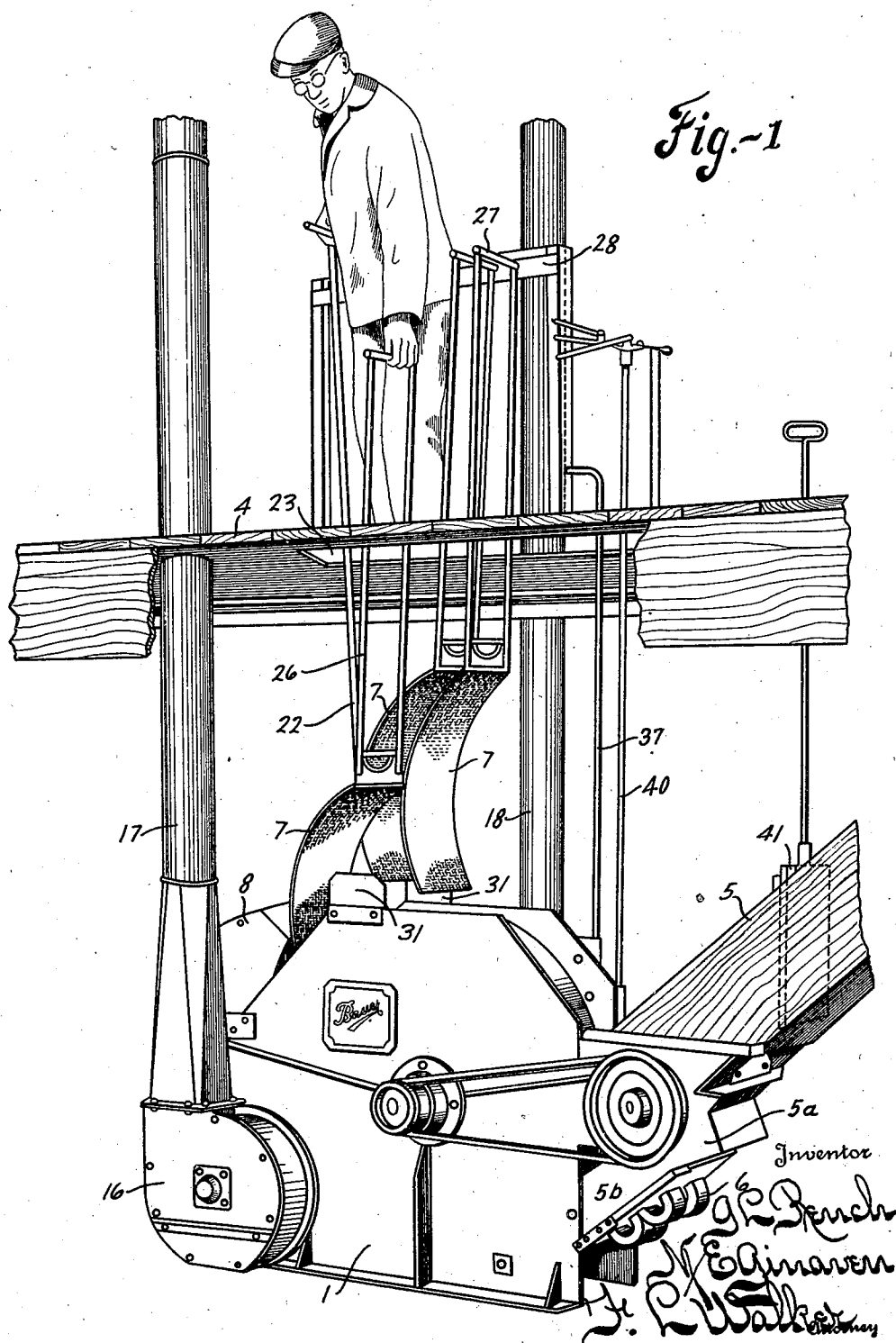
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HAMMER MILL

Filed March 6, 1941

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2 Sheets-Sheet 2

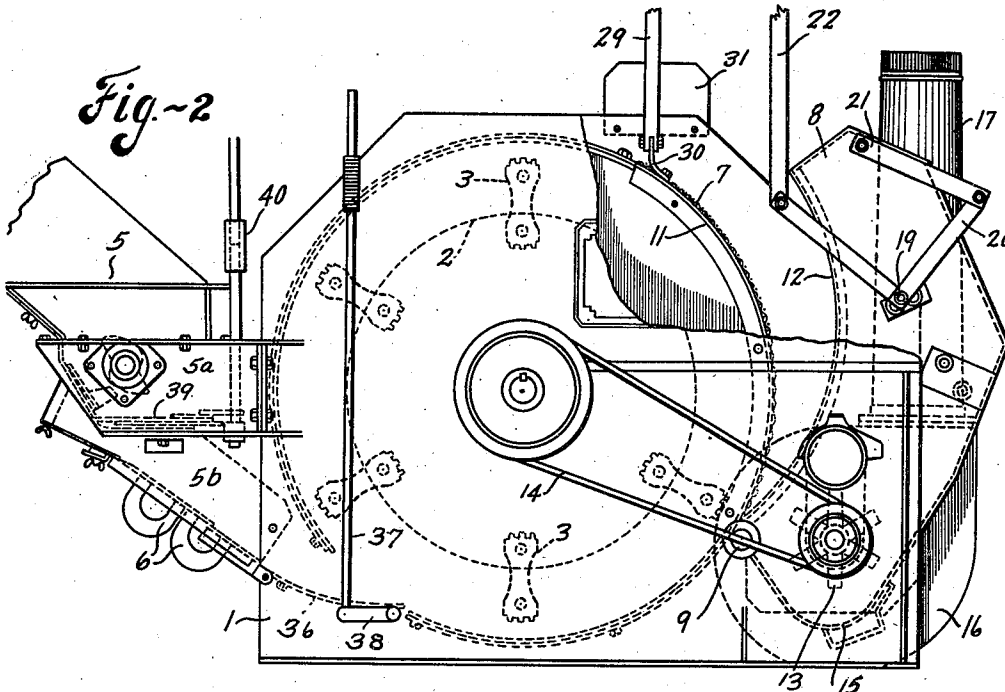
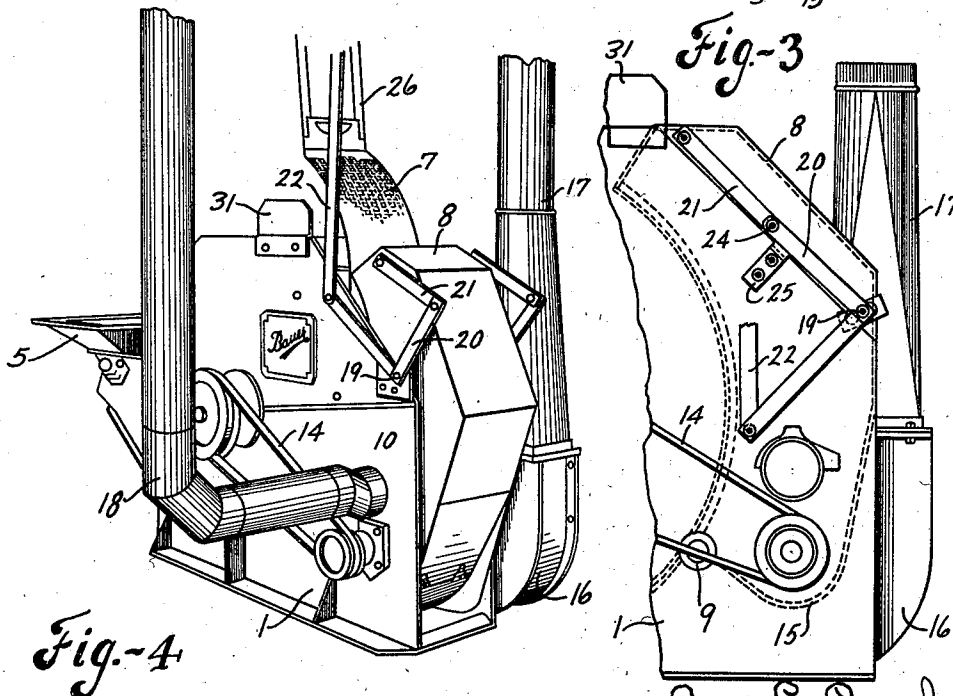


Fig.-4

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HAMMER MILL

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12 Claims. (Cl. 83—11)

This invention pertains to grinding mills and pulverizing apparatus, and more particularly to the provision of interchangeable screens therefor, and the herein described means and method by which screens of different mesh and capacities may be interchanged one for another by remote control.

While the present invention is applicable to apparatus of various character and construction for pulverizing or comminuting either vegetable or mineral materials, for illustrative purpose, but with no intent to unduly limit its scope or application, it is herein shown and described as applied to hammer mills used for grinding grain. It is therefore to be understood that the invention is not limited to the particular application illustrated.

It is quite customary to locate the grinding apparatus on a lower floor or in a basement, while the operator is stationed on a floor above. The operating floor is ordinarily the charging floor from which the material is delivered to the mill by gravity through a chute, and to which it is returned in reduced form by a conveyor or blower.

In such usual installation, it is necessary for the operator to go from one floor to the other each time grading screens are to be interchanged, and it is sometimes necessary to stop the operation of the mill to enable removal and replacement of screens. Such running back and forth results in considerable loss of time and wasted effort. Furthermore, it reduces the output of the mill and materially increases the operating costs thereof.

The present invention is designed to enable the grading screens to be easily and quickly interchanged by the operator without leaving the charging floor and without disconnecting the power or arresting the operation of the mill, other than to interrupt the supply of material thereto. The remote control method of interchange of screens herein described materially reduces the time required for interchange of screens and conserves power, and reduces the time the mill is idle, thus minimizing operating costs.

The object of the invention is to provide remote control screen changing apparatus for mills which may not only be economically constructed and installed, but which will be efficient and rapid in operation, of increased safety, durable, having minimum parts and unlikely to get out of repair.

A further object of the invention is to provide an improved method of screen changing operation which may be performed by remote control without the necessity of the operator leaving the

charging floor and without shutting down the mill.

A further object of the invention is to provide improved means for mounting and securing interchangeable screens in a mill housing.

A further object of the invention is to provide screen changing apparatus possessing the herein mentioned advantageous structural features and inherent meritorious characteristics, and the remote control method of performing the screen changing operations herein described.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation, or their equivalents, as hereinafter described or illustrated in the accompanying drawings.

In the accompanying drawings, wherein is shown the preferred but obviously not necessarily the only form of embodiment of the invention,

Fig. 1 is a perspective view of a hammer mill installation illustrating the present method of interchanging grading screens from the floor above, as herein set forth and claimed.

Fig. 2 is a side elevation, partly in section, showing the mill cover open for interchange of grading screens.

Fig. 3 is a side elevation of the mill housing, partly broken away, showing the housing in closed condition.

Fig. 4 is a perspective view of a hammer mill to which the present invention has been applied viewed from the side opposite that shown in Fig. 1.

In the drawings, 1 is a typical hammer mill, within the housing of which a rotor 2 carries a plurality of pivoted radially extending hammers 3, which by their impact upon the grain or other material reduces it to a pulverized or finely comminuted condition. The rotor is driven from any suitable source of power at speeds varying from

eighteen hundred to thirty-six hundred R. P. M. The mill is ordinarily installed in the basement of the building or on a lower floor, while the operator is stationed upon a floor above as at 4, which is the charging floor. Grain or other material to be ground is supplied to the mill 1 from the charging floor 4 through a chute 5 having therein a cut-off member 5a. In passing through the chute the grain flows over a magnetic separator 6 which attracts and removes "tramp iron" or metallic particles which may be

entrained in the grain and which would damage the mill.

Such mills are frequently, but not always, installed in rural localities where they are used for custom grinding of grain. Farmers deliver their grain in relatively small quantities of five hundred to a thousand pounds to be ground for home use. Frequently the demand is for portions of the same lot of material to be reduced to different degrees of fineness for chicken mash, hog feed, cow feed, and perhaps some for household use. To provide the various grades of output, arcuate screens 7 of different size perforations are employed for each grade of finished product. To stop the mill and go from the charging floor to the mill floor and return for each change of screen several times during the milling of each relatively small lot of grain, causes a great loss of time and wasted effort. Stopping the mill by shutting off the power and waiting for the momentum of the rotor to be arrested, and thereafter waiting for operating speed to be again acquired after the reapplication of power, results in further loss of time and in non-productive use of power while the mill is being brought up to operating speed. The present method of remote control of the interchangeable screens and the structural features for performing the interchange of screens, serves to overcome the difficulties mentioned.

Instead of the usual cover section bolted to the mill, and which must be elevated or removed to enable interchange of screens, and thereafter replaced and secured, the present mill housing is provided with a pivotally mounted arcuate end section 8 journaled at 9 for swinging motion toward and from the main structure of the mill, and intermediate stationary side walls 10 thereof. Mounted within the opposite side walls of the mill and concentric with the rotary carrier 2 upon which the hammers 3 are mounted, are segment bars or flanges 11. Carried by the swing end section of the mill housing in parallel relation with the concentric segmental flanges 11 when the housing is closed, are complementary segmental flanges 12. The several screens 7 are of arcuate form agreeing with the curvature of the flanges or bars 11 and 12. When in operative position one or another of the screens is clamped between the concentric segmental bars or flanges 11 of the mill structure and 12 of the swinging end section. The more or less finely reduced product is discharged by centrifugal influence against the inserted screen. The particles which are too large to pass through the screen drop back into the field of operation of the whirling hammers 3 for further treatment, while the finer particles pass through the screen into the interior of the swinging end section, which comprises a receiving chamber. In the lower portion of the receiving compartment within the swinging end section of the mill housing is an agitator 13 driven from the hammer rotor shaft by a belt 14. The bottom 15 of the swinging housing section 8 is concentric with the screw conveyor 13 when such housing section is in closed position and forms a trough in which the conveyor operates. The conveyor discharges transversely of the mill housing the refined material which falls into the trough 15 and thence into a blower or centrifugal fan 16, by which the finished product is elevated through the stack 17 to the operating floor above.

During the operative periods of the mill a screen 7 is clamped between the swinging end

section of the mill housing and the stationary portion thereof by being interposed between the segmental bars or flanges 11 and 12 with the curvature of which the screens agree. To enable free flow of the refined product under suction influence of the blower fan 16, an air inlet conduit 18 communicates with the interior of the receiving compartment through the stationary side wall 10 opposite the blower. To enable the mill housing to be opened by swinging the end section away from the main portion of the mill and the screens 7 to be interchanged therebetween, means is provided for controlling the swinging housing section 8 and the screens 7 from the operating floor above the mill. For purpose of opening and closing the mill housing there is pivoted at 19 on the stationary side wall 10 thereof a bell crank lever 20, one end of which is connected by a link 21 with the upper end of the swinging housing section 8. To the opposite end of the bell crank lever is connected a control rod 22 which extends upwardly through an opening 23 in the floor 4 above, and into reach of the operator. By raising and lowering the control rod 22, the bell crank lever is oscillated to and fro to open and close the mill housing. When in closed position the joint 24 between the bell crank lever 20 and the link 21 is moved slightly beyond dead center relation with the pivot 19 of the lever, thereby locking the housing section 8 in closed relation. In final position of adjustment the arm of the bell crank lever 20 to which the link 21 is attached is arrested slightly beyond dead center relation by a stop lug 25 upon the housing section 8.

When the mill housing is closed, a screen 7 is clamped in operative position between the concentric segments 11 and 12. To enable the screens 7 to be inserted and removed and controlled by the operator during such operation, each screen 7 is preferably provided with an elongated bail 26 which also extends upwardly through the opening 23 in the operating floor 4.

At their upper ends the bails 26 are provided with transverse tubular hand pieces 27 which when retracted are engageable over supporting studs projecting from a rack or stand 28 on the operating floor 4, whereby the screens are suspended in elevated position above the level of the mill housing. Obviously, other means may be provided for suspending the screens in inoperative position when withdrawn from the mill housing.

In lieu of the elongated bails 26 for manipulating the screens 7, each screen may be provided with a single rod 29 attached to the screen at 30, Fig. 2 of the drawings, and formed with any suitable hand grip at its upper end whereby the screen may be rotated about a vertical axis and swung to and fro in either of transverse directions to align the screen 7 with the arcuate supporting flanges 11 of the mill. To facilitate accurate location of the screens with relation to the mill housing, guide plates 31 project vertically from the sides of the mill housing at opposite sides of the screen position. By means of the bail 26 or the rod 29 each screen in turn may be lowered into its operative position upon the arcuate bars or flanges 11 preparatory to being clamped in such position by the complementary segments 12 upon closing of the mill housing section 8. However, it is found in practice that the operator merely positions the screen between the guide plates 31 in proximate relation above the

segments 11 and then drops it. The screens readily find their proper positions and the housing may be quickly closed. When the screens are to be again interchanged, the housing is opened by pulling upward on the control rod 22, and retracting the screen 7 by its bail 26 or rod 29 without leaving the operating floor above.

The operation of interchanging the screens is performed without shutting off the power or stopping the mill. Heretofore because of the danger to the operator from the revolving hammers while changing screens, it has been necessary in some installations to shut off the power and wait until the momentum of the hammer rotor has been expended. Then after changing the screen and reapplication of power, development of full operating speed necessarily was awaited. By the present remote control method, the operator is not exposed to injury or danger while interchanging screens and the mill may be maintained at full speed. It is only necessary to shut off the grain supply to the mill by closing the gate 39 during the screen changing operation.

While the invention is herein described and illustrated as applied to a hammer mill for grinding grain, it is to be understood that it may be applied to various other purposes and to other types of mills. For example, it may be applied to stone crushing or ore reduction apparatus, or to paper pulp making and grading apparatus and sundry other purposes wherein pulverized or comminuted material is passed through screens of various size mesh which must necessarily be interchanged from time to time.

It is preferred that each of the interchangeable screens 7 be equipped with a permanently attached extension handle 26 or 29 which also supports the screen in elevated position when not in use.

Grain or other material is supplied to the mill from an elevated source of supply through the chute 5 and thence through a rotary feeder 5a (Fig. 2) and chute continuation 5b in which the magnetic separator 6 is located. The flow of grain therethrough is regulated by adjustment of the gate or cut-off 39 controlled from the operating floor above by the revoluble shaft 40, and is completely closed while the screens are being interchanged. The specific form of the cut-off 39 is immaterial. Any device which will temporarily arrest the flow of grain while the screens are being shifted is sufficient for the present purpose. As an alternative cut-off, a simple form of slide gate is shown at 41 in Fig. 1. To enable release of an over supply of grain or of a stone or foreign body which may have passed the magnetic separator, a pivoted gate 36 is located, as shown in Fig. 2, at the entrance to the mill. The gate 36 is hinged for oscillatory motion into and out of closed position from the remote control station by adjustment of an elongated operator rod 37 connected to a rock arm 38 carried by the gate 36.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be

understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described our invention, we claim:

1. A mill, wherein a screen located within a housing, comprises one of a plurality of interchangeable screens, screen shifting means operable by remote control for interchanging the screen within the housing for another of the plurality thereof, including an elongated extension handle secured thereto in such manner that the screen may be rotated about a vertical axis and swung to and fro in either of transverse directions and its movement controlled by an operator in a distantly elevated station, and screen locking means also operable by remote control for locking and releasing the screen within the housing.

2. A mill, wherein a screen within a housing having an adjustable cover member is one of a plurality of interchangeable screens, suspension means for the screen by which the screen may be raised and lowered out of and into operative position within the housing and interchanged with another screen of the plurality including an elongated handle bail having relatively spaced connections with the screen by which rotative and swinging movements of the screen may be controlled from an elevated station, and remote control means for opening and closing the mill housing to enable such interchange of the screen therein for another.

3. The combination with a mill of a screen which is one of a plurality of interchangeable grading screens, clamping means for securing a selected screen of the plurality in operative relation with the mill, remote control means for releasing the clamping means and a handle non-rotatively attached to the screen for effecting unison movement thereof while interchanging the screen for another of the plurality from an operating position exteriorly of the housing.

4. The combination with a mill and a screen which is one of a plurality of interchangeable grading screens for use therein, of an elevated control station above the level of the mill, and permanently connected control means engaged with the screen extending from the screen to the elevated control station enabling the screen to be interchanged for another of the plurality in its relation to the mill from such elevated station.

5. The combination with a mill and a screen which is one of a plurality of interchangeable grading screens therefor, a control station remotely located relative to the mill, and individual elongated handles attached to each of the screens extending thence into operative relation with the remote control station by which the screens may be interchanged one for another in cooperative relation with the mill from such remote control station.

6. A hammer mill or the like, including a housing, a screen which is one of a plurality of interchangeable screens removable from and insertable therein, an opening in said housing through which may pass any one of the plurality of screens, and an elongated handle permanently attached thereto for actuating the screen from a distant control station into and out of the housing through said opening.

7. A hammer mill or the like including a housing, a rotor therein, means for interchangeably supporting any one of a plurality of screen sections in operative relation with the rotor, an adjustable screen section which is one of a plurality of interchangeable screen sections alternately positionable upon the supporting means in cooperative relation with the rotor, and a handle extension attached thereto and extending beyond the housing, for unison rotative and swinging adjustment of the handle and screen while alternating said screen section with other screen sections of the plurality in operative relation with the rotor.

8. A hammer mill or the like including a housing, a rotor therein, a screen portion concentric with the rotor which is one of a plurality of like screen portions of different capacities interchangeably positionable in like relation with the rotor, and an extension handle having a relatively wide connection therewith transversely of the screen for unison movement enabling the said screen portion to be shifted out of operative relation with the rotor when substituting another screen portion therefore in operative relation with the rotor.

9. A hammer mill or the like including a housing, a rotor therein an arcuate screen section comprising one of a plurality of screen sections of different character interchangeably positionable in operative relation with the rotor, an elevated operator's station, above the level of the mill housing and an extension handle to which the screen is attached for unison rotative and swinging movements operable from said elevated operator station for interchangeably substituting said screen for another of the plurality thereof.

10. In combination, a mill comprising a rotary beater mounted on a horizontal axis, a casing therefor, a peripheral opening in the casing extending from a point substantially below a hori-

zontal plane extending through the axis of the beater to a point adjacent the top of the casing, arcuate screen supports adjacent the side edges of the opening, a removable screen positioned against said supports, means for removing said screen, a closure for said opening pivotally mounted at its lower end, means for moving said closure, said means comprising a crank member pivoted intermediate its ends with one end flexibly connected to the closure and a lever connected to the other end of said crank and arranged to be operated from a station distant from and above said mill, the flexible connection between the crank and the closure being a link member so related to the crank as to swing past center in one adjustment to retain the closure locked in closed position.

11. A mill, including a housing, a screen removably positioned therein and comprising one of a plurality of interchangeable screens, an elongated handle connected adjacent one end of the screen and extending thence into proximate relation with a distant control station, a connection therefor embracing a substantial portion of the distance transversely of the screen enabling rotation and swinging adjustment of the screen in unison with movement of the handle during lowering and elevation of the screen into and out of the housing from the distant control station.

12. The combination with a mill and a screen which is one of a plurality of interchangeable grading screens for use therein, of a control station remotely located with respect to said mill and screens, and shifting means connected to said screen and extending to said control station, whereby said screen may be substituted for any one of the other of said plurality of screens within the mill by operation of said shifting means from the remotely located control station.

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