Feb. 18, 1958 R. J. REESE ET AL 2,823,869

SCREEN CHANGER FOR HAMMER MILLS

Filed Jan. 23, 1956 3 Sheets-Sheet 1

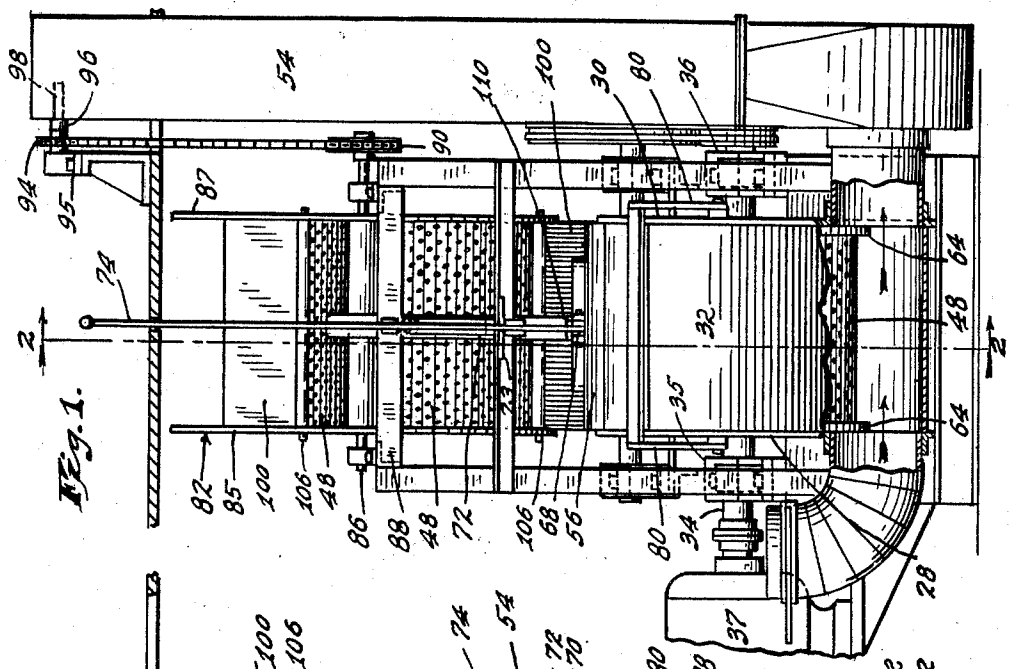


Fig. 1.

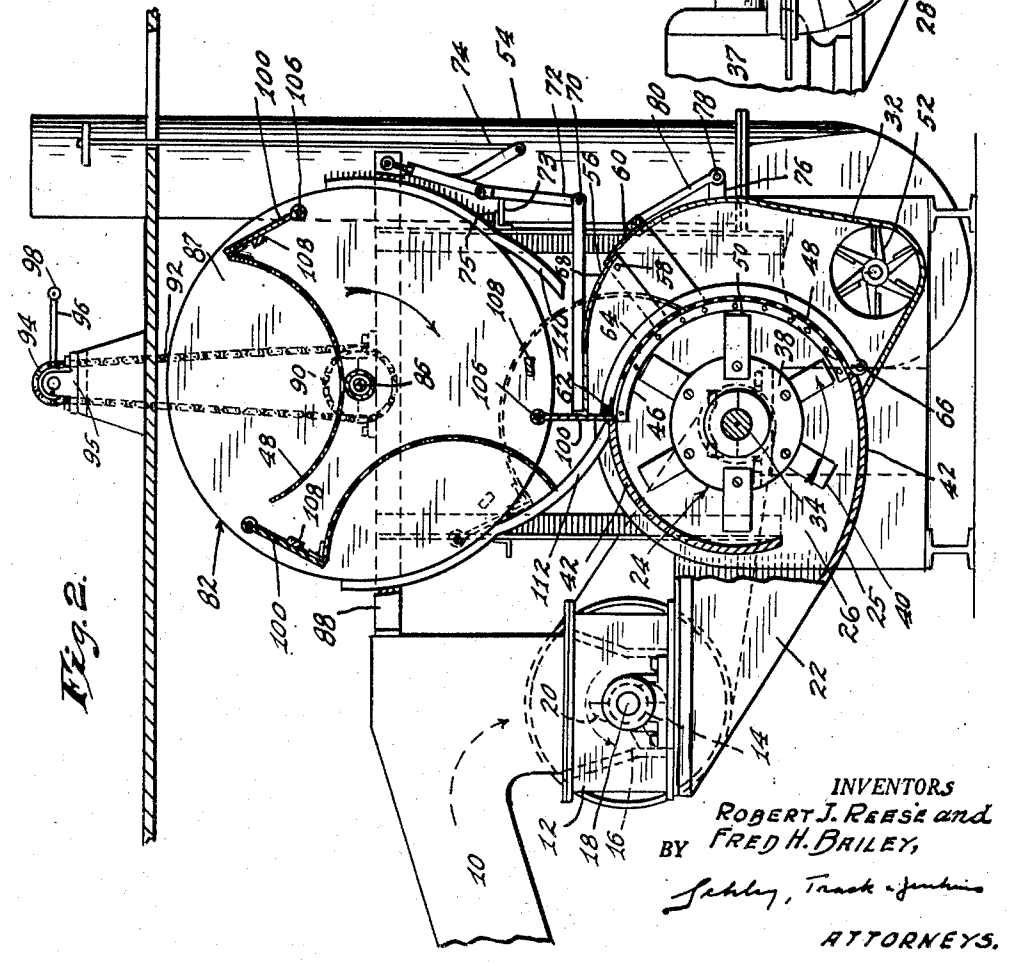


Fig. 2.

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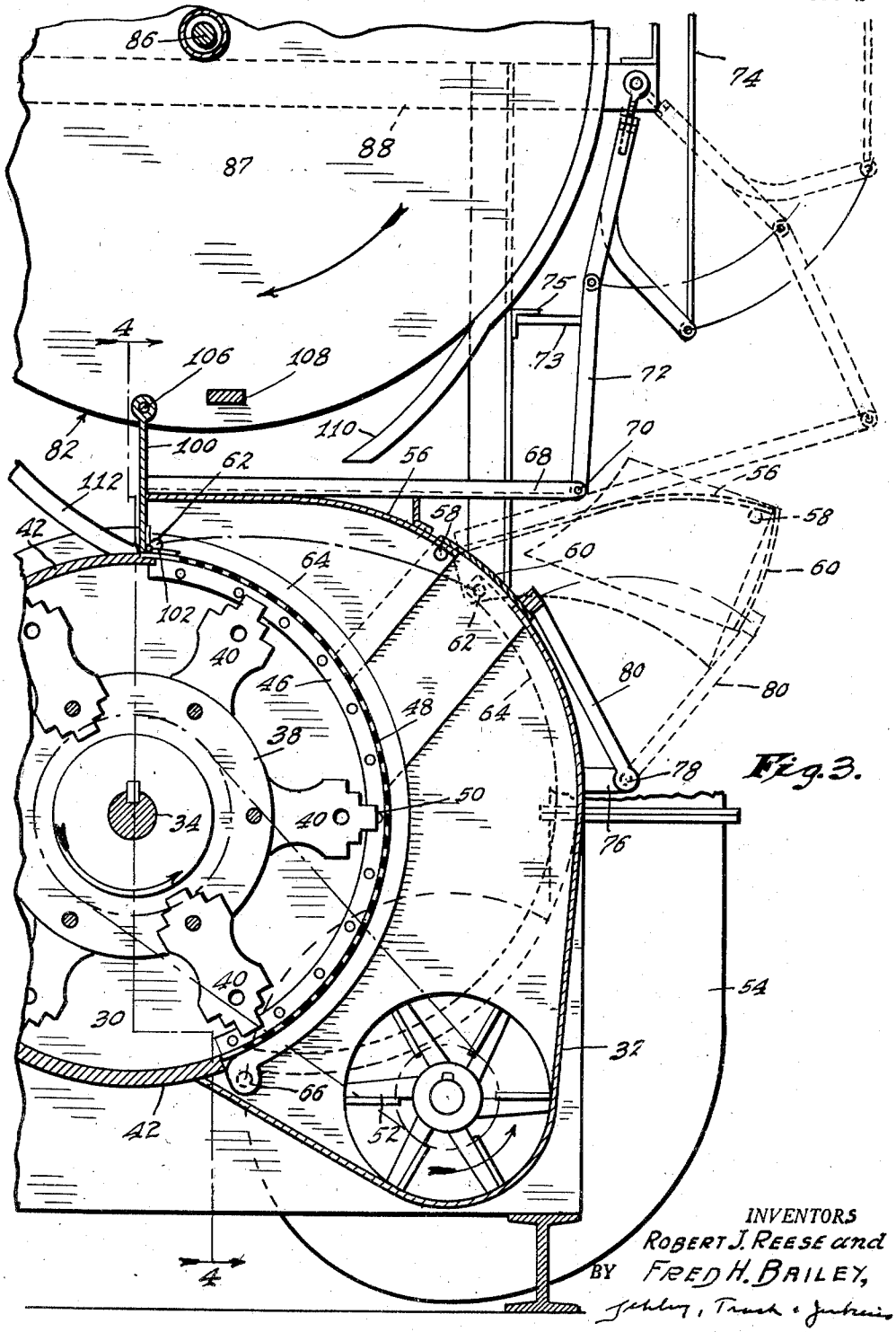


Fig. 3.

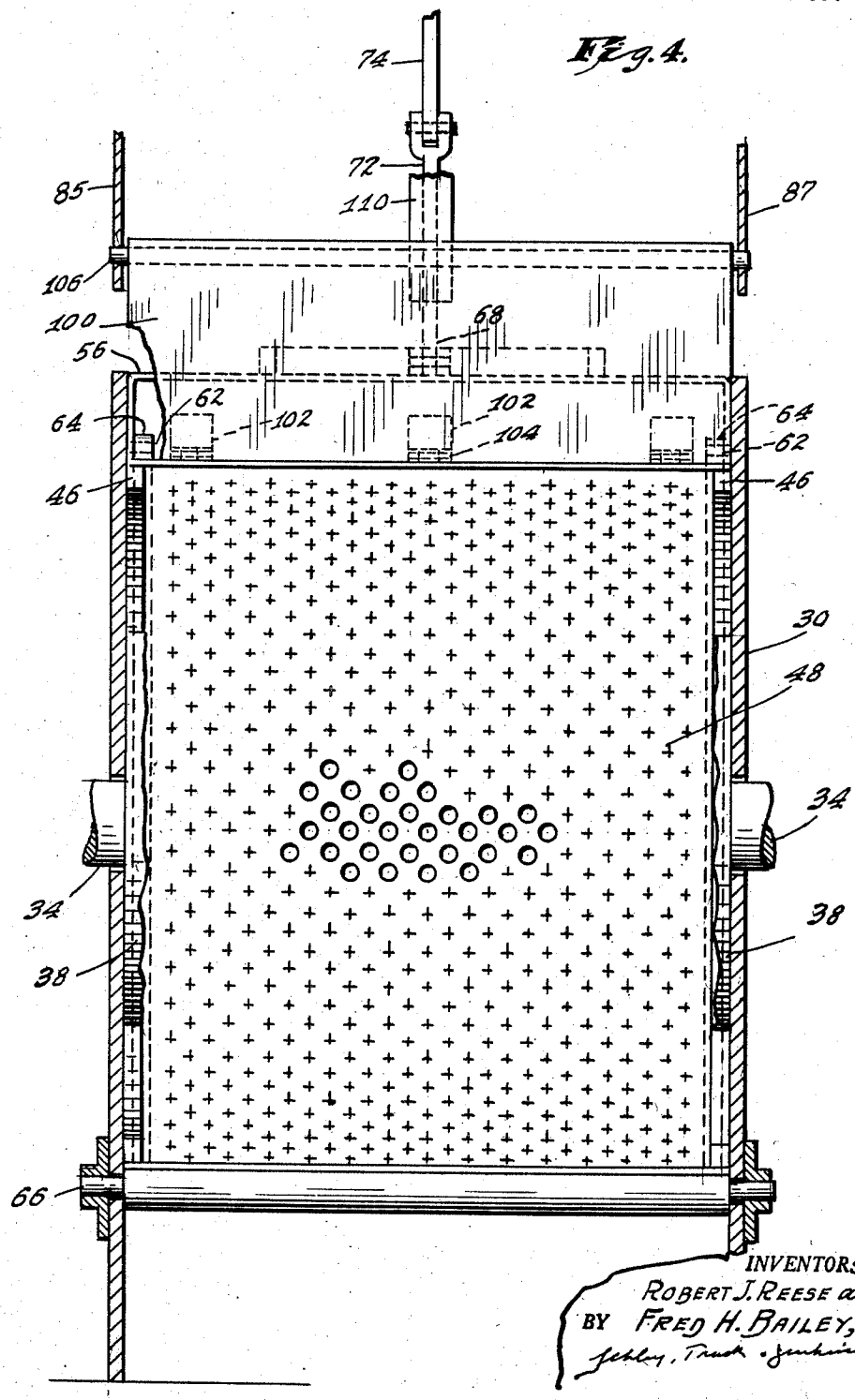
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Filed Jan. 23, 1956 3 Sheets-Sheet 3

Fig. 4.



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United States Patent Office 2,823,869 Patented Feb. 18, 1958

2,823,869

SCREEN CHANGER FOR HAMMER MILLS

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Application January 23, 1956, Serial No. 560,674

14 Claims. (Cl. 241—89)

This invention relates to a hammer mill, and more particularly to a remotely controlled screen changer for a hammer mill.

It is an object of the invention to provide a hammer mill and a screen changer for said mill, wherein said screen changer has a plurality of screens with varying mesh sizes which are insertable in and withdrawable from the mill. It is another object of the invention to provide an inexpensive screen changer for hammer mills of simple construction which is operable for the remote controlled changing of screens in a hammer mill in a minimum length of time.

In accordance with the invention there is provided a hammer mill of the conventional type usually having an auxiliary grinding unit and a main grinder including a plurality of rapidly rotating hammers for grinding and crushing material fed into said mill against an arcuate screen extending partially around the circumference of the rotational path of the hammers. A top cover on the housing enclosing the mill is retractable from its normally closed position by means of a remotely controlled toggle lever arm rigidly attached to said top cover to afford an opening in the mill housing through which screens of varying mesh sizes may be interchanged in the main grinder. The cover section is pivotally connected to curved rigid screen-locking straps within the mill housing that secure the screen in a fixed operating position against a pair of screen-supporting straps when said cover is locked in place on the mill housing.

There is further provided a screen changing mechanism above the mill adapted to hold a plurality of grinding screens usually of different mesh size. The screen changer is comprised of a chain driven rotatable drum which carries said screens equidistantly spaced within the drum walls toward the outer rim of said drum. The screens are pivotally secured to the drum and are held in a storage position through most of the rotation of the drum by suitable supporting means. The screen changer is remotely controlled for the insertion and extraction of screens into and out of the mill through the opening provided in the top of the mill housing.

The accompanying drawings illustrate the invention. In the drawings:

Fig. 1 is an end elevation of a hammer mill with a screen changer attached thereto;

Fig. 2 is a vertical section taken along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary view of a hammer mill showing in detail the removable top cover, and the cooperating relationship between the mill and the screen changer associated therewith; and

Fig. 4 is a further enlarged vertical section taken along the line 4—4 of Fig. 3.

As shown in Fig. 2, in the preferred form of the invention, the material to be ground enters the hammer mill through a duct 10 and is partially ground by the auxiliary grinder 12 comprised of a rotor 14 and a grinding surface 16. The rotor 14 is driven by the drive shaft 18 moving the knives 20 in front of the grinding surface 16 thereby effecting a gross reduction in the particle size of the material passing through said auxiliary grinder.

The partially ground material moves through a duct 22 from the auxiliary grinder 12 to the bottom of the main mill housing and enters the main grinder 24 through an inlet port 26. The main grinder 24 is enclosed by a housing 25 having vertical side walls 28 and 30 and an end wall 32. All of the housing walls are united in a manner to form dust-tight joints for encasing the main grinding unit.

A drive shaft 34 for the mill 24 journalled on bearings 35 and 36 is connected to a high speed motor 37. The drive shaft 34 turns a rotor 38 having a plurality of radially extending hammers 40 attached to said rotor. The rotor 38 revolves within an arcuate inner mill casing 42 partially circumscribing the path followed by the hammers 40. A pair of arcuate metal straps 46 of a lesser radius than the inner mill casing 42 butt against and are tightly secured to the inner face of said casing along its lateral edges forming a seat to support an arcuate screen 48 insertable in the mill housing. The screen 48 when locked in operating position is substantially coextensive with the arcuate length of the straps 46 and forms a grinding surface operatively disposed from the grinding face 50 of the hammers 40. The material comminuted through the screen 48 drops to the bottom of the mill housing 25 where it is picked up and carried by air currents created by the suction fan 52. The ground material is then conducted by said air currents through an exhaust duct 54 to a desired storage area.

The outer mill housing 25 is provided with a removable cover 56 along the top of said housing immediately within the side walls 28 and 30. The lower end of the cover 56 is pivotally connected, as at 58, to a pivotal cover section 60 which overlaps that section of the mill housing adjacent said removable cover, thereby providing a dust-tight seal between the stationary and movable components of the mill housing when the cover is locked in a closed position. The removable cover 56 is pivotally connected by a pin 62 to a pair of arcuate metal straps 64 circumscribing the screen along its lateral edges and fixedly securing said screen in an operative position against the screen-supporting straps 46. The lower ends of the straps 64 are pivoted about the inner mill casing 42 by a pin 66 so that when the cover 56 is removed the straps 64 will move toward the mill end wall 32 away from the screen unlocking it from an operative position to permit said screen to be extracted from the mill.

The cover 56 is rigidly attached to a connecting arm 68 which is pivotally connected, as at 70, to a toggle lever arm 72. A resisting-stop arm 73 mounted on said toggle arm is engageable with a lug 75 mounted on a suitable mill frame member to prevent said toggle arm from extending past its center position. A shaft 74 connected to the toggle lever arm 72 extends upwardly to a remote control point thereby allowing an operator to open and close the cover on the mill housing from a floor above the mill. A lug 76 on the end wall 32 of the mill housing is provided with a pivotal joint, as at 78, for a lever arm 80 which is attached to the pivotal cover section 60. When the cover 56 is removed from the mill by moving the toggle lever arm 72 upwardly and outwardly, the lever arm 80 guides the pivotal section 60 upwardly to swing said section and the cover clear of the mill housing, thereby providing an opening for changing screens in said mill.

As shown in Fig. 2, the screen changer 82 is comprised of a drum 84 having side walls 85 and 87, and

is rotatable about a horizontally disposed shaft **86** mounted on a mill frame member **88**. A driven sprocket **90** on the shaft **86** is driven by a continuous chain **92** extending over a driving sprocket **94** mounted on a suitable support **95** at any desirable remote control point. The driving sprocket **94** is rotated by a crank **96** on said sprocket which is fitted with a handle **98**; said drive mechanism is adapted to rotate the drum **84** and is normally used to drive the drum unidirectionally in the direction of arrow shown in Fig. 2.

Three arcuate screens **48** are equidistantly spaced around the circumference of the drum **84** between the vertical side walls **85** and **87** with the open end of their arcs facing away from the drum shaft **86**. Each screen is connected to a web **100** by means of hinges **102** fitted with suitable hinge pins **104**. The opposite ends of the webs **100** are pivotally secured to the drum **84** by means of pins **106**. A stop-lug **108** is positioned adjacent each pivotal connection **106** and substantially an equal distance from the circumferential rim of the drum **84** as the pivotal connections **106**. When a screen is positioned toward the top of the drum **84**, the web **100** rests on the stop-lug **108** holding the screen upwardly near the circumferential rim of said drum. As the drum is rotated, the screen at the top of the drum moves in a generally downward direction with the weight of the screen pulling the web **100** away from the stop **108**. A guide rod **110** is laterally centered between the side walls **85** and **87** along the lower rim of the drum **84** adjacent the opening in the mill housing. Said guide provides a support for the free end of the screen **48** after it swings free of the stop-lug **108** and until it moves over the opening at the top of the mill housing formed by the removal of the top cover **56**, from which point the screen drops into the mill and seats itself in an operative position. A similarly disposed guide rod **112** extends upwardly to the drum **84** from the opposite side of the mill opening to guide the free end of an extracted screen into a storage position within said drum.

In operation, the material to be ground enters the mill through the duct **10** and a gross reduction in particle size is made by the auxiliary grinder **12**. The partially ground particles then pass down through the duct **22** to the inlet port **26** and into the main grinder **24**. The particles are then ground by the rotating hammers **40** impelling said particles through the screen **48**, and the finely ground material is carried by air currents created by the fan **52** through the duct **54** to suitable storage bins.

To change screens in order to produce a different particle size of the ground material the following sequence of operation occurs. After the flow of material through the duct **10** is stopped by any suitable gate or valve arrangement, the shaft **74** is pulled upwardly causing the toggle lever arm to move outwardly away from the mill pulling the lever arm **68** upwardly and outwardly away from the mill carrying the rigidly attached removable cover **56** to a like position. The outward movement of the cover **56** causes the pivotal section **60** to ride upwardly, pivoting about the pin **58** and the arm **80** such that the entire cover section is removed from the mill into the dotted line position as shown in Fig. 3. By means of the pivotal connections **62** and **66** the screen-locking straps **64** are pulled away from the screen **48** and rest against the end wall **32** when the cover **56** is removed from the mill, thereby releasing said screen for extraction from the mill.

When the cover **56** is removed the screen **48** may be extracted from the mill by turning the crank **96** to rotate the drum **82** in a clockwise direction as shown by the arrow in Fig. 2. The rotation of the drum pulls the screen upwardly out of the mill with the lower end of the said screen riding along the guide means **112** until the screen is held within the drum by its web **100** resting against the stop-lug **108**.

Concurrently with the extraction of one screen another screen is being carried by the drum downwardly into position for insertion into the mill. The weight of the screen causes it to clear its stop-lug such that the free end of the screen rests on the guide member **110**. When the screen passes the end of the guide member it drops down into the mill with its lower end resting on the screen-supporting straps **46**, as shown in dotted lines in Fig. 2. With the drum in this position the several screens are disposed in an unbalanced relationship about the axis of the drum, tending to rotate it in a counter-clockwise direction (Fig. 2). The driving force on the chain drive **90—94** is then released, or the crank **98** reversed, to permit the unbalance to rotate the drum counter-clockwise and lower the new screen into the mill. The lower end of the screen rides downwardly around the screen-supporting straps **46** until said screen is in an operative position with its lower end lying adjacent the lower end of said screen-supporting straps **46**. The shaft **74** then is moved downwardly to pivot the removable cover **56** into a closed position on the top of the mill and bring the straps **64** against the screen to lock it in an operative position. The drive for the mill is left on during the screen changing operation so that all the operator need do to resume grinding operations is to open an inlet to permit material to enter the mill.

Every sequence of the previously described screen changing operation is controllable from a remote operating station. The operator is able to make all of the necessary screen changing adjustments from a floor above the mill where most of his work activities occur; thereby alleviating the time consuming necessity of going up and down stairs to make changes for varying the particle size of the material being ground.

We claim as our invention:

1. A hammer mill, comprising a grinding chamber, a rotor having a plurality of hammers attached thereto revolving in said chamber, an arcuate screen disposed along the circumferential path of said hammers, means on said grinding chamber for releasably retaining a screen along said circumferential path, an inlet and outlet port communicating with said grinding chamber, a housing enclosing said mill, a removable top cover on said housing, and a rotatable screen-changing drum carrying a plurality of screens and cooperating with said mill for the selective insertion and extraction of screens into and out of said mill, and being adapted for the storage of unused screens.

2. A hammer mill, comprising a grinding chamber, a rotor having a plurality of hammers attached thereto revolving in said chamber, an arcuate screen disposed along the circumferential path of said hammers, an inlet and outlet port communicating with said grinding chamber, a housing enclosing said mill, a removable top cover on said housing pivotally connected to screen-securing straps, and a rotatable screen-changing drum carrying a plurality of screens and cooperating with said mill for the selective insertion and extraction of screens into and out of said mill, and being adapted for the storage of unused screens.

3. A hammer mill as set forth in claim 2 with the addition that said screen-securing straps are pivotally connected to said top cover and pivoted on said grinding chamber for locking and unlocking said screens in an operative position.

4. A hammer mill, comprising a grinding chamber, a rotor having a plurality of hammers attached thereto revolving in said chamber, an inlet and an outlet port communicating with said grinding chamber, a housing enclosing said mill, a removable top cover on said housing, a lower section on said cover pivotally mounted on said cover to form a dust-tight seal between the cover and the mill housing, an arcuate screen in the grinding chamber disposed along the circumferential path of the hammers, said screen being one of a plurality of screens pivotally connected to a rotatable screen-changing drum disposed above said mill, said drum being adapted for the insertion and ex-

traction of screens into and out of said mill, and being further adapted for the storage of unused screens, and means on said mill for releasably locking a screen therein.

5. A hammer mill as set forth in claim 4 with the addition that said lower section on the housing cover is connected to a pivotal lever arm to swing said section and the cover upwardly and outwardly away from said mill.

6. A hammer mill, comprising a grinding chamber, a rotor having a plurality of hammers attached thereto revolving in said chamber, an inlet and an outlet port communicating with said grinding chamber, a housing enclosing said mill, a removable top cover on said housing with a pivotal lower section forming a dust-tight seal between said cover and the mill housing, a toggle lever arm attached to said cover for opening and closing said cover, an arcuate screen disposed along the circumferential path of said hammers in the grinding chamber, said screen being one of a plurality of screens pivotally connected to a rotatable drum disposed above said mill, said drum being adapted for the selective insertion and extraction of screens into and out of said mill, and being further adapted for the storage of unused screens, and means on said mill for releasably locking a screen therein.

7. A hammer mill as set forth in claim 6 with the addition that said toggle lever arm is operable from a remote control point by means of an upwardly extending shaft attached to said toggle arm.

8. In combination with a hammer mill having a housing enclosing a main grinding unit, a rotatable screen-changing drum disposed above said mill, a plurality of screens adapted for use in said mill connected to said drum, means on said mill for releasably locking a screen therein, and guide means disposed between said drum and the mill for guiding said screens into and out of the mill.

9. In combination with a hammer mill having a housing enclosing a main grinding unit, a rotatable screen-changing drum disposed above said mill, a plurality of screens adapted for use in said mill pivotally connected to said drum, means on said mill for releasably locking a screen therein, and guide means disposed between said drum and the mill for guiding said screens into and out of the mill.

10. In combination with a hammer mill having a housing enclosing a main grinding unit, a rotatable screen-changing drum disposed above said mill, a plurality of screens adapted for use in said mill, said screens being pivotally connected to webs pivotally secured to said drum, means on said mill for releasably locking a screen therein, and guide means disposed between said drum and the mill for guiding said screens into and out of the mill.

11. In combination with a hammer mill having a housing enclosing a main grinding unit, a rotatable screen-changing drum disposed above said mill, a plurality of screens adapted for use in said mill, said screens being pivotally connected to webs secured to said drum, stop-lugs on said drum engageable with said webs for supporting said screens in a storage position within the drum, guide means disposed between said drum and the mill for guiding said screens into and out of the mill, and means on said mill for releasably locking a screen therein.

12. In combination with a hammer mill having a housing enclosing a main grinding unit, a rotatable drum disposed above said mill, a drive operable from a remote control point for rotating said drum, a plurality of screens adapted for use in said mill, said screens being pivotally connected to webs secured to said drum, guide means disposed between said drum and the mill for guiding said screens into and out of the mill, and means on said mill for releasably locking a screen therein.

13. In combination with a hammer mill having a housing enclosing a main grinding unit, a drum disposed above said mill, a plurality of arcuate screens pivotally mounted to said drum adjacent its circumference and adapted to be selectively disposed in an operative position in said mill, said drum being rotatable for withdrawing the operatively-positioned screen from said mill and inserting another of said screens therein, and means on said mill for releasably locking a screen in operative position therein.

14. In combination with a hammer mill having a housing enclosing a main grinding unit, a drum disposed above said mill, a plurality of arcuate screens pivotally mounted to said drum adjacent its circumference and adapted to be selectively disposed in an operative position in said mill, drive means interconnected to said drum and adapted to unidirectionally rotate said drum to withdraw a screen from operative position in said mill and dispose another one of said screens in position for insertion into said mill upon reverse rotation of said drum, said drive-means being releasable to permit such reverse rotation, and means on said mill for releasably locking a screen in operative position therein.

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