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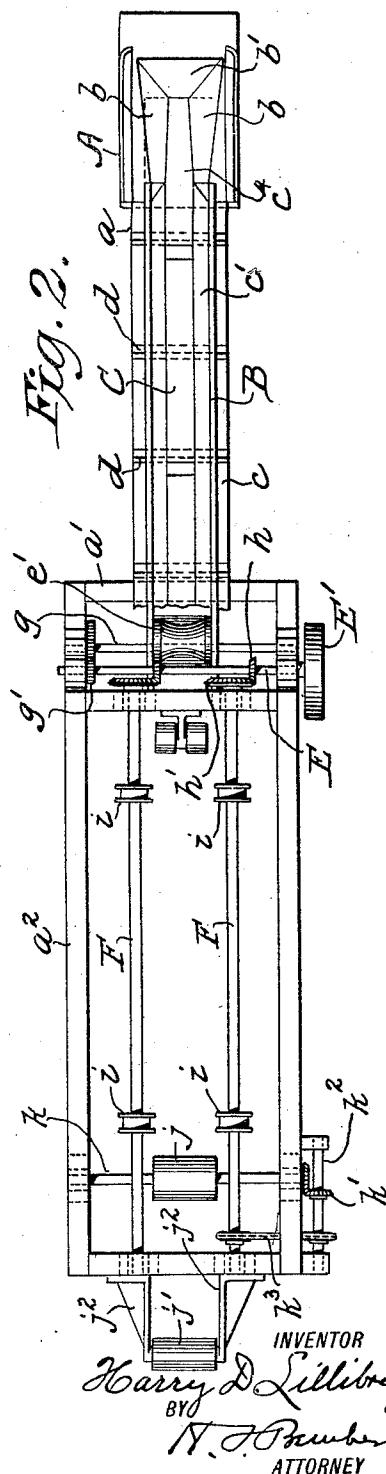
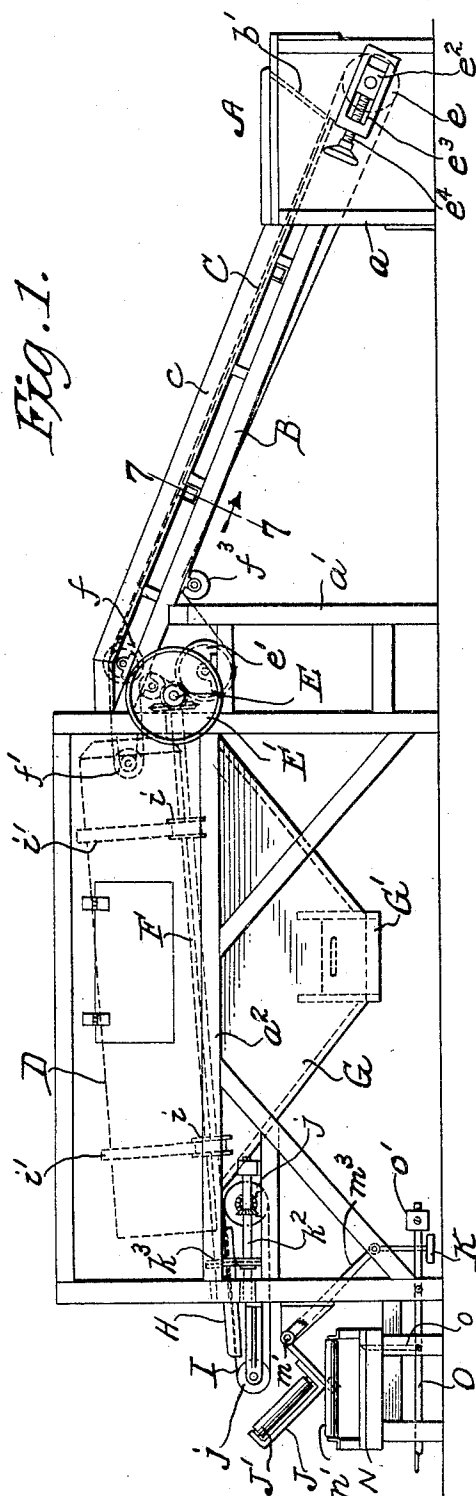
H. D. LILLIBRIDGE

1,649,604

MACHINE FOR CLEANING TILES AND ANALOGOUS OBJECTS

Filed July 27, 1921

3 Sheets-Sheet 1



Nov. 15, 1927.

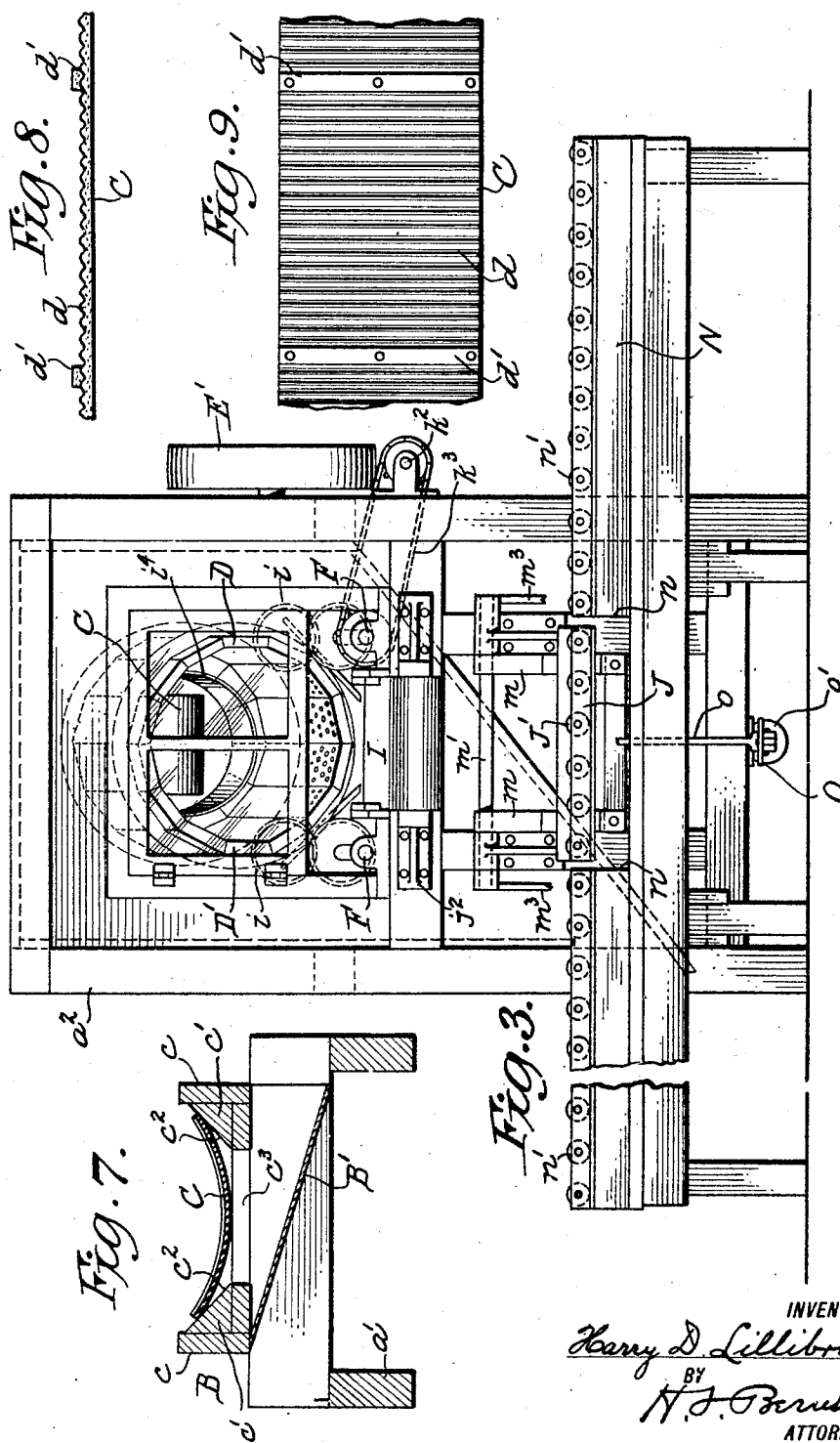
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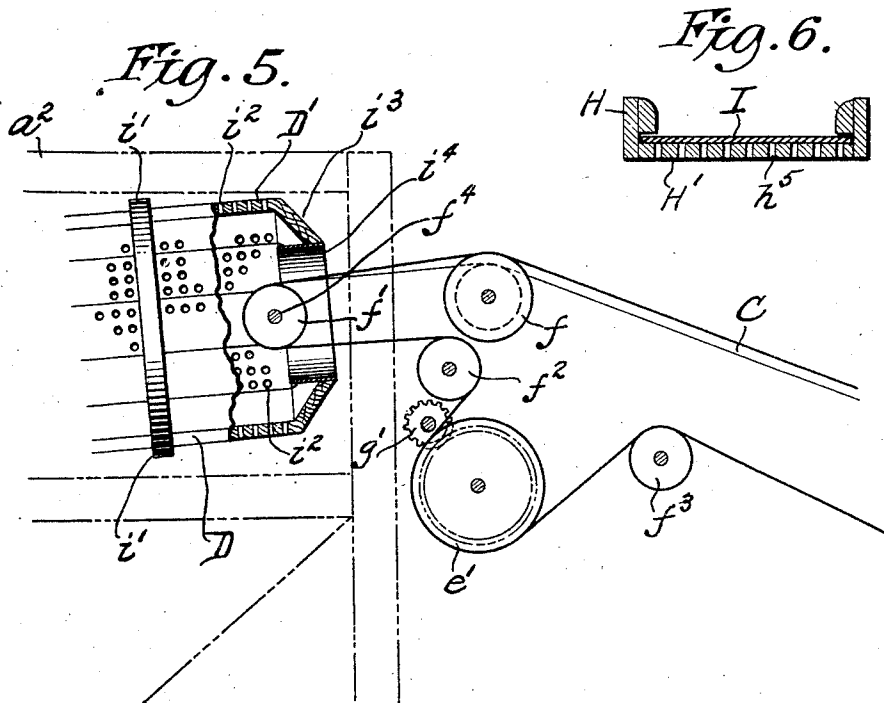
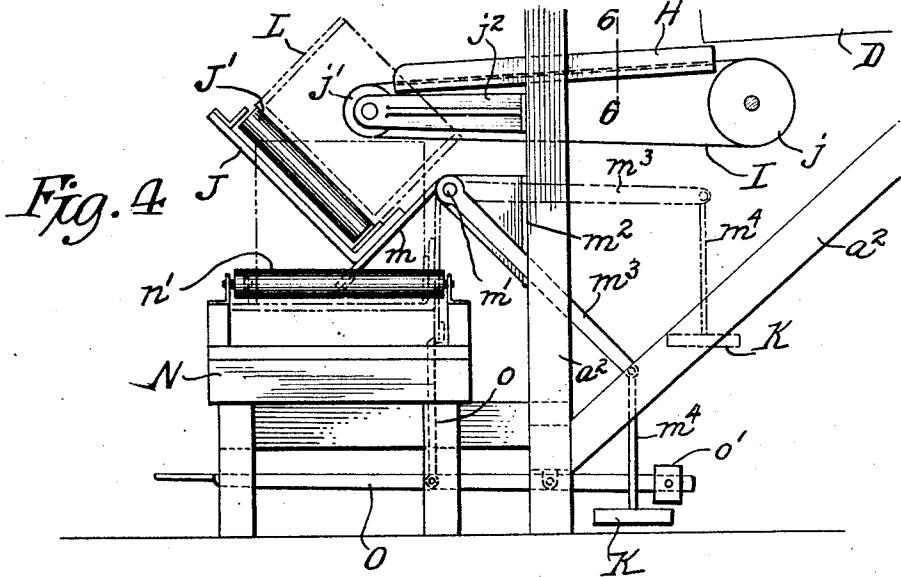
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MACHINE FOR CLEANING TILES AND ANALOGOUS OBJECTS

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3 Sheets-Sheet 3



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MACHINE FOR CLEANING TILES AND ANALOGOUS OBJECTS.

Application filed July 27, 1921. Serial No. 487,854.

This invention is a machine for cleaning objects from adhering foreign substances, the same being adapted, more particularly, for removing sand adhering to tiles of small dimensions, such as tiles for use in mosaic floors and other surfaces.

In the production of small dimension tiles it is usual to deposit the same along with a quantity of sand into saggars prior to burning or firing the product, the sand being interspersed with the tile material for precluding the latter from adhering one to the other as a result of the firing operation; and subsequently to such operation, the tiles and sand are dumped out of the saggars, experience having shown that some of the sand adheres to the surfaces of the burned product so that it becomes necessary to clean the product to effect the removal of the sand adhering thereto.

Owing to the fragile character of the burned clay, the tiles must be handled with some degree of care or under certain conditions during the cleaning operation in order to minimize breakage of the product. Furthermore, for economy and rapidity of operation the tiles are or should be cleaned in bulk or en masse, it being apparent that the cleaning of tiles individually is not feasible owing to the low cost thereof, and, further, that manual attendance upon the cleaning of tiles should be minimized.

To these ends, my invention is a machine for cleaning tiles for the removal of adhering sand by subjecting the articles to frictional rubbing during transit through or within the machine, such operation being conducted without exposing the tiles to contact with metallic or other hard unyielding surfaces at any point which may possibly have a tendency to chip their edges or to break them, and to enable the tiles to be dumped with the sand from the saggars en masse or in bulk into a receiving hopper, and to be discharged from the machine in a cleaned condition and under conditions which reduces to a minimum the tendency to break or fracture the tiles or to chip the edges thereof.

Generally speaking, the machine includes a receiving hopper into which the tiles and sand are to be dumped, an elevating conveyor adapted to be loaded from the hopper, a rotary screen into which the materials are discharged from the conveyor, a delivery conveyor at the discharge end of said rotary

screen, a gravity-operated platform for a receptacle adapted to occupy such relation to the delivery conveyer as to be depressed upon the accumulation of the tiles therein whereby breakage is precluded, and means for discharging the filled receptacles from the machine.

In a preferred form, the walls of the receiving hopper are composed of material, such as hard fibre, capable of resisting the wear due to frictional contact therewith of argillaceous material, the interior of said hopper being fashioned to deliver to the elevating conveyer the material (tiles and sand) in a continuous stream of relatively narrow cross section.

Said elevating conveyer is composed, preferably, of a cross corrugated belt composed of flexible material, usually rubber, the surface of which is provided at intervals with cleats or strips also of flexible material, such as leather, the cross corrugations and the cleats operating to reduce the slippage of the tiles downwardly on the conveyer during the elevating operation to the rotary screen. Said conveyer is supported by an appropriate inclined frame having suitable exits for the sand escaping from the tiles, said frame having longitudinal bearing surfaces for contact of the flexible conveyer therewith in such manner as to impart a substantially concavo convex formation in cross section to the flexible conveyer whereby the tiles and sand materials are confined in a continuous stream of narrow cross section upon a channeled surface of the cross ribbed flexible conveyer.

An important element of the machine is the rotary screen which in this invention is composed of perforated material other than metal. To eliminate such hard materials as metal, and at the same time attain durability in the wear and service of the screen, it is composed of lags of hard wood, such as oak, extending lengthwise of the cylinder and bound together by interior metal bands. The lags are perforated for the free escape of sand, and they are positioned in edgewise contact so that they stand at an angle one to the other, presenting interiorly of the screen a surface designed to impart the required tumbling action to the tiles, for frictionally rubbing them together without subjecting the fragile tile material to fracture and injury. The screen tapers longitudinally

dinally and is mounted in an inclined position and for free rotation by resting upon grooved pulleys carried by a plurality of inclined shafts driven in a suitable manner.

Below the discharge end of the screen cylinder is a conveyer positioned for operation within a perforated chute through which the sand is free to escape.

The delivery of the cleaned tile material is an important feature. Obviously, if allowed to drop or fall by gravity from the delivery conveyer, an undue amount of breakage and loss is liable to occur. To obviate this, I provide a tiltable platform adapted to support a removable receptacle below the discharge end of the delivery conveyer. This platform is counterpoised so as to raise the receptacle when empty into close relation to the delivery conveyer, thus reducing the distance through which the tiles drop from the conveyer to the receptacle; but as the material accumulates within the receptacle and the height of the material increases therein, the weight of the accumulated load acts to depress the counterpoised platform, whereby the latter and the receptacle with the load are gradually depressed until the receptacle assumes a horizontal position when filled, in which position the platform is latched until the filled receptacle is discharged from the platform and is replaced by an empty receptacle, whereupon the latch is released and the platform raises the empty receptacle into close relationship to the delivery conveyer.

Other functions and advantages of the invention will appear from the following detailed description taken in connection with the drawings, wherein—

Figure 1 is a side elevation of the complete machine.

Figure 2 is a plan view with the screen removed, illustrating the driving means.

Figure 3 is an elevation on an enlarged scale looking toward the delivery end of the machine.

Figure 4 is a side elevation of the machine at the delivery end thereof illustrating by full and dotted lines the operation of the tiltable platform.

Figure 5 is a detail view showing in sectional elevation the loading end portion of the rotary screen and the delivery end portion of the elevating conveyer.

Figure 6 is a cross section on the line 6—6 of Figure 4 through the delivery conveyer.

Figure 7 is a cross section on the line 7—7 of Figure 1 through the elevating conveyer.

Figures 8 and 9 are detail views in edge elevation and in plan respectively of the flexible conveyer.

The several parts of the machine are supported by a main frame consisting of the

parts a a' a^2 of any suitable construction; but shown as comprising timbers framed together in a suitable way. The frame section a supports a receiving hopper A, the interior of which is composed of converging walls b b' , the walls b b being at the respective sides of the hopper, whereas the wall b' is at the end of the hopper. The several walls are composed of material, such as hard fibre, which will resist the wear due to the frictional contact of sand and tile material therewith, and said walls are inclined so as to form a throat or delivery space c^4 in the bottom of the hopper.

Intermediate the frame sections a a' , is an inclined runway B for the accommodation of the elevating conveyer C. The runway B is supported at its lower end by the frame section a and at its elevated end by the frame section a' . Said runway includes members c c within which are secured longitudinal cleats c' , the faces of which are bevelled at c^2 . The cleats c' within the runway are separated so as to leave an opening c^3 through which sand and other material is free to escape upon the delivery plate B' , the latter being positioned at the under side of the runway and being inclined transversely thereof, as shown in Figure 7, whereby the sand and other refuse lodging upon the plate B' are discharged from the machine.

The elevating conveyer is composed of flexible material, it being preferred to employ rubber in the manufacture of the conveyer, although any other material suitable for the purpose may be employed. The flexible material is provided on its working surface with transverse corrugations d , as shown more particularly in Figures 8 and 9 of the drawings, and in addition to the corrugations on its active surface, the flexible material of the conveyer is provided with cleats d' . The corrugations d are molded in one surface of the material composing the flexible conveyer, whereas the cleats are made separate from the conveyer material and are attached suitably thereto. The cleats extend upwardly from the corrugated surfaces and they are positioned crosswise of the conveyer parallel to the corrugations thereof. The conveyer being composed of soft material, there is no liability of injury to the ceramic material and in the operation of elevating the material a certain amount of friction exists between the surface of the conveyer and said material, the corrugations of the conveyer reducing the slippage of the tiles as they are carried upwardly by the conveyer, and the protruding cleats acting in effect to arrest any downward movement of the tiles during the elevation thereof by the conveyer.

Said conveyer is an endless web supported in an inclined position by and within a runway B, the lower portion of the conveyer

fitting an idler pulley *e*, whereas the upper part of the endless conveyor is in frictional contact with a driving pulley *e'*, the two said pulleys *e e'* being provided with concave faces, one of which is illustrated by the plan view in Figure 2. The flexible conveyor hugs closely to the concave faces of the driving pulley and the idler pulley, and that part of the conveyor intermediate the said pulleys and in contact with the inclined faces of the cleats *c'* within the runway partakes of the transverse curvature illustrated in Figure 7 of the drawings. The active lead of the conveyor owing to its contact with the concave pulleys and to the contact of its edge portions to the cleats *c'* produces a transverse cavity in said active lead, as a result of which the conveyor is given an approximately trough-shaped form within which the tile material is confined, so that there is, practically speaking, a narrow stream of tile material undergoing the elevating operation during the action of the conveyor. With the idler pulley *e* is associated a suitable take-up device for retaining the conveyor under tension. As shown, the shaft of the idler pulley is mounted in sliding bearings *e²* within a guideway *e³* and adapted to be adjusted by a screw *e⁴*.

The loading end of the endless conveyor operates within the receiving hopper A so that the tile material will flow by gravity through the throat *c⁴* and lodge upon said conveyor, whereas the delivery end of the endless conveyor is operatively related to a rotary screen D, as illustrated more clearly in Figures 1 and 5 of the drawings. The upper run of the conveyor is in contact with the direction pulley *f* positioned near the upper end of the runway and thence passes around another pulley *f'* positioned within the receiving end of the rotary screen, see Figure 5, the conveyor thence passing around the direction pulley *f²* positioned below the pulley *f*, thence around the driving pulley *e'*, and thence over the direction pulley *f³*, from whence the conveyor runs below the runway to the idler pulley *e*. The pulley *f'* is carried by a shaft *f⁴* supported on a member of the runway B that extends into the open loading end of the rotary screen, whereby the tiles and other material are delivered from the elevating conveyor directly into the rotary screen. The driving pulley *e'* is on a countershaft *g* journaled in appropriate bearings of the frame section *a'*. This countershaft is geared at *g'* of a drive shaft E provided with a driving pulley *E'*. This drive shaft is provided with bevelled gears *h* in mesh with other bevelled gears *h'* of parallel shafts F, the latter running longitudinally of the frame section *a²*. Said shafts F are positioned between the sides of the frame section *a²*, and they are inclined longitudinally therein, said shafts being pro-

vided with grooved friction roller *i* for the reception of the track bands *i'* provided exteriorly on the rotary screen D.

It should be stated that the direction pulleys *f f² f³* are on shafts having bearings in the frame section *a'* and in the runway B, as illustrated more particularly in Figure 1.

The rotary screen D is composed of a number of lags assembled in contacting relation along their longitudinal edges, and bound firmly into a single unitary structure by the external track bands *i*. The lags *D'* are composed, preferably, of wood or other non-metallic material suitable for the purpose, each lag having a multiplicity of perforations *i²* through which sand or other fine material is free to escape during the rotary movement of the screen. By constructing the rotary screen of wooden lags, the possibility of injury to or breakage of the tile material is minimized, and notwithstanding the wear which takes place due to the frictional contact of the tile material and sand with the wooden lags, it has been found by experience that the use of oak wood in the construction of the lags secures the desirable durability in the construction of the cylindrical screen. The screen is provided at its receiving end with an inwardly extending member *i³* within which is positioned a band *i⁴*, in which band extends that part of the runway which supports the direction pulley *f'*. The entire screen structure rests by gravity upon the driving rolls of the parallel shafts, said screen cylinder being inclined from its receiving end to its discharging end. The shafts F F are driven from the shaft E for imparting rotative movement to the screen cylinder, and during such rotation the material present within the screen is given a tumbling action, the effect of which is to frictionally rub the tiles against each other for the purpose of removing therefrom the sand which adheres to the surfaces of said tiles. The screen is encased within a chamber the sides and top of which are closed, as shown in Figures 1 and 3, and this chamber is in direct communication with the hopper G provided with an outlet *G'* at the bottom thereof, whereby the sand which is carried into the screen by the elevating conveyor is free to pass through the perforations *i²* and drop into the hopper G, whence the sand may be removed by the attendant opening a gate in the outlet *G'* of said hopper.

Positioned below the delivery end of the rotary screen is an inclined chute H, the bottom *H'* of which is perforated at *h⁵* for the free escape of any sand which may find its way out of the delivery end of said rotary screen. The chute H is supported in a stationary position at the rear part of frame *a²*. For positively carrying the cleaned tiles away from the screen, I employ a short endless conveyor I, the upper lead of which

runs within the delivery chute substantially as shown in Figures 4 and 6. This delivery carrier is supported by pulleys j j' , the latter being an idler mounted in suitable brackets j^2 attached to the frame section a^2 at the rear thereof so as to overhang the delivery roller bed presently described. The other pulley j is on a shaft k journaled in the frame section a^2 below the lower end of the rotary screen. Said shaft k is driven through intermeshing gears k' from a countershaft k^2 also journaled on the frame section a^2 , as shown in Figure 2. Said countershaft is driven by sprocket gearing k^3 from one of the parallel shafts F which, as shown in Figure 2, are geared to the drive shaft E , the described train of shafting and gearing operating to impart motion to the pulley j for driving the endless conveyor I .

It is desirable to deliver the tiles after having been cleaned within the rotary screen into a receptacle; but owing to the fragile character of such tiles and to the tendency of the tiles to break or chip when dropping through a space of appreciable depth, I find it necessary to mount the receptacle for movement relatively to the delivery end of the short conveyor I . Said receptacle is sustained in a raised position close to the conveyor through the action of a counterweight, and as the tiles accumulate within the receptacle, the weight of the load depresses the receptacle gradually, whereby the accumulation of the material within the slowly descending receptacles minimizes the distance through which the tiles fall as they pass from the conveyor I upon the heap of tile material contained within the receptacle. To the attainment of the foregoing ends, I employ a receptacle carrier J which is provided with a desired number of rollers J' . This receptacle carrier is provided on one side thereof with arms m which are fast with a horizontal rock shaft m' journaled in bearings or brackets m^2 firmly attached to the frame section a^2 . Said rock shaft is provided at its ends with arms m^3 to which are pivoted rods m^4 which carry the counterweights K . It is apparent that the receptacle carrier J and its rollers J' are normally elevated by the counterweights to the inclined position shown more particularly in Figures 1 and 4 of the drawings, whereby a receptacle indicated by dotted lines at L in Figure 4 is supported in a position for the delivery end of conveyor I to extend into said receptacle, as a result of which tiles on the conveyor I will drop into receptacle L through a comparatively short space. The accumulation of tiles within the receptacle gradually depresses the carrier and the receptacle so as to swing the arms m inwardly and to raise the counterweights; but owing to the gradually increasing weight of the tile material within the receptacle the distance

through which the tiles drop from the conveyor I is kept at a minimum. The carrier is gradually depressed by the weight of the accumulated tiles until it assumes a substantially horizontal position within a recess n of a roller bed N , the latter comprising a suitable table with rollers n' , see Figure 3. The depression of the carrier J by the tiles accumulating within the receptacle brings the rollers J' of the pivoted carrier into the same horizontal plane as the rollers n' of the roller bed, and when thus depressed it is desirable to lock said pivoted carrier in the horizontal aligned position with the roller bed, to which end I employ a latch o which is pivoted at its lower end to a release lever O , one end of which is counter-poised at o' , see Figures 3 and 4, said latch o being adapted for locking engagement with the pivoted carrier.

The operation is as follows: The loaded saggars are carried to the machine, and the tiles with the sand and other loose material are dumped into the receiving hopper A . Motion having been given to the conveyors C I and the rotary screen, the conveyor C carries the tiles in an upward direction from the hopper A and delivers the same into the rotary screen D . Some of the sand escapes from the conveyor C during the elevation of the tile material so as to be discharged by the plate B' . The rotation of the screen agitates the tiles in a manner to remove the sand adhering to the surfaces thereof, the same being free to pass through the perforations in the screen and accumulate within the hopper G . The tiles are delivered from the open end of the screen upon the conveyor I which transports the tiles into the receptacle L on the pivoted carrier J . As the tiles accumulate within the carrier the increased weight lifts the counter-poise and depresses said carrier to the horizontal plane of the roller bed, whereupon the latch o engages with the pivoted carrier for locking the same in a horizontal position. The operator slides the receptacle L from the pivoted carrier to one section or the other of the roller bed, the rollers facilitating the movement of the loaded receptacle. In the meantime the operator should replace the filled receptacle with an empty one, and thereupon releases the latch by depressing the lever O , whereupon the counter-poise K lifts the empty receptacle and the pivoted carrier to the inclined position in close relation to the delivery end of conveyor I .

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. In a tile cleaning machine, tile-feeding mechanism embodying a conveyor composed of relatively flexible material provided on the load-engaging surface thereof with corrugations, and cleats unitary with said con-

veyor and spaced thereon, said cleats protruding beyond the surfaces presented by said corrugations.

2. In a tile cleaning machine, tile-feeding mechanism embodying a conveyor composed of flexible material and of concavo-convex formation in cross section, said conveyor being provided on the load-engaging surface with corrugations extending crosswise thereof, and cleats unitary with said conveyor, said cleats conforming to the cross contour of the conveyor and protruding from the surfaces presented by said corrugations.

3. In a tile cleaning machine, tile-feeding mechanism embodying a plurality of direct-

ing members spaced relatively to each other, said members having beveled surfaces in opposing relation one to the other, and a conveyor composed of flexible material, said conveyor contacting at its margins with, and unsupported at its middle portion by, said beveled surfaces of said members, said flexible conveyor being provided on its load-engaging surface with means conforming to the cross sectional contour of the conveyor and operating to preclude slippage of the load imposed on said surface.

In testimony whereof I have hereto signed my name this 26th day of July, 1921.

HARRY D. LILLIBRIDGE.