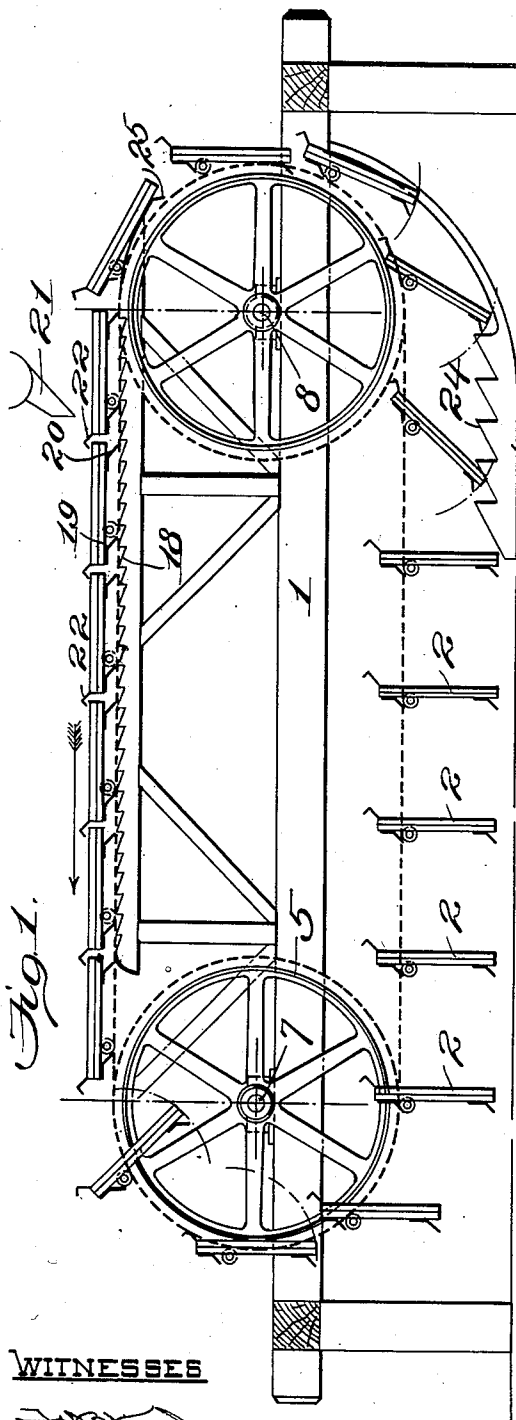


C. A. PRINGLE.
 APPARATUS FOR SCREENING, SIZING, AND CLASSIFYING GRANULAR MATERIALS.
 APPLICATION FILED MAY 2, 1908.

936,162.

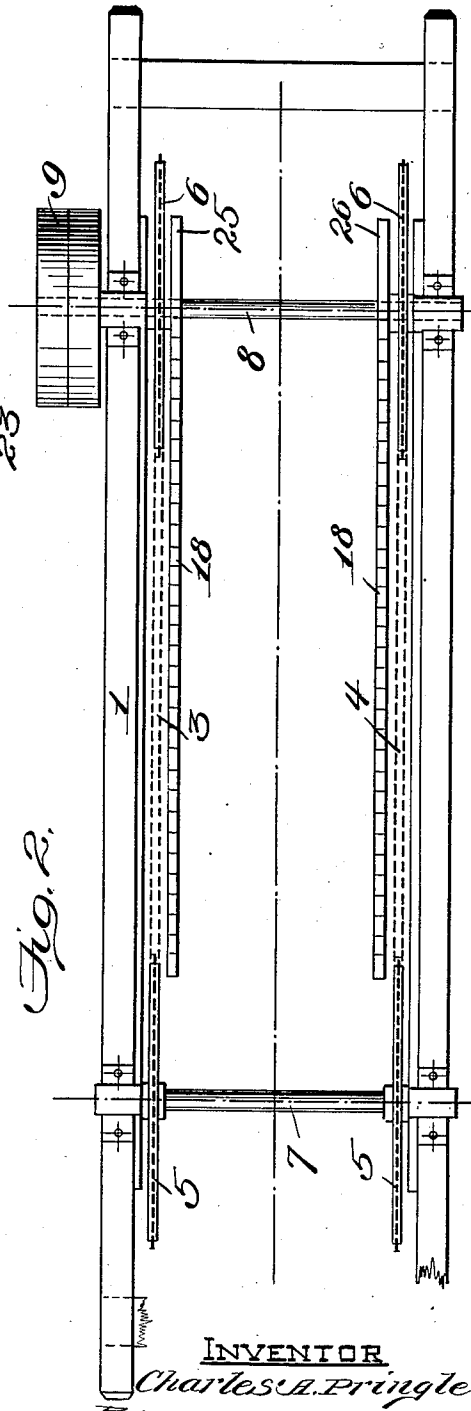
Patented Oct. 5, 1909.

2 SHEETS—SHEET 1.



WITNESSES

W. H. G. G. G.
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INVENTOR

Charles A. Pringle

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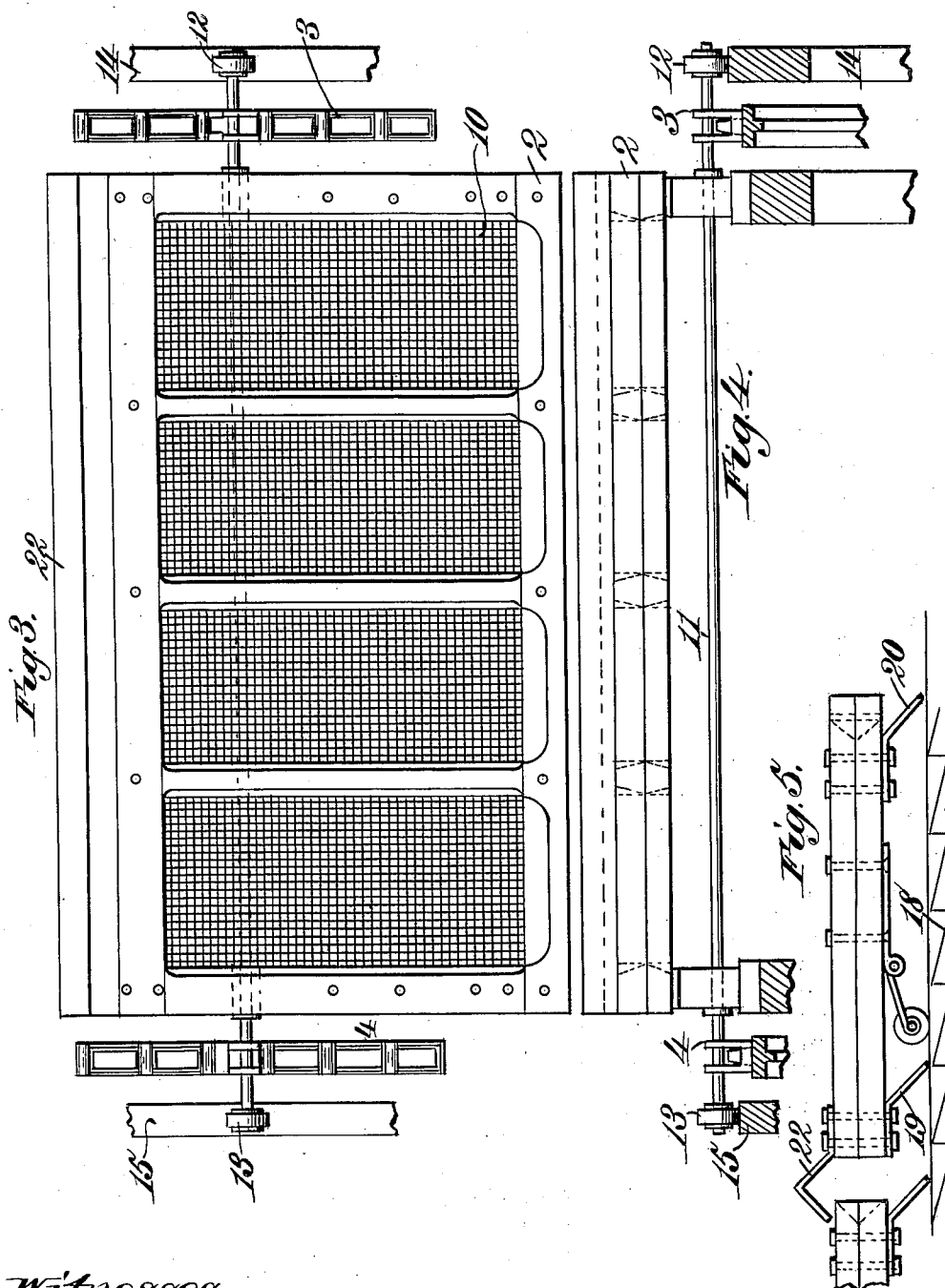
ATTORNEY

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2 SHEETS—SHEET 2.



Witnesses:
[Signature]
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Inventor:
 Charles A. Pringle.
 By *James L. Norris*
[Signature]

UNITED STATES PATENT OFFICE.

CHARLES A. PRINGLE, OF CHIHUAHUA, MEXICO, ASSIGNOR TO CALERA MINING COMPANY, A CORPORATION OF NEW JERSEY.

APPARATUS FOR SCREENING, SIZING, AND CLASSIFYING GRANULAR MATERIALS.

936,162.

Specification of Letters Patent.

Patented Oct. 5, 1909.

Application filed May 2, 1908. Serial No. 430,554.

To all whom it may concern:

Be it known that I, CHARLES A. PRINGLE, a citizen of the United States of America, residing at San Isidro, Dto. Guerrero, Chihuahua, Mexico, have invented certain new and useful Improvements in Apparatus for Screening, Sizing, and Classifying Granular Materials, of which the following is a specification.

My present invention relates to improvements in apparatus for screening, sizing and classifying granular materials of various kinds, such as ore, sands, flour, cement, clinker and the like, and it has for its object primarily to provide an improved apparatus of this character wherein the material to be treated is supported on a set of traveling trays which during their operation are vibrated so as to thoroughly agitate the material thereon and thereby facilitate its passage through the screens on the trays, the trays being automatically inclined after each screening or analogous operation has been completed in order to dump the material remaining thereon from the trays, and the trays, preparatory to their receiving subsequent charges of material, are subjected to a bumping action which serves to effectually remove any material adhering to the screens.

A further object of the invention is to provide an apparatus of this character comprising an endless carrier which serves to operate a series of trays carrying the screens, the trays being supported in substantially horizontal position during the screening or classifying operation and are provided with bumpers which cooperate with racks, the latter serving to agitate the material on the trays, the latter after the screening or classifying operation has been completed, swinging automatically into an upright position to dump the material remaining thereon, means being provided for guiding the trays so as to properly enter tracks which support the trays during the screening or classifying operation, and cleaning devices being provided in advance of said guides for jarring the trays so as to free from the screens thereon any adhering material.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will

be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification. 55

In the accompanying drawing:—Figure 1 represents a central vertical section of a screening, sizing and classifying apparatus constructed in accordance with my present invention; Fig. 2 represents a plan view of the apparatus shown in Fig. 1, the trays being shown removed therefrom; Fig. 3 is an enlarged plan view of one of the trays showing its supporting shaft and portions of the tracks and the conveyers for actuating it; Fig. 4 represents an end view of the tray shown in Fig. 3; and Fig. 5 represents a side elevation of one tray and a portion of an adjacent tray, portions of the vibrating rack and the supporting track being shown. 60 65 70

Similar parts are designated by the same reference characters in the several views.

Apparatus constructed in accordance with my present invention is capable of being used generally for the purpose of screening, sizing and classifying granular materials of various kinds, and it is to be understood that in applying the machine to different uses, the materials constituting the screens and the meshes thereof may be varied, and certain modifications or changes in the construction and arrangement of its parts may be made in order that the apparatus may be employed to the best advantage. 75 80 85

In the accompanying drawing, I have shown one specific embodiment of the invention which comprises a supporting frame 1 which may be made of any suitable construction, and beneath which appropriate bins or other devices may be placed to receive the material passing through the screens and the material remaining upon the screens and which is dumped therefrom after the screening or classifying operation has been completed. 90 95

In the present embodiment of my invention, a series of trays or sections 2 are used which preferably travel in an endless path. In order to operate these trays or sections, an endless carrier is preferably employed which may be composed of a link belt or a belt of any other character that may be found suitable. In the present instance, a 100

pair of link belts or chains 3 and 4 are shown which are of endless form and which pass over pairs of sprocket wheels 5 and 6 supported on shafts 7 and 8 which are suitably journaled in the supporting frame, one of the shafts, the rear shaft 8 in the present instance, being provided with pulleys 9 or other appropriate power-transmitting devices by means of which motion may be imparted to the carrier chains or belts. The trays are preferably mounted upon the belts or chains so as to form a practically continuous conveyor, the trays, however, being pivoted so as to permit independent tilting movement thereof at certain points in their travel, and their adjacent ends are spaced sufficiently to provide clearance between the trays in order that they may operate freely with respect to one another. These trays may be of any appropriate construction, those shown in the present instance being each in the form of a frame having openings between them for the passage of the material which drops through the screens. These trays are provided with screens 10 which may be of any appropriate material having the desired mesh, screen cloth, punched sheets and silk bolting cloth being appropriate in some instances, the screen in each instance being suitably stretched over the tray and secured, the tray in the present instance being composed of two frame sections between which the screen may be bolted by a clamping action. It will be understood, of course, that the material composing the screen may be varied according to the nature of the material to be screened or classified. Each tray is provided at a point adjacent to one of its transverse edges with a supporting shaft 11, the ends of which project beyond the sides of the tray and are suitably connected to the chains or belts 3 and 4 so that the movement of these chains will be imparted to the trays. The ends of each shaft are also provided with rollers 12 and 13 which travel along a pair of tracks 14 and 15 which are mounted parallel to the plane of movement of the trays while the latter are in operative position. During the travel of the trays over the supporting tracks, a vibratory or bumping motion is imparted thereto in order to agitate the material upon the screens and facilitate its passage therethrough. In the present instance, a pair of racks 16 and 17 are mounted on the supporting frame between the chains or belts and immediately beneath the trays, these racks having longitudinally spaced rows of teeth 18 in their upper sides which, in the present instance, are of ratchet form, the sloping sides of the teeth being inclined upwardly toward the direction of movement of the trays, abrupt recesses being thereby formed by each tooth.

On the under side of each tray at points

adjacent to its forward and rear edges, are mounted a pair of bumpers 19 and 20 which cooperate alternately with the teeth of the vibrating racks, these bumpers being composed in the present instance of angle iron bolted or otherwise secured to the tray and having their free ends depending so as to trail beneath the tray and cooperate successively with the teeth of the respective rack, these bumpers dropping suddenly into the recesses of the teeth and thus producing rocking movements of the tray about the shaft 11 as an axis. Each vibration of the tray agitates the material supported on the screen thereof, thereby presenting the smaller portions of the material in position to pass through the meshes, and the numerous vibrations imparted to each tray during its passage over the supporting tracks will insure an efficient screening of the material.

The material may be fed to the trays in a stream by any suitable means, a hopper or other feeding device 21 being shown in Fig. 1 which is mounted above the trays and is provided with an appropriate spout, and in order to prevent the material from falling between the adjacent edges of the trays, it is preferable to provide shields which protect these edges and cause the material to fall upon either tray. These shields in the present instance each comprise a strip 22 having one end bolted or otherwise secured along an edge of one screen and having an overhanging portion which bridges the space between the trays and overlaps a portion of the adjacent tray, this overhanging portion being preferably in the form of a ridge, the walls of which preferably incline toward the respective screens so as to cause any material falling thereon to pass upon the respective trays. One of these shields is attached to each tray and it permits an independent swinging movement thereof.

The vibrating racks terminate before reaching the forward sprocket wheels 5, and the moment the forward bumpers of each tray leave the ends of these vibrating racks, the tray will automatically swing by gravity into a substantially upright position, the supporting shaft of each tray being mounted nearer the forward edge of the tray in order to accomplish this purpose. As the trays successively swing into an upright position, the unscreened material remaining thereon will be dumped, and while the trays travel around the forward sprocket wheels and at the under side of the apparatus, they remain in such position until the lower or free edges of the trays encounter a cleaning device which serves to free any material which may adhere to the screens. This cleaning device in the present instance is composed of a rack 23 which is provided on its upper side with a set of teeth 24 which are arranged above the plane of the bottom edges of the trays

while the latter are suspended in upright position. These teeth also are preferably in the form of ratchet teeth, and as the lower edges of the trays successively ride over these teeth, the trays will be inclined so that the face of the screen is inverted, and the successive jars imparted to the trays will serve to effectually dislodge any material that may adhere to the screens. Beyond these clearing devices and at the entrance end of the racks 16 and 17 are formed a pair of curved guides 25 and 26 which successively engage the under sides of the trays and thereby turn them into horizontal position, preparatory to the reception of a charge of material from the feeding device 21 as they pass beneath the same.

I claim as my invention:—

1. An apparatus of the class described comprising a plurality of independently mounted screen-carrying trays the rear ends of which are capable of vibratory motions, said trays having conveyer means for imparting a traversing movement thereto, and means coöperating directly with the said rear vibratory ends of the trays and independent of said conveyer means for supporting and imparting vibratory motions to the said ends of the trays during the traversing movement of the tray to facilitate the passage of the material through the screens.

2. An apparatus of the class described comprising a carrier, a tray or section carrying a suitable screen and having conveyer means for imparting a traversing movement thereto, the rear end of said tray being mounted for vibratory movements, and means acting directly on the said rear vibratory end of said tray independently of said conveyer means for imparting vibratory motions thereto in a direction transverse to the direction of movement thereof and during the traversing movement.

3. An apparatus of the class described comprising a tray carrying a suitable screen and having conveyer means for imparting a traversing movement thereto, the tray being mounted at one end on said conveyer means and capable of a vibratory motion at its opposite end, and means operating simultaneously with the traversing movement of the tray and coöperating directly with the said vibratory end thereof for imparting a bumping motion to the tray during the screening operation.

4. An apparatus of the class described comprising a tray carrying a suitable screen, means arranged toward one end of said tray for supporting the tray for pivotal movement to cause a vibratory motion of its opposite end, means for imparting a traversing movement to the tray, and means coöperating directly with the said vibratory end of the tray for supporting the said vibratory end of the tray and also for vibrating the

latter about its axis of support during its traversing movement.

5. An apparatus of the class described comprising a horizontally arranged track, a tray having a transverse supporting shaft connected thereto toward one of its ends and guided to move longitudinally on said track, the tray being adapted to carry a screen, and means extending longitudinally of said track and acting directly on said tray for imparting a vibratory movement to the tray in a direction transverse to the length of the track and for supporting that end of the tray opposite to that supported by said shaft.

6. An apparatus of the class described comprising a suitable supporting track, a tray adapted to carry a screen, a shaft guided to operate longitudinally on said track and pivotally supporting the tray toward one of its ends, a continuous rack extending longitudinally of said track, and a bumper arranged on the vibratory end of the tray opposite to that end supported by said shaft and adapted to coöperate with said rack for supporting the said vibratory end and also for imparting a vertical vibratory movement to the tray as the latter traverses said track.

7. An apparatus of the class described comprising a suitable track, a screen-carrying tray guided to traverse said track, said tray being pivotally supported toward one of its ends, a rack extending longitudinally of the track and provided with ratchet-shaped teeth spaced longitudinally thereof, and a bumper mounted adjacent to that end of the tray opposite to the pivotally supported end thereof and adapted to coöperate with the teeth on said rack for supporting that end of the tray opposite to said pivotally supported end and also for imparting a vibratory movement thereto as the tray traverses the track.

8. An apparatus of the class described comprising a pair of tracks, a shaft coöperating at its ends with said tracks, a tray adapted to carry a screen and pivotally supported by said shaft at a point toward one of its ends, means coöperating with said shaft for causing the latter to traverse said tracks, a pair of racks extending longitudinally of the tracks and having longitudinally spaced teeth on their upper edges, and bumpers arranged in proximity to the front and rear ends of the tray respectively and coöperating alternately with the teeth of said racks for imparting vibratory movements to the tray as the latter traverses said tracks.

9. An apparatus of the class described comprising suitable supporting tracks, a tray adapted to carry a screen and guided to traverse said tracks, means coöperating with the tray for causing a traversing movement thereof, a pair of racks extending longi-

itudinally of the tracks and having longitudinally spaced teeth thereon, and pairs of bumpers arranged adjacent to the front and rear ends of the tray and adapted to cooperate with the respective racks for positively imparting vertical vibratory movements in opposite directions to the tray during its traversing movement.

10. An apparatus of the class described comprising suitable guiding tracks, an endless conveyer composed of a set of independently mounted screens adapted to traverse said tracks and having vibratory rear ends, means connected to said screens for imparting a traversing movement thereto, and a pair of transversely spaced racks extending longitudinally of the tracks for supporting and also imparting vibratory movements to the said vibratory ends of the screens during their traversing movements.

11. An apparatus of the class described comprising an endless conveyer composed of a set of independently movable trays adapted to carry screens, endless belts for imparting traversing movements to said trays, means for imparting vibratory movements to said trays during their traversing movements and embodying devices for supporting the trays in operative position during their traversing movements.

12. An apparatus of the class described comprising an endless conveyer composed of a set of trays adapted to carry screens, a pair of endless belts having means for imparting movement thereto, shafts operatively connected to said belts and serving to pivotally support said trays to permit them to move into operative and inoperative positions, and means for imparting vibratory movements to said trays during their traversing movements and also for supporting them in substantially horizontal position during the screening operation.

13. An apparatus of the class described comprising an endless conveyer composed of a set of trays adapted to carry screens, a pair of endless belts having means for imparting movement thereto, shafts operatively connected to said belts and supporting said trays toward the forward ends thereof, racks extending longitudinally of a portion of the length of said belts and having teeth thereon, and means on the trays cooperating with the teeth of said racks for imparting vibratory movements to the trays during their traversing movements and serving to support the trays in substantially horizontal position, said racks being interrupted at a point in proximity to one of the ends of the conveyer for permitting the trays to tilt into a substantially upright position after disengaging from said racks.

14. An apparatus of the class described comprising an endless conveyer composed of a set of trays adapted to carry screens,

a pair of endless belts having means for imparting movement thereto, shafts operatively connected to said belts and pivotally supporting the trays at points adjacent to their forward ends, tracks extending longitudinally of said belts and cooperating with said shafts for supporting the trays, racks extending longitudinally of said tracks and having teeth on their upper sides, and bumpers arranged adjacent to the front and rear ends of the trays for imparting vibratory movements thereto while traversing said tracks.

15. An apparatus of the class described comprising an endless conveyer composed of a set of trays adapted to carry screens and pivotally mounted at points adjacent to their forward ends, means for supporting said trays in substantially horizontal position to screen the material resting thereon and adapted to swing into substantially upright position to dump material remaining thereon, and a cleaning device arranged in the path of movement of the lower edges of the trays while the latter are suspended in upright position and serving to jar said trays to dislodge material adhering to the screens of the trays.

16. An apparatus of the class described comprising an endless conveyer composed of a set of trays carrying screens, said trays being pivotally mounted at points adjacent their forward edges, means for supporting said trays in substantially horizontal positions during the screening operation, said trays being adapted to assume an upright position subsequent to the screening operation, and a rack arranged to engage the lower edges of the trays while suspended in upright position to tilt the trays toward an inverted position and to impart a vibratory movement thereto to dislodge material adhering to the screens of the trays.

17. An apparatus of the class described comprising an endless conveyer composed of a set of trays adapted to carry screens and pivotally mounted on axes transverse to the direction of movement of the conveyer, racks for supporting the trays in operative position during the screening operation and for imparting vibratory motion thereto, and guides arranged in advance of said racks for automatically positioning the trays, preparatory to receiving the charges of material to be screened.

18. An apparatus of the class described comprising an endless conveyer composed of a set of trays carrying screens and spaced from one another longitudinally of the conveyer, means for pivotally supporting said trays at points adjacent to their forward edges, means for feeding material to the screens on said trays during the movement of the conveyer, and shields for preventing the material from falling through the spaces

between the trays, said shields arranged also
on the forward edges of the trays each com-
prising a strip attached to one tray and hav-
ing an overhanging portion which overlaps
the edge of an adjacent tray, said overhang-
ing portion having the form of a ridge, the
walls of which slope in opposite directions
toward the respective adjacent trays.

In testimony whereof I have hereunto set
my hand in presence of two subscribing wit- 10
nesses.

CHARLES A. PRINGLE.

Witnesses:

C. M. LEONARD,
E. W. HAYEN.