H. MARCUS.

APPARATUS FOR THE SIMULTANEOUS CONVEYING AND GRADING OF MATERIALS.

APPLICATION FILED NOV. 25, 1911.

1,173,597.

Patented Feb. 29, 1916.

2 SHEETS—SHEET 1.

Fig. 1

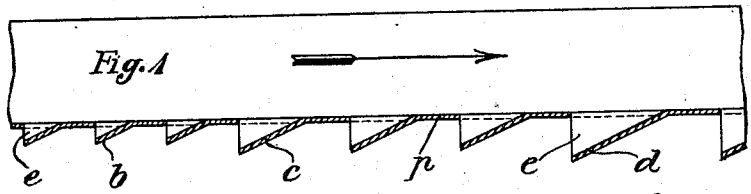


Fig. 2.

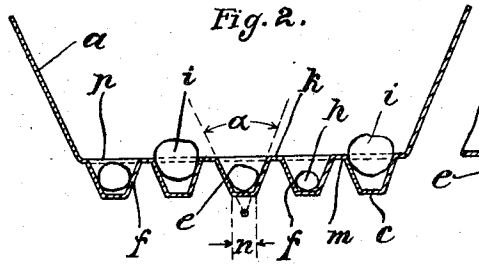


Fig. 3.

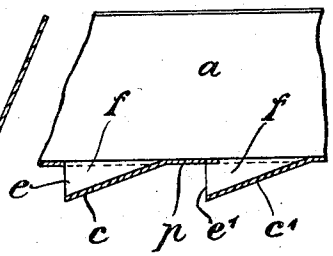


Fig. 4.

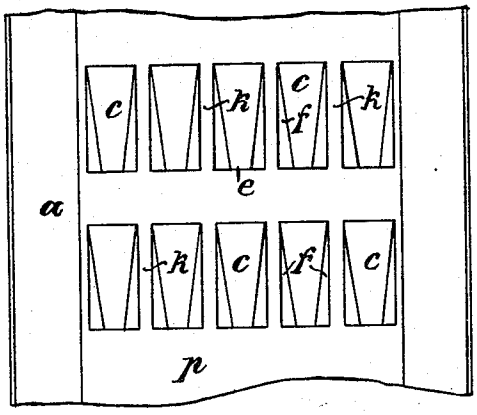


Fig. 5.

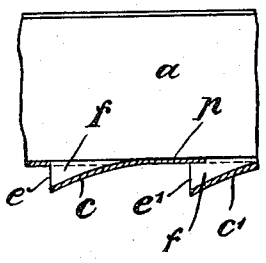
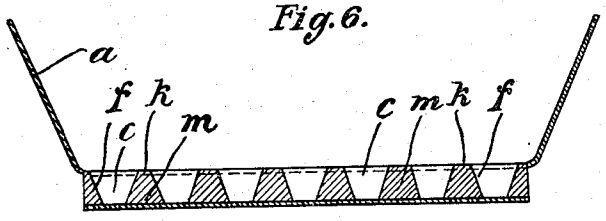


Fig. 6.



Witnesses:

John C. Sanders

John A. Percival

Inventor:

Hermann Marcus

per

Attorney:

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

H. MARCUS.

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2 SHEETS—SHEET 2.

Fig. 7.

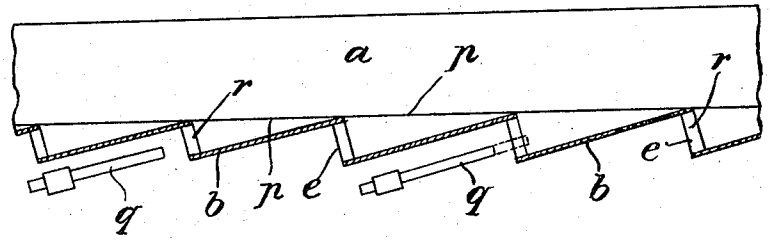


Fig. 8.

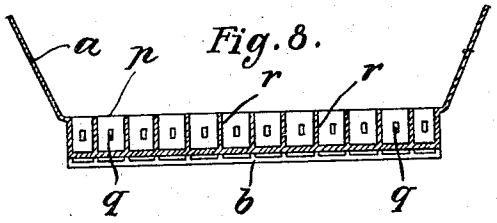


Fig. 9.

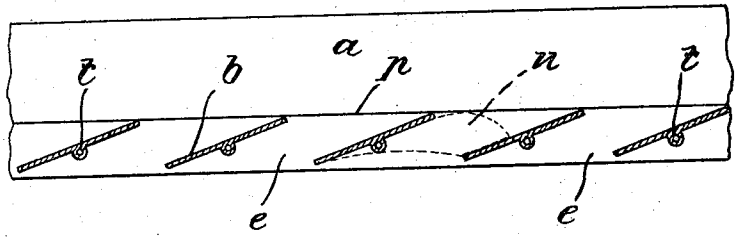
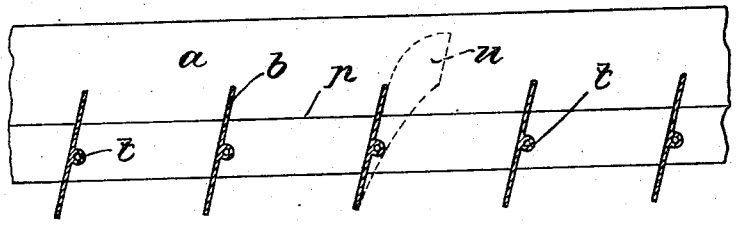


Fig. 10.



Witnesses:
John C. Sanders
John A. Lucival.

Inventor:
Hermann Marcus
per Wm. McLean Attorney:

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HERMANN MARCUS, OF COLOGNE, GERMANY.

APPARATUS FOR THE SIMULTANEOUS CONVEYING AND GRADING OF MATERIALS.

1,173,597. Specification of Letters Patent. Patented Feb. 29, 1916.

Application filed November 25, 1911. Serial No. 662,343.

To all whom it may concern:

Be it known that I, HERMANN MARCUS, engineer, a subject of the German Emperor, residing at Gereoushaus, in Cologne-on-the-Rhine, Germany, have invented new and useful Improvements in Apparatus for the Simultaneous Conveying and Grading of Materials, of which the following is a specification.

The grading of materials in different sizes has principally been effected hitherto by causing the material to pass over in succession a number of screens the perforations in which respectively increase in size step by step. This well-known arrangement however has many disadvantages. On the one hand the material is rubbed and damaged during its passage over the perforations in the screen and on the other hand the screen itself also naturally suffers thereby. Finally the perforations in the screen very easily get choked up whereby the grading becomes injuriously affected or interrupted.

The present invention relates to a novel device or apparatus for the simultaneous conveying and grading of all kinds of materials such as ores, coal and the like.

According to this invention a support trough chute or the like is employed having the bottom plate provided with discharge surfaces which incline downward at an angle with the plate and in a direction opposite to that in which the material is to be conveyed. By giving the support an accelerated movement in the forward direction, that is, in the direction in which the material is to be conveyed, the following will take place: When the support and the inclined surfaces are accelerated in their forward movement the pressure on the top of the smaller pieces of material is reduced so that they slide downward and are graded out through the openings. The larger pieces on the other hand which do not pass through the openings receive the same acceleration as the support in its forward movement and on the return movement of the support are carried forward by their own momentum, and thus gradually reach discharge surfaces with larger openings through which they in turn are graded out.

The essential feature of the device according to the present invention resides herein that on the forward stroke of the support the smaller pieces move backward thereon and become graded out while the larger pieces are moved forward and conveyed farther.

Figure 1 is a longitudinal section of a portion of the trough. Fig. 2 is a cross-section of the trough. Fig. 3 is a sectional detail of a modified form. Fig. 4 is a fragmentary plan view. Fig. 5 is a view similar to Fig. 3, showing a modified form. Fig. 6 is a view similar to Fig. 2 of another modification. Figs. 7 and 8 are longitudinal and transverse sections respectively of a further modification. Figs. 9 and 10 show the manner of adjusting the inclination of the bottom surfaces.

In Fig. 1 of the drawings, a portion of the trough or support *a* is shown having the bottom *p* provided with discharge surfaces *b*, *c*, *d* which incline downward therefrom at an angle and to an increasing depth. The said discharge surfaces incline downward at an angle in a direction opposed to that in which the material is to be conveyed as indicated by the arrow. The discharge surfaces and corresponding openings in the screen may be of any desired width.

When the support or trough, upon which the material to be conveyed and graded is placed, receives an accelerated movement forward in the direction indicated by the arrow, the following effect takes place. The smaller pieces lying for example on the inclined discharge surfaces *b*, owing to the pressure imposed on the inclined surfaces being diminished by the accelerated movement, slide down the said surfaces and are graded out through the openings *e*. The larger pieces on the other hand, which cannot pass through the openings *e*, partake in the accelerated forward movement together with the remainder of the material resting upon the bottom *p* of the trough and shoot forward upon the trough as the trough is suddenly arrested for the reversed movement. As this to and fro movement of the trough is repeated for some time the material not graded out gradually reaches the larger discharge surfaces *e*, *d* and so on, whereby the material is graded into different gages.

On the forward stroke of the trough, the inclination of the discharge surfaces has, as described, the effect of causing the smaller pieces to move backward toward the screen openings. The larger pieces, however, resting upon the same inclined surfaces might easily partake in this backward move-

ment in an undesirable manner. This can be avoided in a manner illustrated in Figs. 2–4. The inclined depending discharge channels *c* are in this case provided with inclined rising side walls *f* and are thereby for example so formed that the discharge surfaces *c* extending over the whole width of the support comprises a plurality of wedge-shaped pieces *m* which are parallel to one another and to the direction of the conveying movement and the horizontal upper corners of which exactly coincide with the bottom *p* of the support while the cross section of the same constantly diminishes toward the discharge openings (Fig. 4). As shown in Figs. 2–4 this is attained for example by pressing the bottom plate of the trough into the desired shape. In this manner each downwardly inclined discharge channel has an inclined bottom *c* and two inclined rising side surfaces *f* which latter inclose between them an angle of about 50°–70°. The object of this arrangement is as follows: The smaller pieces of material, for example, those shown at *h* in Fig. 2, which come directly into contact with the bottom *c* of the discharge channel, slide downward on the forward stroke and are graded out through the openings. The somewhat larger pieces, for example, the pieces *i*, on the other hand, which touch the side walls *f* of the discharge channels are subjected to an increase of pressure from above upon these side walls owing to their particular inclination without the possibility however of causing obstruction by sticking. Upon the forward accelerated movement therefore, the diminution in the imposed pressure, which diminution is due to the downward inclination of the discharge channel, is balanced, so far as the larger pieces are concerned, by the increase in the imposed pressure to which these pieces are subjected upon the inclined side surfaces *f*. The effect of this increase in the imposed pressure is that on the forward stroke of the support the larger pieces not only cannot slide farther backward but are necessarily carried forward that is to say, partake in the acceleration and are conveyed farther forward. The very large pieces simply remain upon the upper parallel pieces *k* which bridge the spaces between the inclined discharge surfaces and partake likewise in the acceleration and further conveyance upon ths forward stroke of the support.

Not only the distance *n* between, but also the angle of inclination of, each two side surfaces *f* which form the limiting walls of each discharge channel, should be so chosen that the material is graded out up to a certain gage while the larger pieces on the other hand are necessarily conveyed farther forward.

In certain cases the bottom *c* of the downwardly inclined discharge channels might in a manner shown in Fig. 5 be given an upward bend so that the pieces of material *i*, the pressure upon which from above is increased by contact with the inclined side surfaces *f*, may as rapidly as possible, upon the forward movement of the support come into contact with the horizontal portions of the bottom *p* which approach one another.

In Fig. 6, there is illustrated a modified arrangement for carrying this invention into effect in which the wedge-shaped pieces between each two discharge channels are constituted by solid wedges *m* resting on the inclined discharge surfaces *c* and forming the downwardly inclined side surfaces *f*.

The support or trough *a* might obviously be moved to and fro, in certain cases, in a straight or curved path and inclined in one direction or the other instead of moving in a horizontal plane.

In order to avoid stopping up of the rearwardly extended discharge openings, rods *q* may be arranged below the reciprocating conveying trough so that each rod stands exactly in front of a discharge opening *e* as shown for example in Figs. 7 and 8. Thus each time the trough reaches the end of its movement to the rear the points of the rods *q* are forced into the openings thereby loosening the material so that the screening of the smaller and larger pieces through corresponding discharge openings *e* is always maintained.

As shown in section in Fig. 8 each discharge surface *b* may extend across the entire breadth of the bottom of the trough and may be provided near the lower discharge opening *c* with a comb-like arrangement of vertical division walls *r*. The comb formed by the rods *q* engages between the aforesaid division walls in such a manner that as the conveying trough moves to and fro the two combs work within and between one another and thereby cause an effectual loosening of the material. The rods *q* are inclined at such an angle that as the trough moves horizontally to and fro the comb of rods *q* moves within the comb *r* not only in a horizontal direction but also relatively to the latter in a vertical direction thereby producing an increase effect in loosening the material.

In certain cases the rods *q* may be given such a length as to remain in the screen openings during the whole or nearly the whole of the stroke. Further the rods *q* might be replaced by an equal number of jets of fluid adapted to play constantly into the discharge openings *c* of the jigging trough of the screening conveyance and thereby loosen the material.

In the construction shown in Figs. 9 and 10 the inclined bottom surfaces *b* are not

rigid but are each adapted to rotate about an axis t located below them so that the surfaces can be adjusted in position at different angles. In this manner the size of the discharge openings c can be regulated and thereby also the grading effect. Further the rotatable bottom surfaces may be moved into a vertical or nearly vertical position as shown in Fig. 10 so that all the material upon the bottom surfaces and between the bridging pieces may fall vertically downward thus permitting the whole screen surface to be very easily and rapidly cleaned. By thus constructing the bottom surfaces so as to be capable of rotation it is lastly possible to adjust said surfaces in a horizontal position so that the bottom of the trough is completely closed and no further screening or grading can be effected but only a further conveyance of the material can take place. The grading or screening can therefore be completely interrupted for a time.

In cases where regulation of the grading effect is not desired the dividing walls u may be secured to the underside of the rotatable bottom plates so as to normally rest upon the upper surface of the next following bottom plate and so that when the bottom surfaces are turned into approximately the vertical position the dividing walls will likewise be moved upward into a similar position and thus free the inclined bottom surfaces. In certain cases the dividing walls might also be arranged on the upper side of the bottom plates so as to normally rest against the underside of the preceding bottom plate.

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

1. An apparatus for the simultaneous conveying and grading of materials comprising a horizontally disposed reciprocable trough having a bottom portion provided with openings therein of progressively increasing sizes from the receiving to the discharge direction of the trough, said openings having downwardly inclined walls beneath the same and open at the rear whereby particles passing through said openings will be discharged in a direction opposite to the conveying direction of the materials upon the bottom of the trough during the reciprocation thereof, the rear ends of said walls terminating in close proximity and substantially beneath the forward ends of the preceding walls.

2. An apparatus for the simultaneous conveying and grading of materials comprising a horizontally disposed reciprocable trough having a bottom portion provided with openings therein of progressively increasing sizes from the receiving to the discharge direction of the trough, said openings having downwardly inclined walls beneath the same and open at the rear whereby particles passing through said openings will be discharged in a direction opposite to the conveying direction of the materials upon the bottom of the trough during the reciprocation thereof, the bottom portions of the trough between said openings being substantially horizontally disposed and overlying the succeeding bottom portions of succeeding openings with respect to the direction of conveyance.

3. An apparatus for the simultaneous conveying and grading of materials comprising a horizontally disposed reciprocable trough having a bottom portion provided with openings therein of progressively increasing sizes from the receiving to the discharge direction of the trough, said openings having downwardly inclined walls beneath the same with their rear ends lying substantially beneath the adjacent ends of the preceding openings and open at the rear whereby particles passing through said openings will be discharged in a direction opposite to the conveying direction of the materials upon the bottom of the trough during the reciprocation thereof, the bottom portions of said openings tapering toward their discharge ends and having inclined side walls diverging upwardly and of uniform outward dimension whereby the sides of the openings are parallel.

4. An apparatus for the simultaneous conveying and grading of materials comprising a horizontally disposed reciprocable trough having a bottom portion provided with openings therein of progressively increasing sizes from the receiving to the discharge direction of the trough, said openings having downwardly inclined walls beneath the same and open at the rear whereby particles passing through said openings will be discharged in a direction opposite to the conveying direction of the materials upon the bottom of the trough during the reciprocation thereof, the bottom portions of said openings tapering toward their discharge ends and having inclined side walls diverging upwardly and of uniform outward dimension whereby the sides of the openings are parallel, said bottom portions having a slight upward bend producing convexity of their operative surfaces throughout their lengths to facilitate the conveying operation and overlying the next succeeding bottom portions.

5. An apparatus for simultaneously conveying and grading materials comprising a reciprocable horizontal support, said support being provided with openings in its bottom of progressively increasing sizes and arranged in transverse rows across the support, downwardly inclined surfaces positioned beneath said openings and inclining to progressively increasing depth correspondingly to the progressive increasing sizes of the

openings whereby materials of gradually increasing sizes will be progressively discharged through said openings for grading the same during the reciprocation of the support, each of said surfaces extending throughout the entire length of its associated opening to prevent the materials from dropping directly through the openings and inclining in a direction opposite to the direction of travel of the material upon the support whereby the sorted out material will travel in a direction opposite to that of the conveyed material upon reciprocation of the support, and means operating in each opening to eject material therefrom which has become clogged.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HERMANN MARCUS.

Witnesses:
M. KÜPPERS,
HANS DUMONT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."