July 4, 1939. K. C. APPLEYARD ET AL 2,164,676

VIBRATORY CHUTE

Filed July 27, 1936 3 Sheets-Sheet 1

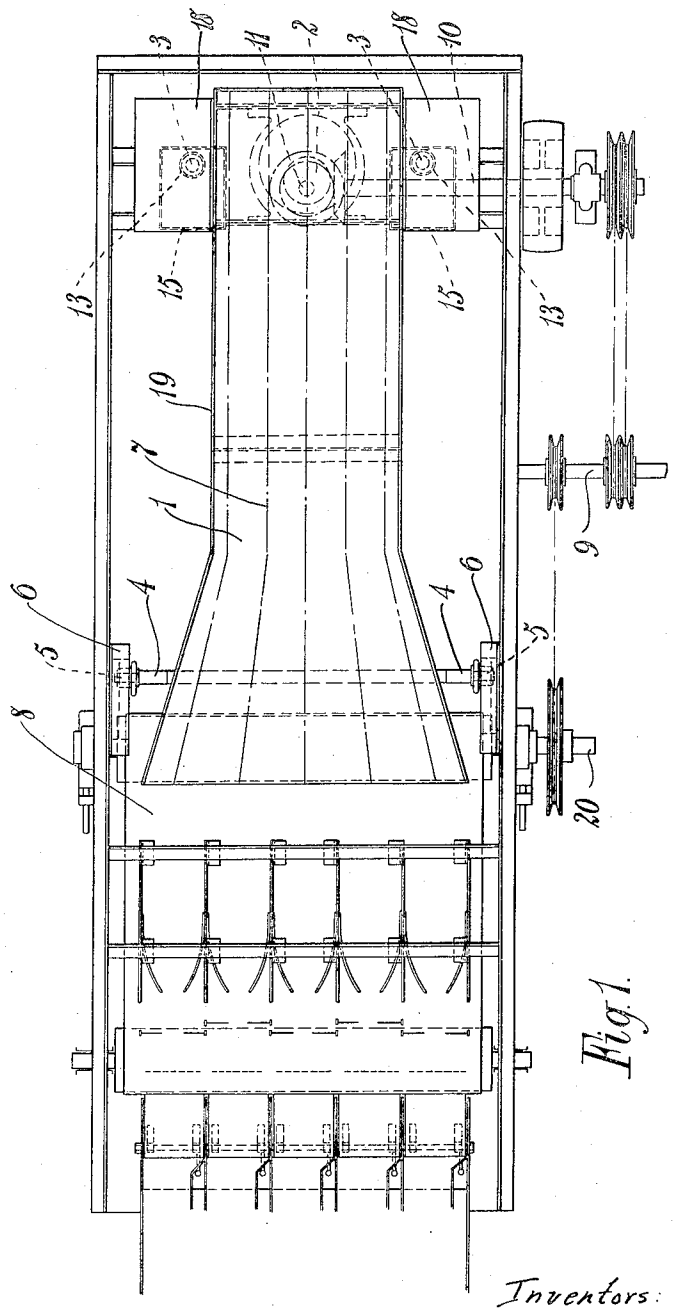


Fig. 1.

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Filed July 27, 1936 3 Sheets-Sheet 2

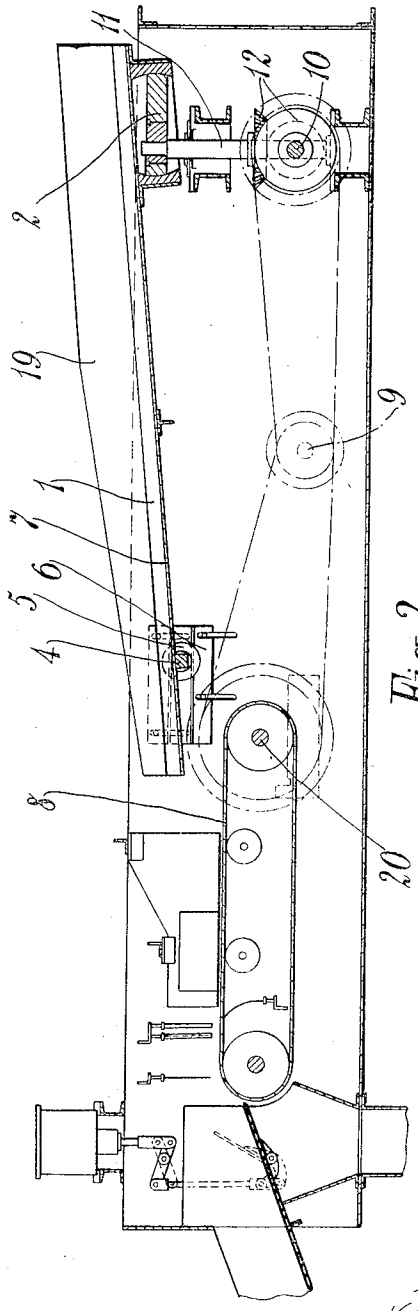


Fig. 2.



Fig. 7.



Fig. 6.

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Filed July 27, 1936 3 Sheets-Sheet 3

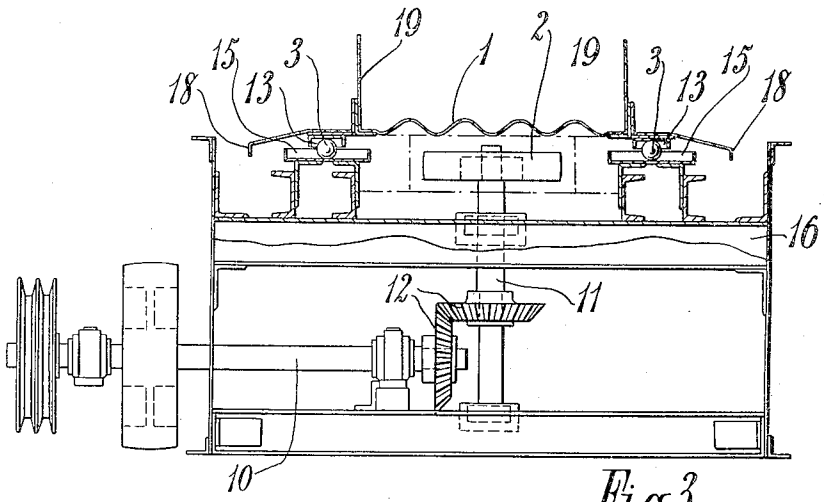


Fig. 3.

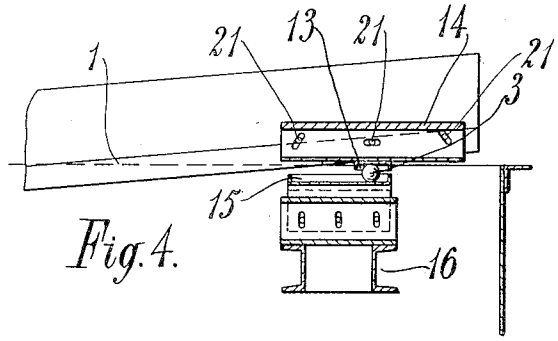


Fig. 4.

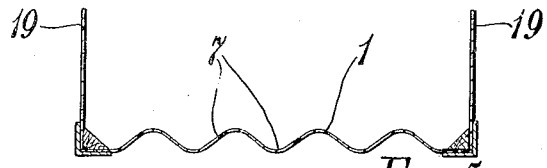


Fig. 5.

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Patented July 4, 1939 2,164,676

UNITED STATES PATENT OFFICE

2,164,676

VIBRATORY CHUTE

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Application July 27, 1936, Serial No. 92,920
In Great Britain August 2, 1935

1 Claim. (Cl. 198—220)

This invention relates to improvements in the electrical separation of coal from material composed of coal and associated impurities and more particularly to marshalling devices for ensuring the passage of the various pieces of material to an electrical discriminating device, for instance of the kind described in British Specification No. 421,401 (application No. 13,721 of 1933).

Up to the present difficulty has been experienced in marshalling the material sufficiently quickly and the object of the present invention is the provision of a marshalling device which is capable of high speed marshalling.

The invention consists in a process for marshalling particles of material which includes feeding the material to a chute or the like having a longitudinally corrugated upper surface, imparting to one end of the chute a curvilinear motion and causing the other end of the chute to move in a rectilinear path substantially parallel to the longitudinal axis of the chute.

The invention further consists in the processes and apparatus for carrying out such processes substantially as hereinafter described.

One way of carrying the invention into effect by way of example will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a plan view of a machine embodying the invention;

Figure 2 is a sectional elevation of the same machine associated with an electrical separating device.

Figure 3 is an elevation, partly sectioned, of the machine of Figure 1 viewed from the upper end of the chute.

Figure 4 is a detailed elevational view of the adjustment of the ball recess near the upper end of the chute.

Figure 5 is a section of the parallel walled part of the corrugated chute.

Figure 6 is an end view of the lower end of the chute with a straight delivery end.

Figure 7 is a similar view to Figure 6 but with an arched or bowed delivery end to the chute.

Referring to the drawings, a corrugated conveying jigging chute 1 is driven by an eccentric device 2 and supported at the top end on steel balls 3. Attached to the bottom end of the chute is an axle 4 carrying rollers or wheels 5 on its ends, which rollers or wheels run in longitudinal guides 6. The wheels 5 have flanges which prevent transverse motion at the bottom end. The resultant motion of the conveyor or chute is therefore rotational at the top end, the transverse component of this rotational motion decreasing from the top towards the bottom, finally becoming zero at the supporting axle 4. The longitudinal motion however remains constant from top to bottom.

When the material to be treated is delivered on to the top end in heaps, it is immediately scattered over the whole surface of the chute 1 by the transverse motion and simultaneously fed downwards by the longitudinal motion produced by the eccentric device 2. The pieces of material arrange themselves in lines in the bottoms 7 of the corrugations and are delivered at the bottom end one after the other to a fast moving belt 8 which then feeds them through discriminating devices of a known kind.

A main shaft 9 is driven from a source of power and in turn, by means of belts, drives the high speed belt 8 and a vertical shaft 11 by means of crown wheels 12. The eccentric device 2 is of the adjustable type, so that the stroke may be varied for different sizes of material. The guides or rails 6 can be raised or lowered, thus altering the angle of the conveying chute so as to control the rate of delivery of material. Because of this adjustability of the angle of the conveyor, the eccentric device has spherical driving surfaces. At the top end of the conveying chute, steel cups 13 are fixed by means of brackets 14. These brackets are fixed to the frame of the conveying chute by bolts through slots 21 (see Figure 4) so that when the guides 6 are raised or lowered, thus altering the angle of the chute 1, the brackets 14 can be adjusted in order that they be level.

The steel balls 3 are located inside these cups 13 and rotate in a circular path on steel plates 15, the said steel plates being fixed to the cross members 16 by adjustable angle iron supports as shown in Figure 4. Sheet steel guards 18 attached to the brackets 14 reach out and over the steel plates 15 thus preventing pieces of material from dropping on to the said plates.

The conveying chute 1 is fitted with side plates 19 to prevent the material from falling off the sides. The bottom end of the conveying chute is fanned out in order to lead the streams of material into the appropriate channels on the belt 8. If necessary the guides can be set at an angle from horizontal in order to give the material an upward kick on the forward stroke. The corrugations on the conveying chute may be made with a sharp V-shape contour instead of a rounded one and are as many in number as is required to give the desired output to the machine.

In operation the material forms itself into lines,

each piece touching the one immediately preceding it. The steel belt 8 is moved at a constant velocity greater than the forward speed of the pieces of material on the conveyor chute and consequently the pieces of material become spaced out as they drop on to the steel belt. If desired, the pieces of material may be given an initial spacing by progressively increasing the angle of rake of the conveyor from top to bottom.

Material passing down the centre channel has a free path along the corrugations, but that passing in the outer channels has a small resistance component due to movement against the sides of the corrugations, seeing that in this region there is a divergence of the path from the direction of the stroke. For this reason it will sometimes be desirable to bow the corrugations of the conveying chute at the lower end, for instance as shown in Figure 7, and thereby increase the angle of fall at the outside edges.

If necessary, the chute may be made progressively wider throughout its whole length instead of at the bottom end only. Alternatively, it may be made parallel throughout.

We claim:

Apparatus for marshalling materials such as coal of size one inch cubes and upwards into files including a downwardly inclined chute or the like having a longitudinally corrugated upper surface with corrugations suitable for the transmission of the aforesaid material of one inch cube and upwards which corrugations extend uninterruptedly from end to end of the chute, means for imparting a curvilinear motion to the higher end of the chute, means feeding aforesaid lumps of material to the higher end of the chute, and means for causing the lower end of the chute to move in a rectilinear path substantially parallel to the longitudinal axis of the chute, the corrugations being wider at the lower end of the chute than at the upper end of the chute, and the delivery end of the chute being of arched form.

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