J. T. NORMAN.

COAL AND SLATE SEPARATOR.

APPLICATION FILED NOV. 5, 1910.

1,025,587.

Patented May 7, 1912.

3 SHEETS—SHEET 1.

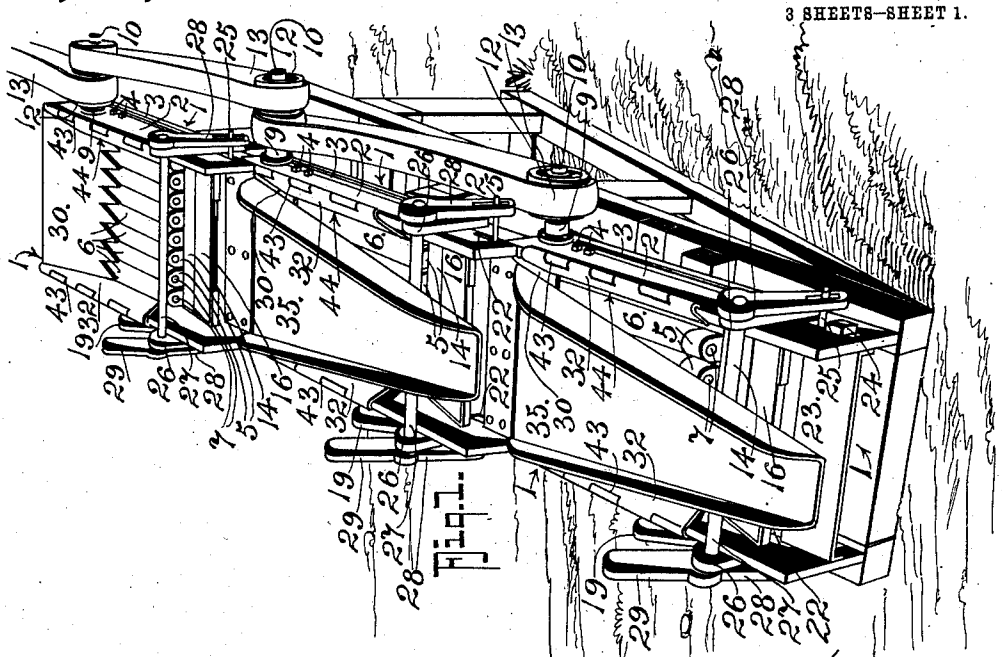

Fig. 1.

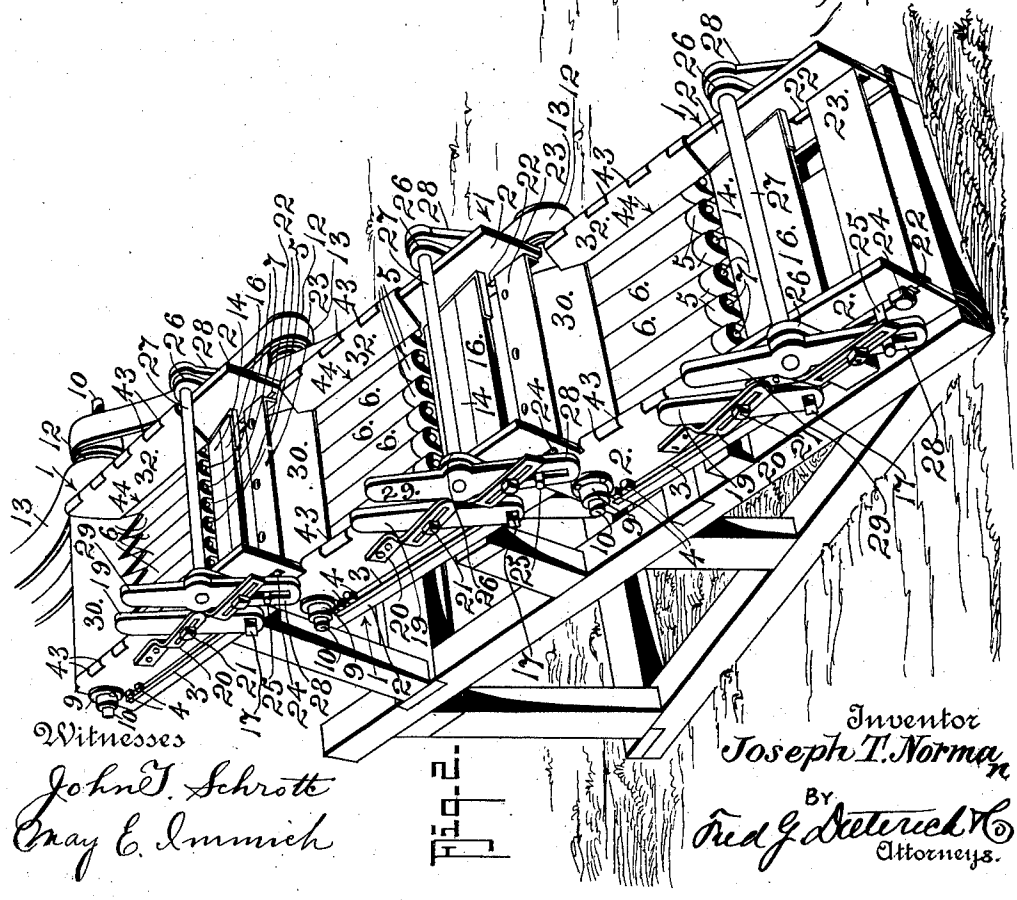

Fig. 2.

Witnesses

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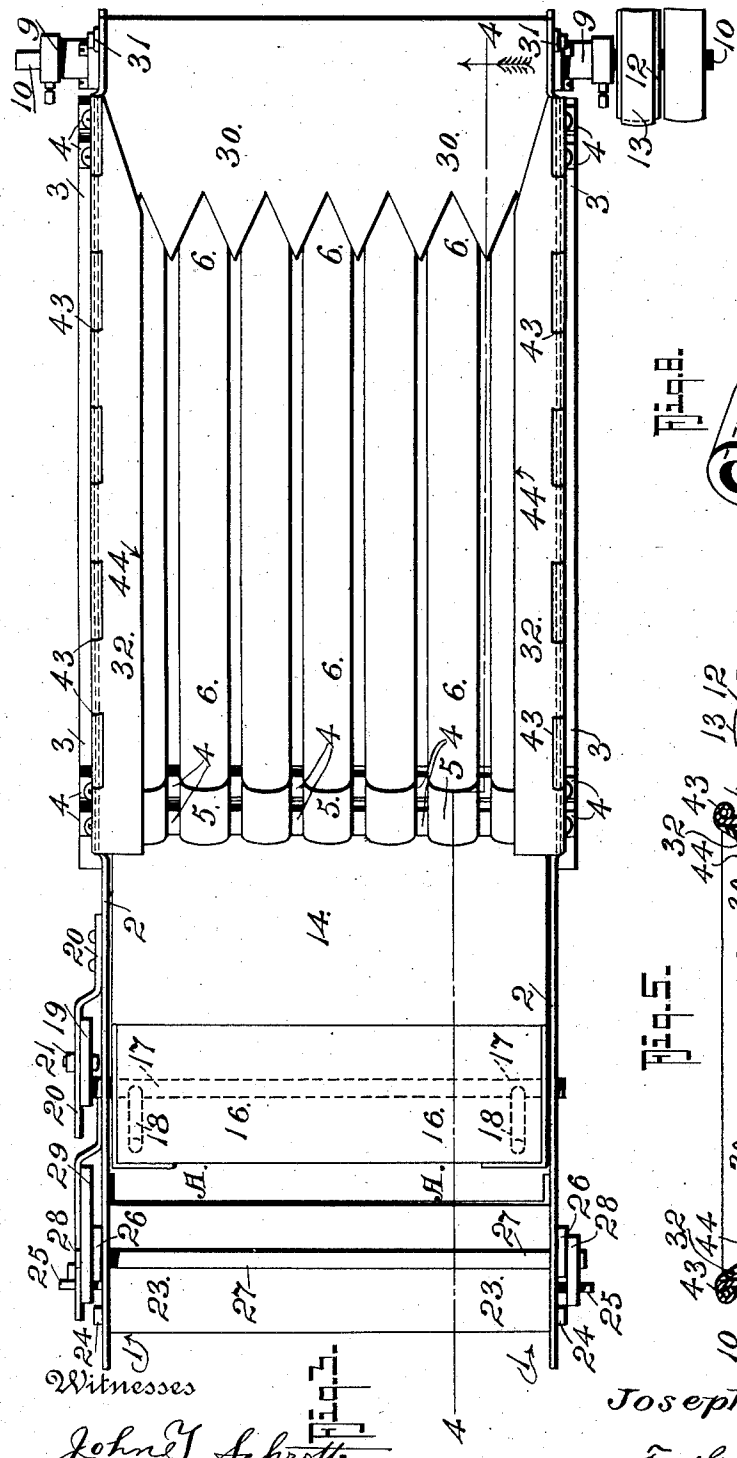

Fig. 7.

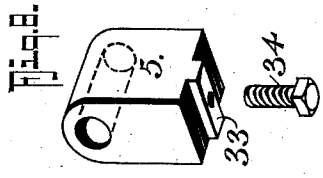

Fig. 8.

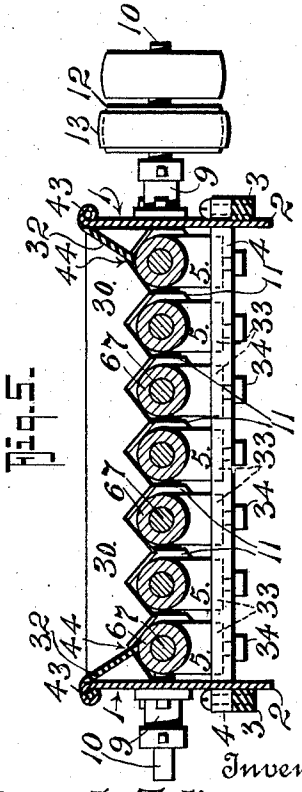

Fig. 5.

Witnesses

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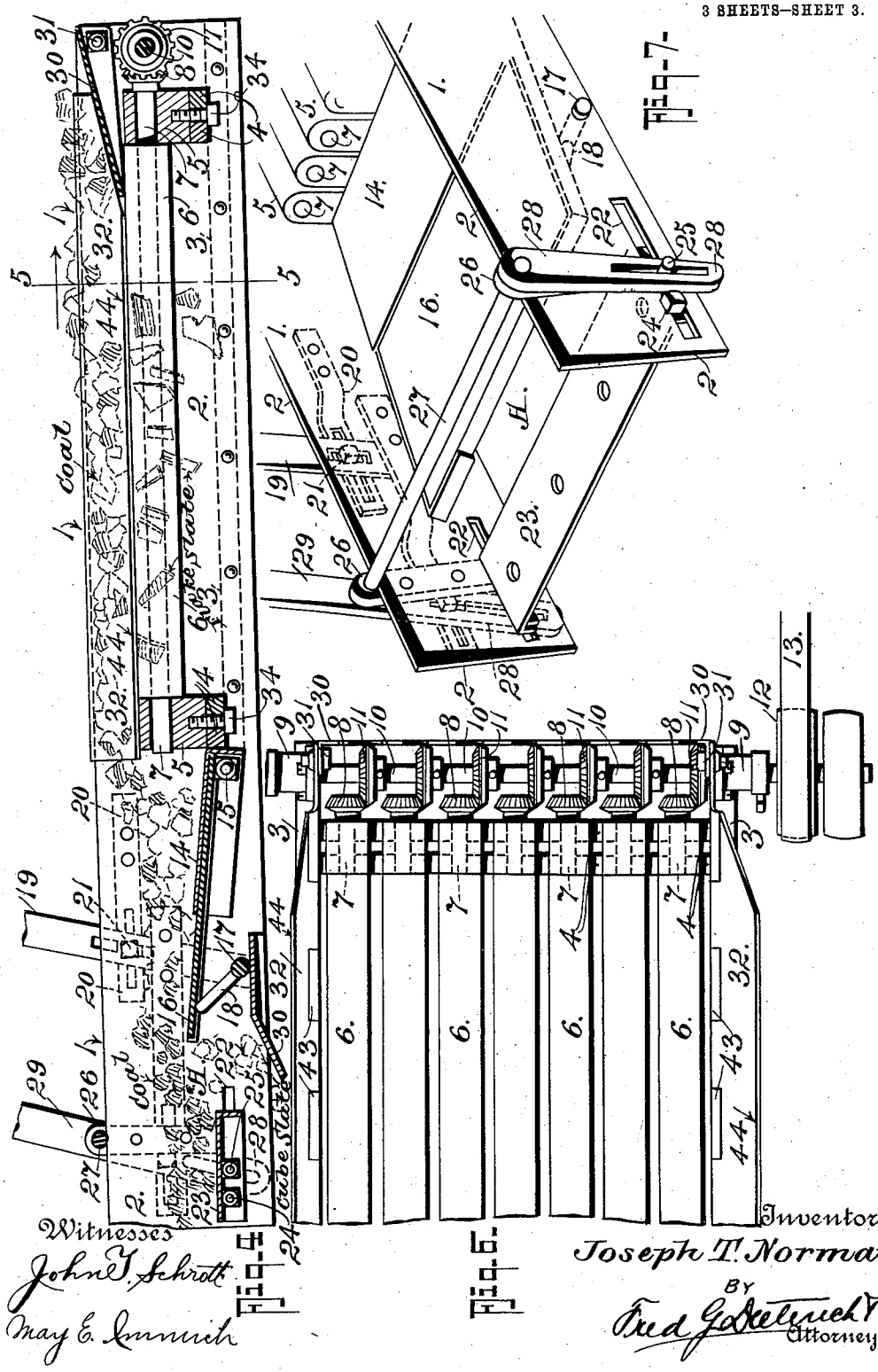
3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

JOSEPH T. NORMAN, OF WILKES-BARRE, PENNSYLVANIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE NORMAN PICKER CO., OF NANTICOKE, PENNSYLVANIA, A PARTNERSHIP.

COAL AND SLATE SEPARATOR.

1,025,587. Specification of Letters Patent. Patented May 7, 1912.

Application filed November 5, 1910. Serial No. 590,895.

To all whom it may concern:

Be it known that I, JOSEPH T. NORMAN, residing at Wilkes-Barre, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Coal and Slate Separators, of which the following is a specification.

My invention is a new and improved mechanism for separating the slate from all grades of coal, and to that end the invention includes a set of chutes along which the mixture of coal and slate is passed, each chute having means for effecting a separation of the flat or "flake" slate from the coal during the initial part of its journey down the chute, and having provisions to permit the separation of the "cube" slate from the coal after the "flake" slate has been separated therefrom.

More specifically my invention embodies a set of chutes (one or more) each including a suitable supporting frame, in which a set of longitudinally disposed rolls are located, the rolls extending, from the entrant end of the chute, a distance slightly more than one-half the length of the chute. The mixture of coal and slate is fed onto these rolls at the entrant end of the chute and means is provided for turning all the rolls of a given chute in the same direction to effect a transverse as well as longitudinal feed of the coal and slate, so as to turn the "flake" slate on an edge and permit it to thereby drop between the rolls and be discharged, while the "cube" slate and coal pass off the rolls at their lower ends onto an apron which is provided with a slate retarding section to hold back the slate while permitting the coal to be shot over a space onto a gate from which it passes onto an off-take and is delivered out of the machine while the retarded "cube" slate falls through the space over which the coal is shot and is delivered, together with any coal that may fall through, onto the next succeeding chute to effect further separation when a plurality of chutes is employed.

Another object of my invention is to provide separating rolls that are susceptible of adjustment whereby the space between adjacent ones of the rolls may be varied to permit thicker or thinner "flakes" slate passing through, depending upon the grade of coal being worked, or other conditions met with in practice.

In its more subordinate nature, the invention also includes those novel details of construction, combination and arrangement of parts all of which will be first fully described, then be specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which:—

Figure 1, is a perspective view of my invention ready for use. Fig. 2, is a view similar to Fig. 1, with the off-take chutes removed. Fig. 3, is a top plan view of one of the chute members. Fig. 4, is a vertical longitudinal section on the line 4—4 of Fig. 3. Fig. 5, is a cross section on the line 5—5 of Fig. 4. Fig. 6, is a detail top plan view of the driving mechanism for operating the rolls. Fig. 7, is a detail perspective view of the lower end of the chute showing the slate retaining section or table and the gate onto which the coal is deposited. Fig. 8, is a perspective view of one of the roll bearing members.

Referring now to the accompanying drawings, in which like letters and numerals of reference indicate like parts in all of the figures, 1 designates the chute sections, of which any number may be employed, depending upon conditions met with in practice. Each chute 1 is composed of side boards 2 having frame bars 3 joined by cross bars 4 each having a transverse longitudinal slot to receive the projections 33 of the roll bearings 5 and to permit passage of the clamping screws 34 that retain the bearings 5 in position. The bearings 5 are arranged in two sets, one set adjacent to the inlet end of the chute and the other set slightly beyond the midlength of the chute, there being two bearings, one in each set for each roll 6, the shaft 7 of each roll being mounted in upper and lower bearings 5. Each shaft 7 carries a beveled pinion 8 which is adapted to mesh with adjustable pinions 11 on a drive shaft 10 that is mounted in bearings 9 in the upper or entrant end of the chute, the shaft 10 receiving its motion in any desired way, as for example, by a pulley 12 and belt 13 from a suitable source of power. Below the rolls 6 and be-

tween such rolls and the exit end of the chute is a table 14 which is pivoted at 15 and has its free end adapted to rest on a transverse shaft 17, which has fingers 18 to engage the under side of the table 14 and adjust its position, the shaft 17 being operated by a lever 19 that may be located in its various positions by tightening up the bolt 21 that connects the lever 19 with a fixed bracket 20 on the side of the chute. The table 14, at its exit end, is provided with a slate retarding section 16 that serves to retard the movement of the slate, while permiting the coal to be shot over the space A onto the gate 23. The gate 23 has pins 24 and 25 that project into longitudinal slots 22 in the sides 2, so that the gate 23 may be slid to or from the table 14 to adjust the area of the opening A. The gate 23 is operated through levers 28 that engage the pins 25, the levers 28 being mounted on shafts 27 that project through suitable bearings 26, a lever 29 being provided by means of which the operator may manipulate the gate 23.

30 is a plate pivoted at 31, at the entrant end of the machine onto which the coal and slate is dumped, the same sliding down the plate 30 onto the rolls 6. Other plates 32 are provided which are hinged at 43 to the sides 2 and have their lower edges 44 resting on the side rolls 6—6 to prevent the coal and slate working down between the rolls 6—6 and the sides 2—2.

Suitable off-take spouts 35 are attached to the gates 23, or to any suitable part of the chute and through which the coal deposited on the gates 23 is passed out of the machine.

When two or more chute sections are employed, as indicated in Figs. 1 and 2 of the drawings, I arrange the gears 11 on the respective shafts 10, so that all the rolls 6 of one chute are turned in a clockwise direction, and all those of the next succeeding chute are turned in a counter-clockwise direction, and so on, so as to effect a zig-zag travel of the material down the sets of chutes, for a purpose presently more fully explained.

In practice, the material is fed into the chutes by depositing it on the upper plate 30, the chutes being held at a suitable incline to allow the material to gravitate downwardly, and power is applied to the several shafts 10 to turn the respective sets of rolls 6. As the rolls 6 all turn in the same direction the material will work toward one side of the chute and in doing so the "flake" slate will be turned on an edge and drop down between the rolls 6. In practice the first set of rolls will be placed closer together than the next succeeding set and so on down through the entire set of chutes, whereby the thinnest slate will be first picked out in the upper chute, the next thickest grade of slate will be picked out in the next chute, and so on down the line until a complete separation of slate and coal has been effected. As the "flake" slate is turned on an end and passes between the roll 6 out of the machine, as shown in Fig. 4, the "cube" slate and coal and some "flake" slate will be shot off the rolls onto the table 14, passing along the table. The slate retarding surfaces 16 retards the slate that may be in the coal, not only the "cube" slate but the "flake" slate that was too thick to pass between the rolls 6, and permits it to drop through the opening A, while the coal jumps the gap and lands on the gate 23 from whence it passes to the off-take 35 and is delivered out of the machine.

In practice, some coal will follow the slate through the opening A, and the coal and slate that passes through the opening A of one chute will be deposited on the plate 30 in the next lower chute where a further separation of the coal and slate takes place.

By making the rolls of succeeding chutes turn in a direction opposite those of preceding chutes, the mass is caused to effect movement in a zig-zag path down the set of chutes, thereby more efficiently dividing the coal and slate, so as to further their separation by the rolls 6 and the retarding plate 16, the effect being somewhat analogous to that which would be the case were a lateral reciprocating motion imparted to the ordinary chute down which coal is passed.

The table 14 may have its plane adjusted to any position where it will effect the most efficient operation and the gap A may be increased or diminished by the gate 23 at the will of the operator, depending upon conditions that may be met with in practice.

The provision of the side plates 32, as before stated, prevents any of the coal and slate getting down between the side rolls and the sides 2 of the frame and binding or jamming them and by reason of the rolls 6 of a set all turning in the same direction, no crushing action is imparted to the coal.

In practice the plate 32 at the side of the rolls opposite to that side toward which the mass is moved may be raised so as to give an additional separating slot between the sideboard of the machine and the adjacent roll 6. In other words, during the operation of the sections only one or the other side plates 32 need be down on the rolls, depending upon the position of the rolls, so that should the operator start up the machine in a direction different to that from which it had been running when it was last shut down, he need not stop his engine and restart his machine. It is only necessary for him to throw down the opposite plate 32 and throw up the one that was down. In this way only one of the longitudinal slots between the sides of the frame and the rolls is inactive at any time.

Thus with seven rolls in the machine there are always seven available slots for separation, whereas were the side plates 32 at each side of the machine in contact with the rolls there would be but six separating slots with seven rolls.

By arranging the respective chute sections in longitudinal succession and making one discharge directly into the other, a quicker separation of the coal and slate is obtained than in other types of coal and slate separators where the successive chutes are in a superimposed position, that is, where the succession of chutes is not in longitudinal succession but in vertical succession. The reason for this is apparent. When the chutes are arranged one above the other in vertical succession, the direction of movement of the coal and slate is reversed back and forth, as it passes from one section into the next succeeding section, making it necessary for the movement of the coal in a given direction to come to a stop and the direction of movement reversed with each succeeding chute section, whereas in my apparatus the direction of movement of coal and slate is always the same through the succession of chutes, thereby enabling the speed of separation to continue uniform throughout and thus effect a more accurate and rapid separation than is possible with the same number of chutes arranged in a vertical succession where the direction of movement of coal and slate is successively reversed. It will also be observed that by arranging the table 14 wholly below the plane of the roller separators the coal and slate passing from the roller separators is dropped and tumbled thereby insuring a better distribution of the coal and slate on the table, so as to permit it to become spread over the table and thus give a more effective separation. Attention is also called to the fact that by arranging the coal chutes 35 to distribute successively one into the other, all of the coal is discharged from the machine at one point, while the separated slate is deposited directly beneath the apparatus. This is a material improvement in that it reduces the labor in collecting and removing the coal and slate, and further makes it necessary to have but one attendant at the machine, whereas in other types of machines having separate coal and slate discharges more than one attendant is necessary.

From the foregoing description taken in connection with the accompanying drawings, the complete construction, operation and advantages of my invention will be readily understood by those skilled in the art to which the invention appertains.

What I claim is:

1. In an apparatus of the class described, a plurality of coal chutes discharging one into the other, each of said chutes including a set of longitudinally disposed uni-directionally rotatable separating rolls, the rolls of a set being spaced apart, means for turning said rolls to effect a separation of the "flake" slate from the coal, each of said chutes including a table onto which the coal and residual slate is discharged from the rolls, means for separating the "cube" slate from the coal as said mass leaves said table to enter the next succeeding chute, off-take spouts for delivering the separated coal from the chutes, the rolls of one chute being rotatable in a direction opposite to those of the next succeeding chute to effect a zig-zag travel of the mass, along the chutes from the entrant end of the first chute to the exit end of the last chute.

2. In an apparatus of the class described, a chute composed of a frame having sideboards, a set of longitudinally disposed spaced rotatable rolls mounted in said frame and onto which the coal and slate is passed, a plate at the entrant end of said chute to project over the entrant end of said rolls to project the coal onto said rolls, side plates hinged to the sides of the chute and projectable over the side rolls, a shaft mounted in said chute, gear connections between said shaft and said rolls to effect the rotation of all of said rolls in the same direction whereby to separate the slate from the coal as the mass passes along said rolls from the entrant end toward the exit end of said chute.

3. A coal and slate separating apparatus including a plurality of sets of successively arranged longitudinally disposed rotatable separating rolls, the rolls of a set being spaced apart, means for turning said rolls to effect a separation of the "flake" slate from the coal, the rolls of one set being rotatable in a direction opposite to those of the next succeeding set to effect a zigzag travel of the mass along the apparatus from the entrant end to the exit end of the same.

4. A coal and slate separating apparatus including a plurality of separate and distinct separating sections each of like construction to the other discharging directly one into another, and arranged in longitudinal succession, each of said sections including means for separating the coal and slate, and means for effecting a zigzag travel of the mass along the apparatus from the entrant end of the first section to the exit end of the last section.

5. In an apparatus of the class described, a plurality of coal chutes discharging directly one into the other and arranged in longitudinal succession, each of said chutes including a set of longitudinally disposed uni-directionally rotatable separating rolls, the rolls of a set being spaced apart, and means for turning said rolls to effect a separation of the "flake" slate from the coal,

each of said chutes including a table onto which the coal and residual slate is discharged from the rolls, means for separating the "cube" slate from the coal as said mass leaves said table to enter the next succeeding chute, an offtake spout for each coal chute, the off-take spout of one chute delivering into the off-take spout of the next succeeding chute to deliver the separated coal from the chutes at a single place.

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Witnesses:
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