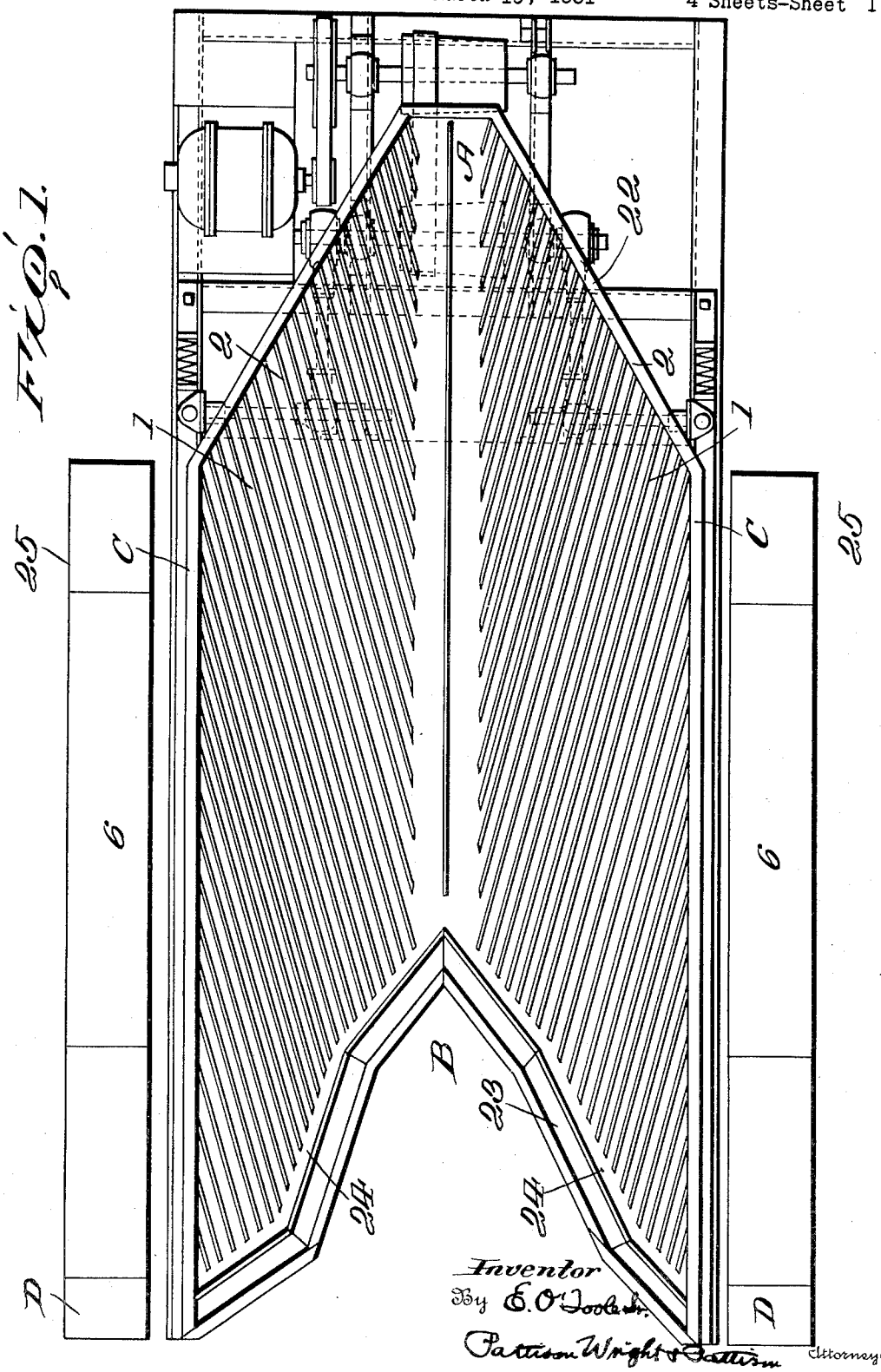
March 13, 1934. E. O'TOOLE, SR 1,950,861

METHOD AND APPARATUS FOR FEEDING AND SEPARATING DRY COAL FROM REFUSE

Filed March 19, 1931 4 Sheets-Sheet 1

Fig. 1.



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METHOD AND APPARATUS FOR FEEDING AND SEPARATING DRY COAL FROM REFUSE

Filed March 19, 1931 4 Sheets-Sheet 2

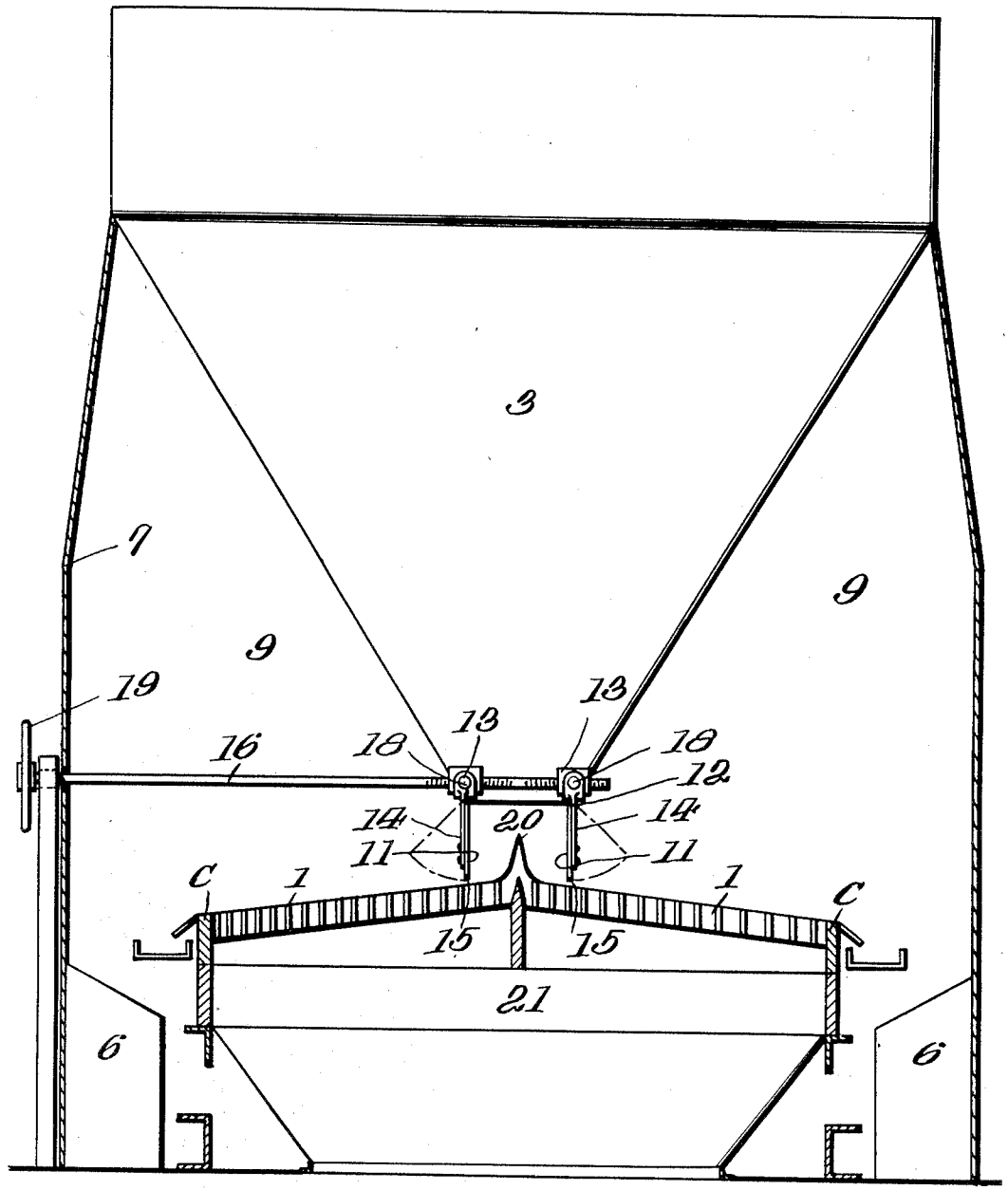


Fig. 2.

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METHOD AND APPARATUS FOR FEEDING AND SEPARATING DRY COAL FROM REFUSE

Filed March 19, 1931 4 Sheets-Sheet 3

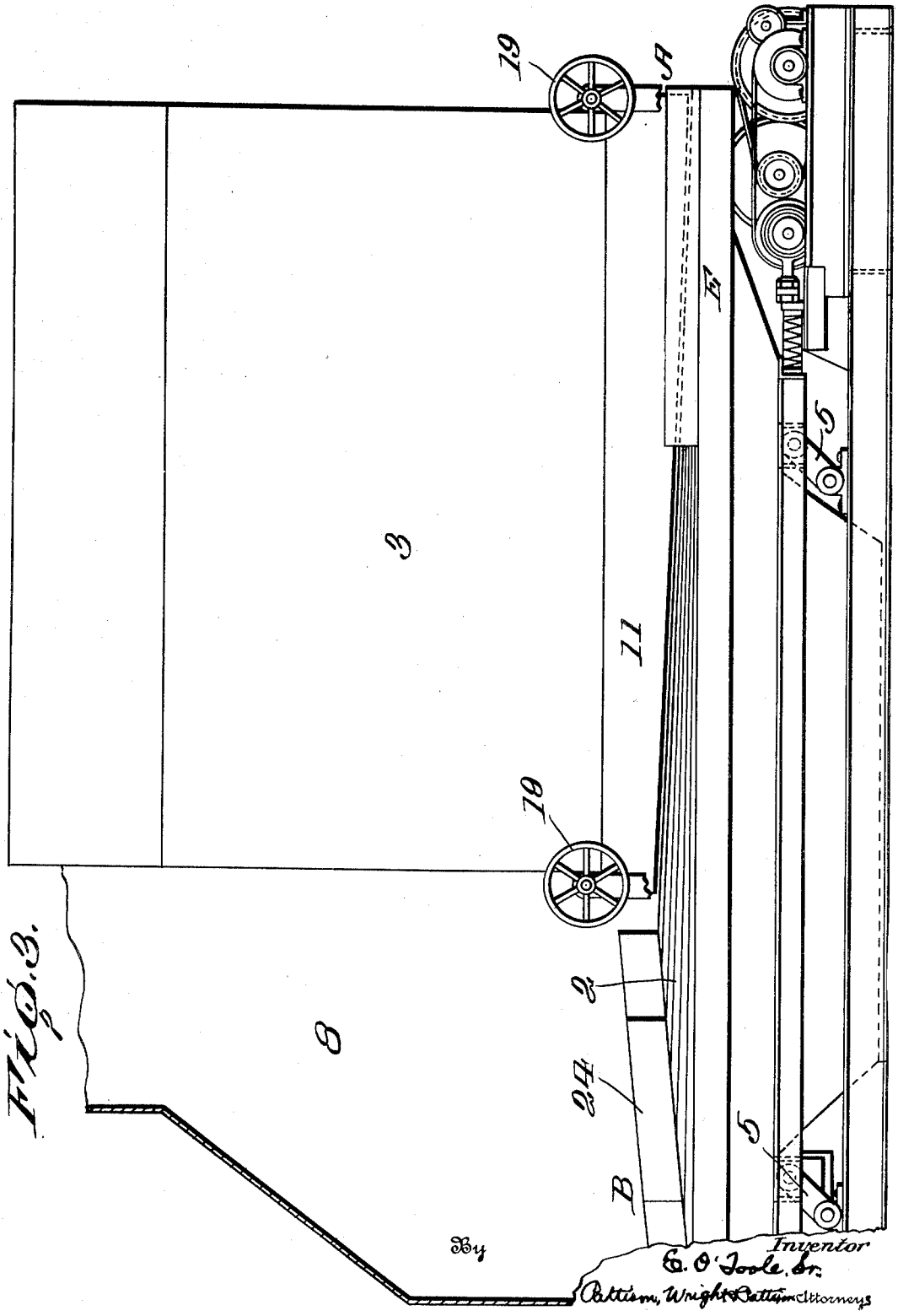


Fig. 3.

March 13, 1934. E. O'TOOLE, SR 1,950,861

METHOD AND APPARATUS FOR FEEDING AND SEPARATING DRY COAL FROM REFUSE

Filed March 19, 1931 4 Sheets-Sheet 4

Fig. 4.

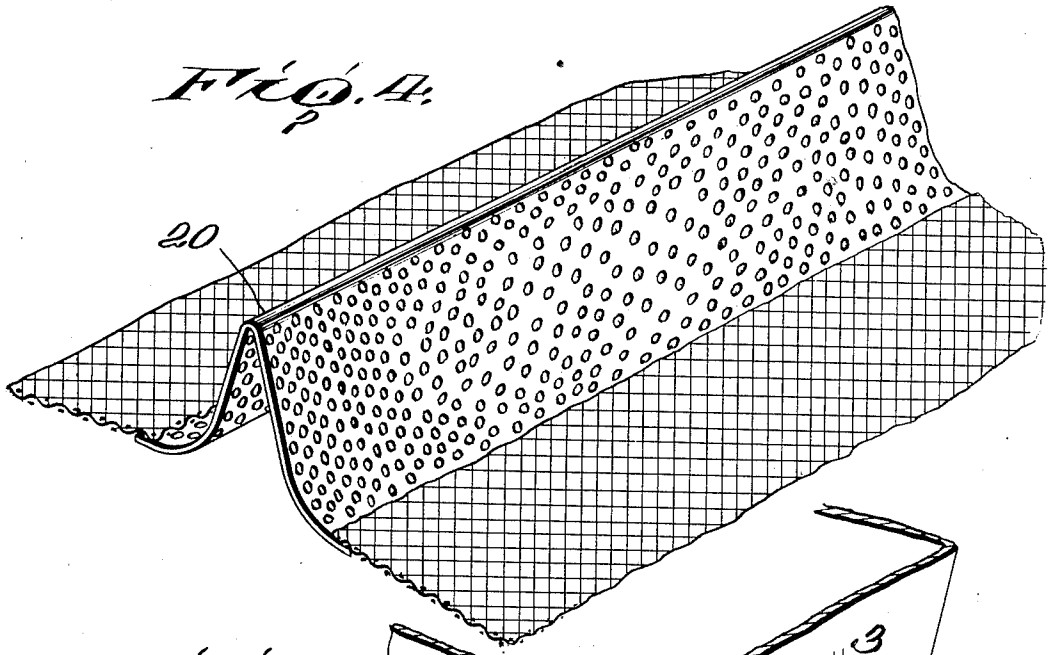
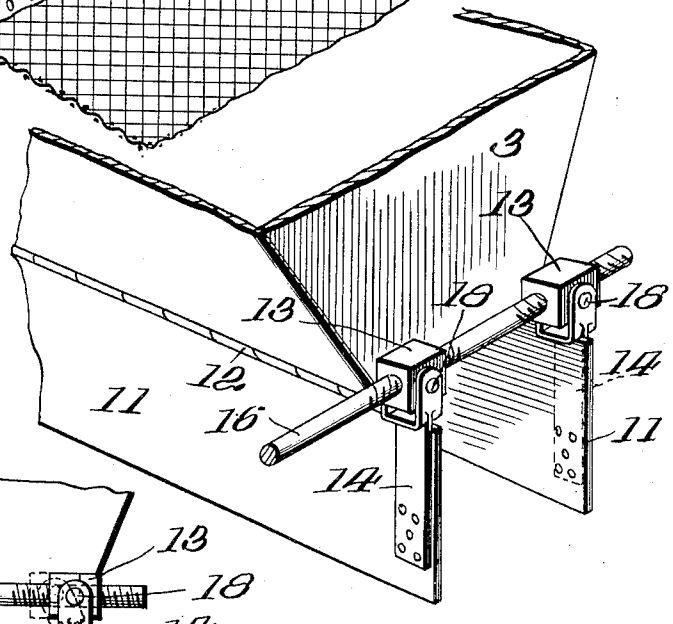


Fig. 5.



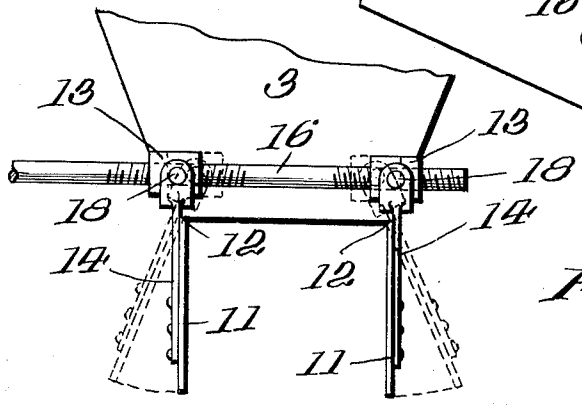


Fig. 6.

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Patented Mar. 13, 1934 1,950,861

UNITED STATES PATENT OFFICE

1,950,861

METHOD AND APPARATUS FOR FEEDING AND SEPARATING DRY COAL FROM REFUSE

Edward O'Toole, Sr., Gary, W. Va.

Application March 19, 1931, Serial No. 523,903

13 Claims. (Cl. 209—467)

This invention relates to improvements in method and apparatus for feeding and separating dry coal from its refuse which improvements will be fully described and shown hereinafter.

In a copending application I have shown a method and apparatus in which the coal to be cleaned of its refuse is fed in a stream extending longitudinally of the deck whereby great efficiency is obtained over the prior method of feeding the coal substantially at the feed end of the deck. The advantages in this elongated longitudinal feed or stream of the coal is set forth in my application Serial No. 523,902 filed March 19, 1931 and it is unnecessary to repeat these advantages in this application.

One object of the present invention is to provide this elongated opening in the feed bin extending longitudinally of the deck with a door or doors located at the feed end which are adjustable substantially throughout their length. This adjustability throughout the elongated doors is accomplished as shown in this application my making the doors flexible whereby the adjustment of the door or doors can be made more at one end than the other due to their flexibility.

The present improvement is applied to a pervious deck that has air passing upward through it and therefore through the bed of coal on the deck and the deck made to vibrate longitudinally whereby stratification of the particles of the mass is made with the heavy particles sinking down and the lighter particles moving upward thereabove.

In carrying out this old method of separation the separated coal is being discharged from the deck throughout its length and therefore the bed carried by the deck is gradually decreasing from the feed end of the deck to its discharge end.

I have discovered a new method of feeding the deck with coal whereby the mass fed is gradually increased from the feed end to the delivery end of the deck thereby enabling a uniform bed of coal from end to end of the deck by reason of this new method of feeding. This method because of the substantial uniformity of the bed of coal on the deck throughout its length increases very much the efficiency of the deck in its separating operation.

This invention is therefore particularly adapted to be used on decks which are very much longer than those which have heretofore been used which enables me to separate a mass composed of very much larger pieces of coal than heretofore down to a very small particle of coal and without resizing the coal prior to its separating action on the old usual short decks. This has certain advantages which are set forth in my above enumerated application and need not be repeated here.

A further object of the present invention is to utilize the space not occupied by the deck, which object is accomplished by extending the deck over the driving gear thereby increasing its length and its efficiency without occupying any more floor space, which will be described hereinafter.

Another object of the present invention is to do away with the now existing dead corners at or near the feed end of the deck whereby certain saving in power in supplying the air to these dead spaces is effected.

A further object of the present invention is to provide means that is embraced by the feed bin and the adjustable door hereinbefore referred to for feeding air to the coal or means located in the said feed whereby the coal is aerified and the particles thereby segregated which serves to prevent the mass which has become pressed together while in the bin, from interfering with its feeding, and further permits the stratification to begin as soon as the mass of coal reaches the separating deck. Feeding air to the coal in the above manner also permits a more efficient cleaning when operating on coal having a high moisture content.

Additional objects of the present invention will be described hereinafter.

In the drawings:

Figure 1 is a plan view of a dry coal separating deck, the feed bin being omitted to expose the details of the deck.

Fig. 2 is a central cross section of the deck showing the feed bin in position thereabove.

Fig. 3 is a side elevation of Figure 2.

Fig. 4 is a perspective view of part of the separating deck and bin disclosing the longitudinally extending aerating device.

Fig. 5 is a perspective view of the elongated doors for controlling the passage of the mass to be separated.

Fig. 6 is an end view of Fig. 5.

In Figure 1 of the drawings the deck is shown broken to indicate that it is in practice preferably much longer than would otherwise be illustrated.

That well known form of the deck 1 herein illustrated consists of a pervious material. In the form here shown A indicates the feed end

of the deck and B in general the discharge end of the deck. In the operation of this deck air is supplied in any well known manner under this pervious deck by means of a suitable fan (not shown) and this air passes through the pervious deck and in contact with the mass on the deck that is to be cleaned.

In the form here shown the deck has a plurality of parallel riffles 2 which extend forward and inward from the feed end to substantially its center portion. This deck preferably extends uphill, or in other words, is inclined upward from the feed end A to its discharge end B, and is inclined upward and inward from its opposite edges C. While I have referred to the end A being the feed end, and the end B the discharge end this is simply for assistance in explaining the said invention. As a matter of fact the coal to be cleaned is fed in a longitudinal stream at its center and this stream or mass extends substantially throughout the length of the main portion of the separating deck so that the terms "feed end A" and "discharge end B" are therefore misnomers and merely for the purposes of explanation. In the type of separating decks heretofore used the end A would in fact be the feed end and the end B would substantially in effect be the discharge end. In the present instance the cleaned coal is being discharged throughout the edges C so that in fact it would be accurately stated that the sides of the table are the discharge sides, but at the same time it will be pointed out hereinafter that the slate and other refuse is not discharged until it reaches the extreme corners D, as will be explained further on. The edges C are sufficiently low to act as a tailings riffle.

The idea of feeding the mass to be cleaned in an elongated longitudinally extending stream is shown and described in my said copending application to which attention is particularly called for any feature relating to it that is not stated herein. In order to enable the present improvement however to be fully understood the function of the longitudinal stream must to some extent be explained.

In operation the coal is fed to the bin 3 in any suitable manner from any source of supply and this mass of coal finally flows outward through the longitudinal feed opening 4 formed in the lower end of the bin.

Also for the purpose of avoiding any confusion in the illustration of this case I have omitted to show in the section Figure 2 the riffles 2. These riffles are of a well known type and they are omitted in Figure 2 to prevent unnecessary complication and possible confusion.

In operation the coal being fed to the deck 1 and air flowing upward through the previous deck, and the deck being longitudinally reciprocated by any well known mechanism such as shown at E, this coal is agitated by the reciprocation of the deck and the upflowing air causing a stratification to be made between the lighter particles (coal) and the heavier particles such as slate and other refuse. This slate and other refuse which is heavier than the coal sinks in between the riffles 2 and the deck being reciprocated in the direction indicated by arrow, Figure 1, on suitable inclined toggles or links 5, the deck when it moves forward is lifted and when it moves backward it drops partly from the heavier particles between the riffles, and due to this operation these heavier particles are positively projected forward and inward on the deck. They are therefore projected uphill while the lighter particles of coal which float above the riffles and the heavier particles of slate flow by gravity in opposite directions from the center of the deck and finally pass off of the edges C into a suitable trough 6 or other receptacle constructed to receive it. This separated coal can be removed by any suitable mechanical mechanism from the receptacle or trough 6.

As shown in Figures 2 and 3 the bin 3 is enlarged upwardly so that its upper end preferably extends beyond the sides of the deck 1 and depending from the upper end of this bin are suitable flanges 7 which extend below the deck and embrace the deck. This arrangement together with the extension 8 of the bin completely encloses the whole deck and constitutes what may be termed two dust laden receiving chambers 9 which are connected with the dust laden extension 8 which in turn is suitably connected at 10 with any desired fan (not shown) for withdrawing the dust laden air from the hood. The construction of this bin is fully shown and described in my aforesaid pending application and it is needless to repeat the description here.

Coming now to the present improvements I will first explain the flexible doors 11 that are hinged at 12 to the lower edges of the elongated feed opening 4 of the bin 3. These doors extend as here shown throughout the length of the bin. Projecting upwardly at the front and rear ends of the hinged doors 11 are suitable arms 13 while the lower portions 14 of these arms are located below the hinges and are firmly attached to the said doors. For the purpose of adjusting these doors inward and outward and thereby increasing and diminishing the spaces 15 between the lower edges of the doors and the deck 1 rods 16 pass through the depending hood flange 7 and extend over the deck 1 and the inner ends of these rods are provided with right and left hand screw threads 17 on which are placed some screw threaded blocks 18 that are engaged by the screw threads on the rods. Attached on the ends of these rods and located outside of the depending flanges 7 where they can be conveniently operated are suitable wheels 19. The amount of flow of the coal in opposite directions past the lower edges of the doors 11 is controlled and regulated by the distances of these doors from the deck 1. When these doors are in a vertical position as shown in full lines small passages 15 for the coal are provided but when these doors are adjusted outwardly these passages increase in size and therefore the flow of the coal to be separated correspondingly increases. These doors are hinged at their upper ends at 12 and one end of these doors can be opened a greater distance than the opposite end due to their flexibility.

In this machine with the central elongated feed the heavy particles, as stated, are caught between the riffles 2 and conveyed to said stream. Because of this there is an accumulation of the heavy particles from the feed end of the deck to the opposite end of the stream. Because of this accumulation of heavy particles along the edges of the said elongated stream it is necessary that the doors, gates, or valves 11 be adjusted with a wider opening at the delivery end of the machine to permit the same amount of unseparated coal to flow to the deck and maintain on the deck throughout its whole length a bed of unseparated coal having substantially a uniform depth. This accumulation of the

heavier particles begins at the feed end A of the deck and the heavy particles gradually increase from that feed end until they escape at the opposite end of the said stream. Therefore there is a gradual accumulation of these heavy particles along the edges of the streams. Therefore in order to permit the escape of substantially the same amount of unseparated coal to the deck it is necessary that the doors 11 be adjusted to gradually increase the opening from the receiving or feed end of the deck to its opposite discharge end of the deck or stream.

To facilitate the segregating and the free flowing of the coal through the opening 4 and to get it in condition to have stratification begin when the coal reaches the deck and to further better adapt the method to operate on coal containing a high moisture, I provide means for feeding air to the coal between the doors 11. This means consists in an upwardly elongated device 20. This device is preferably located as shown in the drawings and it consists of a pervious element 20. It may preferably consist of perforated metal and it is elongated to extend substantially throughout the length of the feed opening whereby air is fed to the coal in this feed passage and the coal is aerated and is segregated thereby. In the form of the invention here shown this aerating device 20 receives its air pressure from the air chamber 21 below the deck which is provided with air pressure in a well known manner and by the same means that supplies air pressure under the pervious deck 1. This aerator 20 also serves as a longitudinal banking bar.

The separated coal does not flow from the tapered feed end of the deck and for the purpose of holding the coal thereon an upwardly projecting board 22 extends around that end of the deck. The discharge end of the deck B is surrounded by a banking bar 23 which serves to hold the slate and other refuse matter on the deck until it travels in the unobstructed spaces 24 to the refuse point D which is in the form of a receptacle or trough 25.

By means of the adjustment of the flexible doors 11 hereinbefore referred to, more coal can be permitted to flow from the bin at one point than another and thereby maintain a substantially uniform depth of the mass throughout the deck.

Variations in the constructions herein described may be made without departing from the spirit of the invention so long as they come within a liberal interpretation of the appended claims.

It will be understood that any medium other than air can be used so long as it accomplishes the function and purpose of air as herein set forth, and where the term air is used in the claims it is to be construed sufficiently broad as covering any other medium.

While this invention has been described as treating coal, it will be understood that it is also adapted to treat other granular material as well as coal.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. The method of separating a mass of coal comprised of heavy and lighter particles which consists in feeding the mass in a longitudinal stream on an elongated longitudinally reciprocating surface, segregating and aerating said stream by applying air thereto at a point above and in advance of said surface whereby stratification of the particles of the mass when it reaches said surface is facilitated, projecting the heavier particles of the mass towards the said elongated stream and causing the lighter particles to flow in a direction away from the stream whereby separation is accomplished.

2. An apparatus for the dry separation of coal comprising a separating deck, an elongated passageway extending longitudinally of said deck for feeding coal thereto, said passageway having a door extending longitudinally of the deck for controlling the longitudinal passageway, said control capable of having its ends independently adjustable whereby a larger passage for the coal can be provided at one end than at the opposite end of the passageway.

3. An apparatus for the dry separation of coal comprising a separating deck, a longitudinally extending feeding bin having a longitudinally extending passageway for the coal to the deck, an elongated flexible door for said passageway and means for independently adjusting the opposite ends of the door to form a gradually increasing passageway from one end to the other end.

4. An apparatus for the dry separation of coal comprising a separating deck having a longitudinally and centrally arranged unobstructed portion, means extending longitudinally of the said unobstructed portion of said deck and projecting upward therefrom, said projecting means constructed to permit air to pass through it, means for supplying air thereto and means for supplying coal to be separated at the side of said projecting means whereby the unseparated coal is aerated and segregated for the purpose specified.

5. In an apparatus for the dry separation of coal comprising a separating deck, means for feeding a longitudinally extending stream to said deck and pervious means projecting into the said stream, and means for supplying air through the said pervious means into the said coal for aerating and segregating the particles thereof, as specified.

6. An apparatus for the dry separation of coal comprising a separating deck, a bin located above the deck and extending longitudinal thereof to supply a stream of coal to the deck to be separated and an upwardly projecting perforated member in engagement with said coal, and means for forcing air through said perforated member for aerating and segregating the particles of coal to assist the separation of said particles.

7. An apparatus for the dry separation of coal comprising a separating deck provided with a longitudinally arranged feed opening, a centrally arranged elevated pervious extension above said deck located in said feed opening, means for supplying air through said pervious extension, and means for feeding coal substantially against said pervious extension, whereby lateral air pressure is provided, for the purpose set forth.

8. An apparatus for the dry separation of coal comprising a pervious deck, riffles on top of said pervious deck, an elongated feed passageway, an elongated upwardly projecting pervious member located in said passage at one side of said riffles, means for supplying air through said upwardly projecting pervious member, and means feeding coal at one side of the said pervious extending member, the parts operating for the purpose described.

9. An apparatus for the dry separation of coal comprising a pervious separating deck provided with a plurality of forwardly projecting riffles, an upwardly projecting pervious member located in advance of said riffles through which air is forced laterally, means for feeding coal at one side of and substantially against the pervious extending member, the parts operating for the purpose specified.

10. An apparatus for the dry cleaning of coal comprising a pervious deck provided with a plurality of forwardly projecting riffles, an upwardly projecting pervious member extending across one end of the said riffles, means feeding air through said pervious member and means for feeding coal to one side of the upwardly projecting pervious member, for the purpose specified.

11. An apparatus for the dry cleaning of a mass of coal comprising a pervious deck provided with parallel forwardly projecting riffles arranged to form an unobstructed space extending across the riffles in which the concentrated heavy particles travel, an elongated upwardly projecting pervious member located longitudinal the said unobstructed portion of the deck, means for supplying pressure through said pervious extending member, and means for feeding coal at one side of said pervious upwardly extending member, the parts operating substantially as set forth.

12. An apparatus for the dry cleaning of coal comprising a deck having an elongated unobstructed portion, riffles on the deck extending towards the unobstructed portion and stopping at the unobstructed portion, an elongated upwardly extending pervious member located centrally in said unobstructed portion, means for supplying air through the pervious member in opposite directions and means for supplying coal to opposite sides of the pervious member, the parts operating as specified.

13. An apparatus for the dry cleaning of coal comprising a pervious deck having a centrally arranged unobstructed portion, a vertically extending pervious substantially A-shaped member in cross section, means for supplying air between the legs of the A and through the perforations therein and means for feeding coal at both sides of the said pervious member, the parts operating for the purpose set forth.

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