

Jan. 28, 1936.

M. E. HAWORTH

2,028,904

COAL CLEANING APPARATUS

Filed April 9, 1931

5 Sheets-Sheet 1

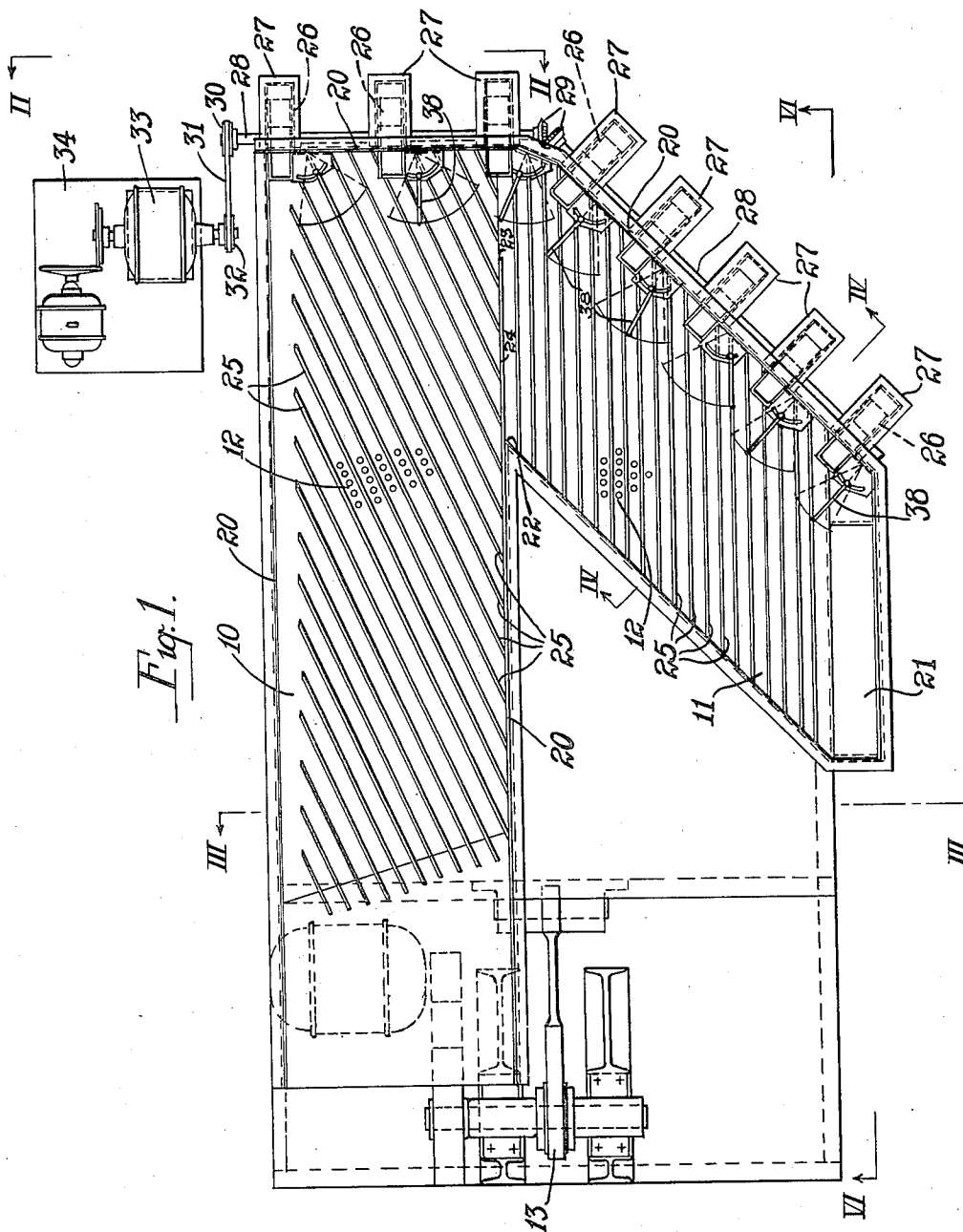


Fig. 1.

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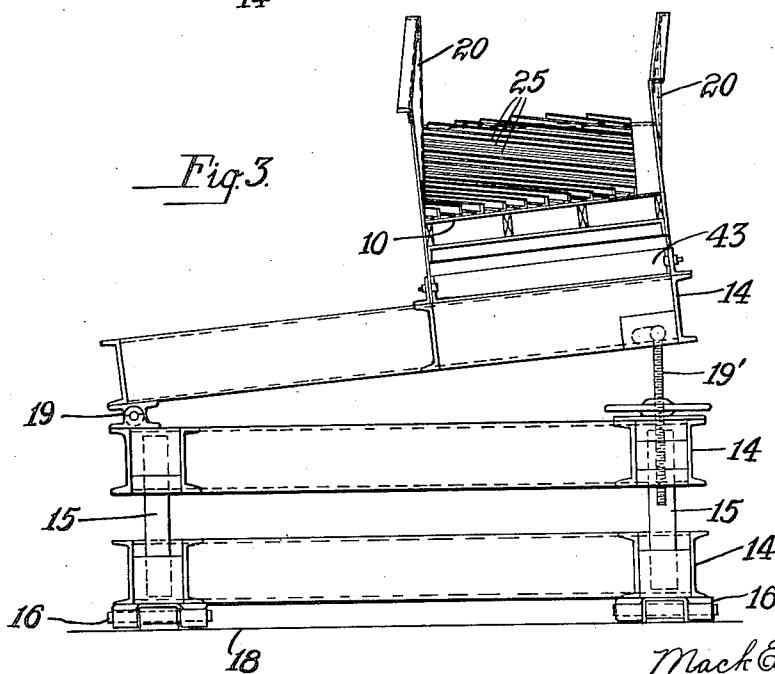
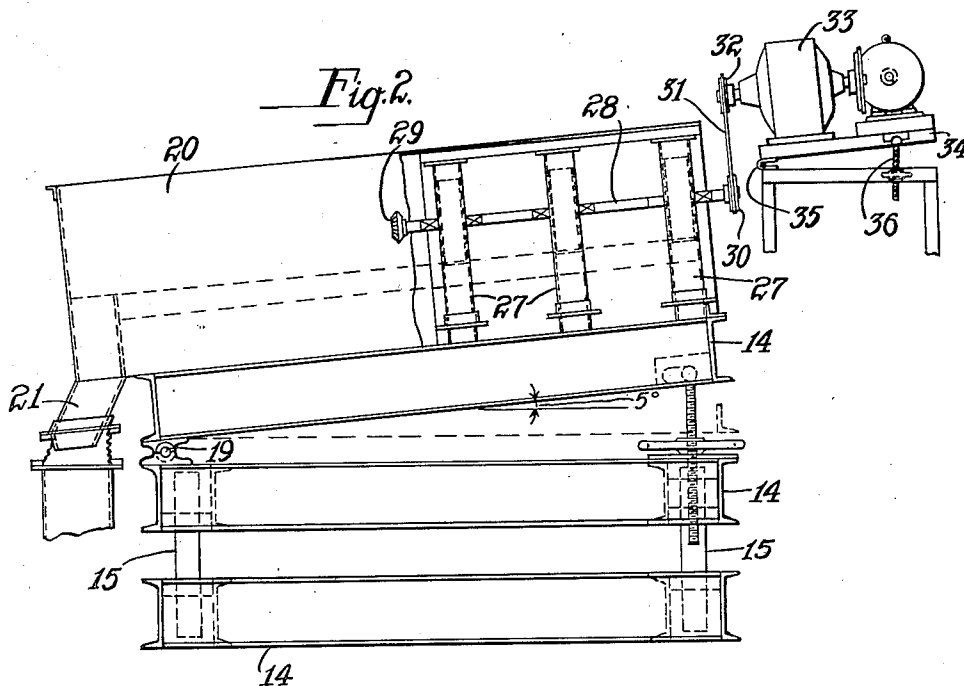
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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

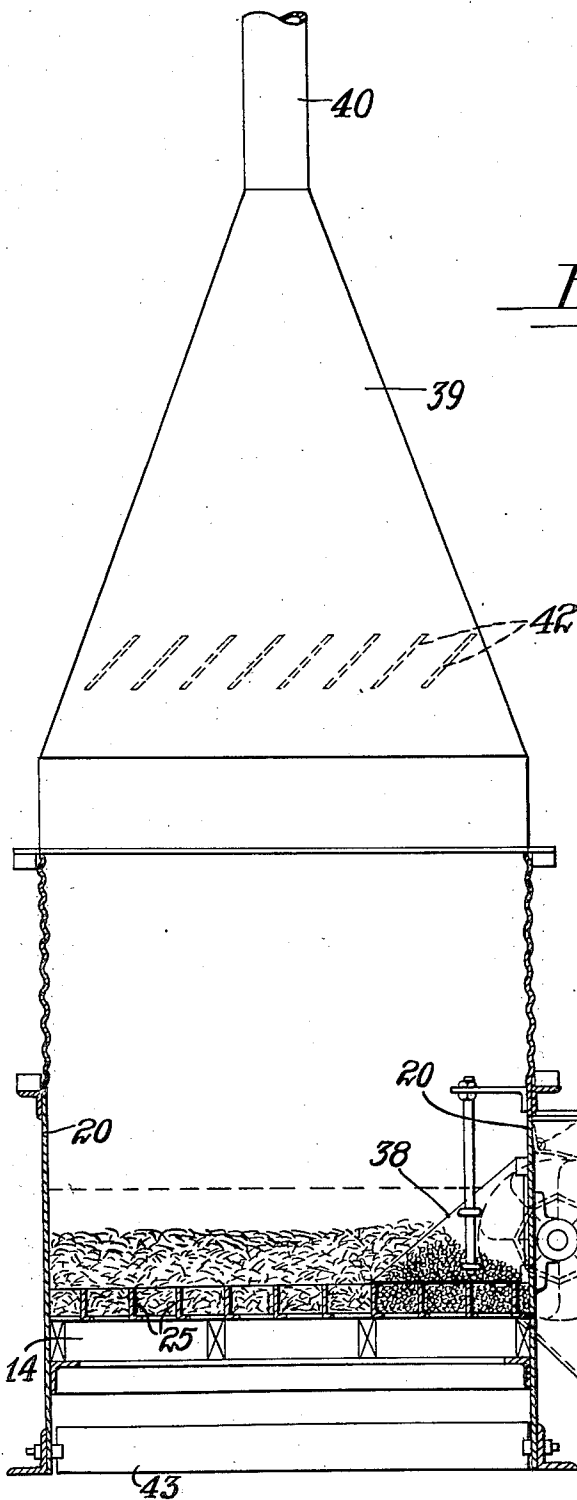


Fig. 4.

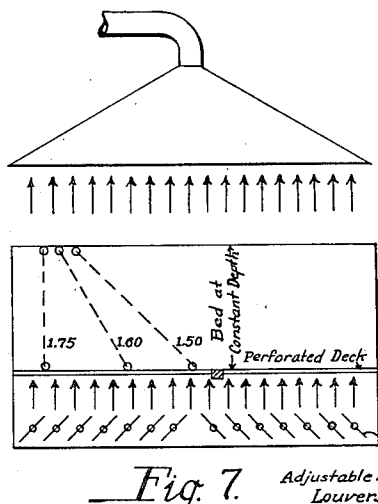


Fig. 7. Adjustable Louvers

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COAL-CLEANING APPARATUS

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Fig. 5.

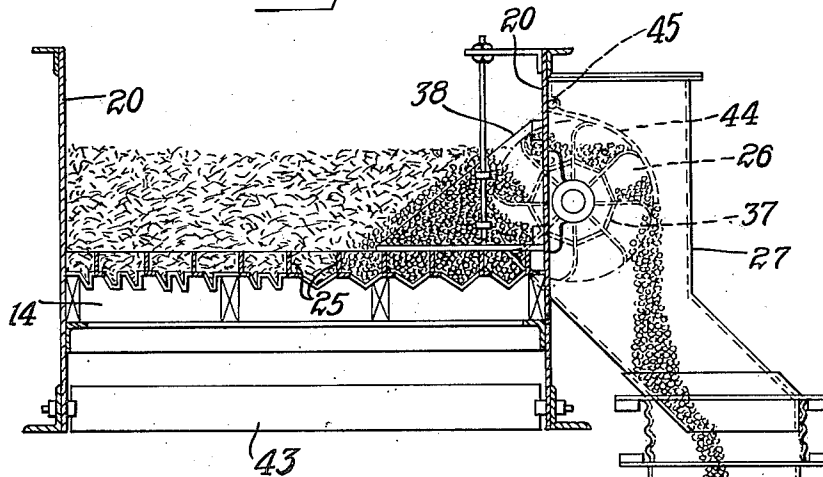


Fig. 8.

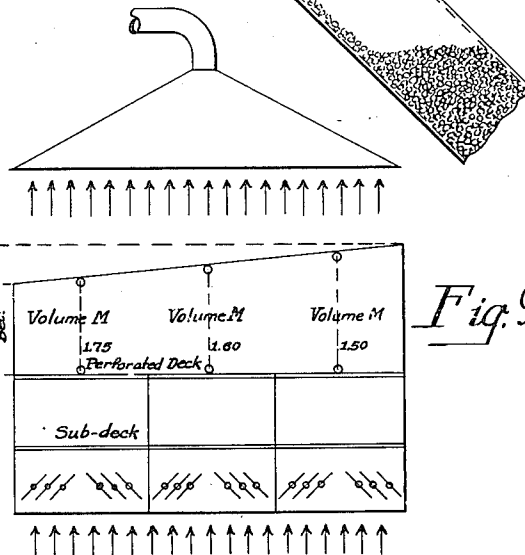
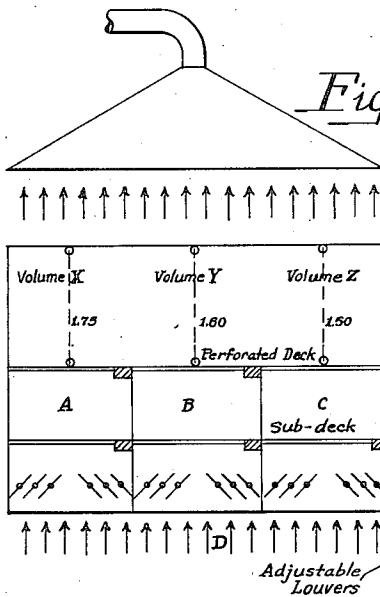


Fig. 9.

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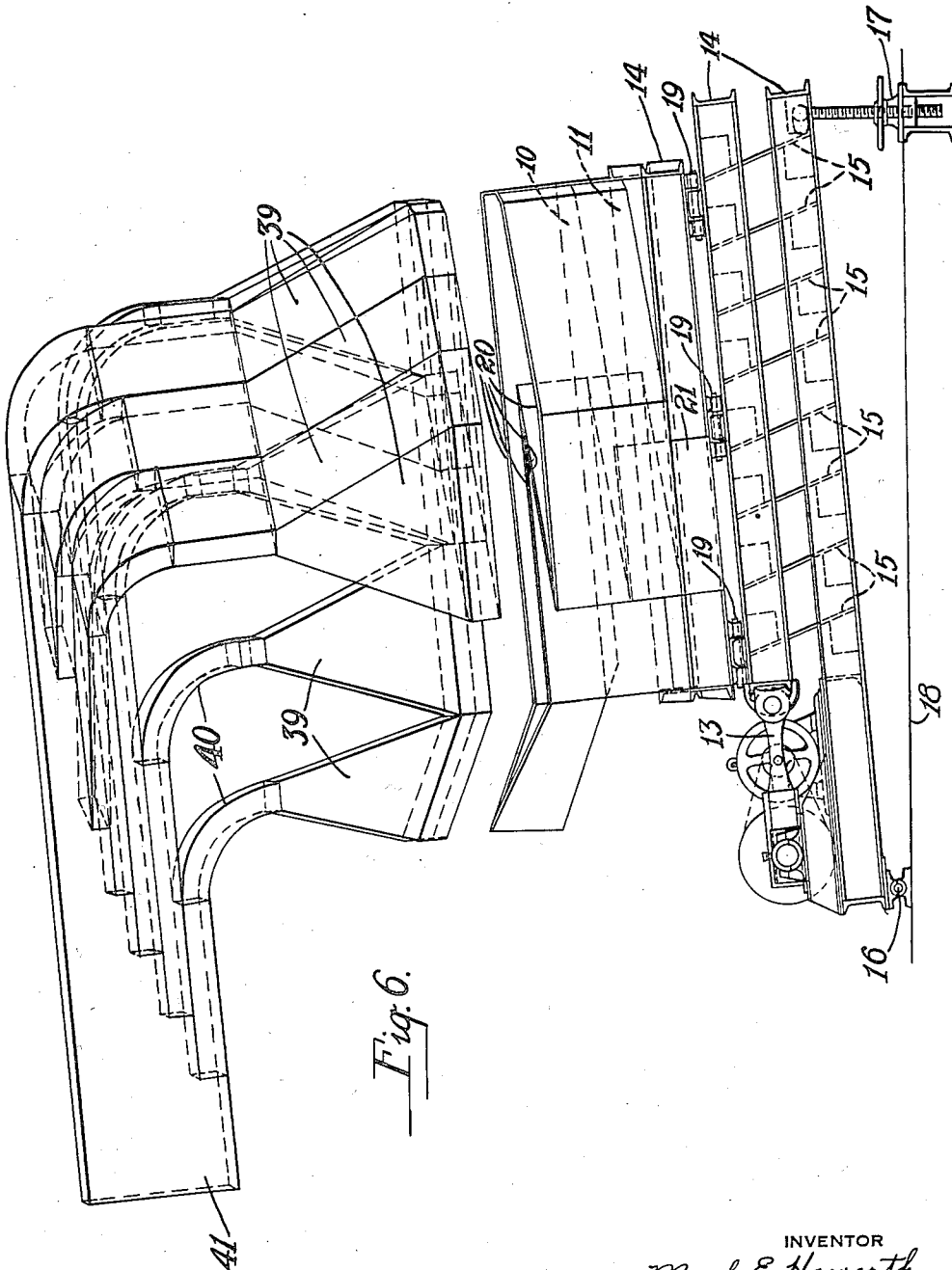
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COAL CLEANING APPARATUS

Filed April 9, 1931

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,028,904

COAL CLEANING APPARATUS

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Application April 9, 1931, Serial No. 528,725

17 Claims. (Cl. 209—467)

This invention relates to coal cleaning apparatus and particularly to an apparatus of the dry or pneumatic type which is provided with new and improved means for controlling the refuse.

5 While there are many known constructions for carrying out the dry or pneumatic separation of a solid mixture of constituents of varying specific gravities, there has been no particularly efficient arrangement available heretofore for controlling the refuse or other constituents of the dry mixture which are the impurities or adulterating ingredients which are to be separated from the fraction of the material to be recovered.

10 One of the objects of my invention is to provide an apparatus for cleaning coal, for example, whereby the remaining constituents, other than the coal and hereinafter designated as refuse, are efficiently and rapidly separated from the coal so as to obtain a clean coal concentrate.

15 A further object is to provide a coal cleaning apparatus which has in predetermined positions with respect thereto a plurality of refuse ejectors for positively removing the refuse at a predetermined rate.

20 A further object is to provide such refuse ejectors with means for varying their effective rate of discharge and this may be done either by varying the capacity of the individual ejectors and/or by increasing the speed of operation of said ejectors separately or together.

25 A further object is to provide means for guiding such refuse to said refuse ejectors and to make such means adjustable so as to predetermine the amount and rate at which said refuse is fed to said ejectors, which latter may then be so adjusted as to remove the refuse at a rate of speed substantially the same as that at which it is fed thereto.

30 Other and further objects and advantages will either be understood from the following disclosure or will be appreciated by those skilled in this particular art.

In the accompanying drawings:

35 Figure 1 is a plan view of a coal cleaning apparatus embodying the present invention with overhead parts omitted to prevent confusion.

Fig. 2 is an elevation of the parts of Fig. 1, but partially broken away, as indicated by the line II—II of Fig. 1.

40 Fig. 3 is a partial section and partial elevation taken on the line III—III of Fig. 1 looking in the direction of the arrows.

Fig. 4 is a view taken on the line IV—IV of Fig. 1 and with the addition of a portion of the superstructure omitted from Fig. 1.

Fig. 5 is a view similar to the lower portion of Fig. 4 on an enlarged scale but through a different portion of the apparatus.

Fig. 6 is a general perspective view of the apparatus of Fig. 1 with cooperating superstructural parts taken substantially along line VI—VI thereof; and

Figs. 7, 8 and 9 represent diagrammatically times of settling under various conditions.

Similar numerals refer to similar parts throughout the several views.

One of the important features of the coal cleaning apparatus of my present invention is the deck member on which the action takes place. This deck is composed primarily of a so-called upper section 10 and an inclined section 11, preferably angularly disposed with relation to each other as indicated in Fig. 1. Each said deck portion is perforated as at 12 in the manner known in the industry. An eccentric drive means indicated as a whole by 13 is conventionally provided for the usual purposes of imparting a desired movement or stroke to the deck. The general arrangement is further clearly shown in Fig. 6 which further indicates that the eccentric drive operates directly on deck supporting frames 14 to which the deck is suitably secured. These deck supporting frames are connected by cantilever springs 15 as clearly indicated in Fig. 6. Below the eccentric drive there is a hinge 16 for changing the longitudinal slope of the deck supporting frames and hence of the deck. The adjustment of the slope may be secured by means of the screw jack arrangement 17 which is provided at the opposite ends of the frames. This adjustment takes place relatively to the top of the floor surface indicated by 18. The lateral slope of the deck may also be varied and for this purpose there are provided the hinges 19 between the deck supporting frames in such a manner as to permit of the desired adjustment, which may be effected by screw jack means 19'.

Enclosing the surface of the deck are the side boards 20, the configuration of which is clearly apparent from Figs. 1 and 6. These side boards, as indicated, extend above the top of the deck sections and to such a height as will be above the bed of coal or other material formed thereon. The only portion where the side boards are omitted is at the lower end of the inclined section designated as the clean coal discharge (chute) and identified by the numeral 21.

Extending substantially from the point 22 where the side boards meet at an acute angle between the upper and inclined deck sections to

a point 23 near the opposite side of the deck and arranged substantially as an extension of that side board extending along the inner edge of the upper section is the baffle plate 24. This baffle plate has a height equal to the side boards at the side boards and tapers down gradually to its other end at which it has the same height as that of the riffles 25 which are disposed over the whole surface of both deck sections as indicated in Fig. 1. The baffle 24 permits the lightest material in the upper strata of the bed of coal to flow from the upper section to the inclined section at the point nearest the intersection of the baffle with the side boards. At points successively nearer the opposite end of the deck section, successive intermediate strata of the bed which has stratified on the deck, in the usual manner, are permitted to flow onto the inclined deck section and these materials are of heavier gravity than the coal which, as is known, constitutes the lightest fraction of the mixture.

The end of the upper deck section near the eccentric drive is known as the feed end. Disposed along the end of the upper deck section opposite to said feed end and also along the adjacent side of the inclined deck section are the refuse ejectors 26. These consist generally of a rotatable member having pockets for the reception of refuse which is discharged when the particular pocket has made a revolution of approximately 180° and a chute member 27 of suitable construction. These ejectors may be suitably driven by shafts 28 there being bevel gears 29 interposed when necessary; for example, when the shaft takes a turn or has an angle in it as shown in Fig. 1. This common shaft is provided with a suitable pulley 30 which is belt connected at 31 to a suitable pulley 32 connected to a variable speed drive arrangement indicated in general by 33. This variable speed drive is disposed upon a suitable hinged support 34 having hinge 35 and adjusting screw jack means 36 as shown in Fig. 2 so that the drive may be suitably inclined and its lateral slope varied according to the inclination of the deck so as to maintain the efficiency and effectiveness of the drive. In connection with refuse ejectors 26, there is an air seal 44 spring hinged at 45.

Each of the pockets above referred to is variable in its capacity by means of a suitable adjustable membrane or partition, or the like 37, see Figs. 4 and 5, so as to cause a predetermined amount of refuse to be taken up thereby. This is desirable especially because it is not desired to deplete the depth of the bed at the point the ejectors are operating as this would cause an undesirable mingling of the various strata of the bed. Thus the bed is allowed to assume its proper depth after an interval and then the capacity of the ejectors is so adjusted that the refuse will thereafter be removed at substantially the same rate at which it is received at the points where the ejectors are operating.

In order to increase the efficiency of the ejectors and the effectiveness of the cleaning operation as a whole, deflectors 38 are provided, which constitute a means for guiding refuse to the ejectors. These deflectors 38 are generally triangular shaped plates as seen in Fig. 4, for example, and they are so arranged with respect to the deck as to be adjustable in position. The arrangement is clearly shown in Fig. 1. Due to the arrangement hereinbefore described the ejectors progressively discharge refuse of a decreasing specific gravity as considered with respect to a direction

from the variable speed drive to the clean coal discharge (chute 21). Any coal which is discharged by any of the refuse ejectors may be easily recovered by recirculating the refuse containing the same and this is merely done by feeding such material back onto the deck at the feed end thereof, where it undergoes again a stratification due to the stroke imparted to the deck and the air or fluid stream passing up through the perforations in the deck, said stream being generated by suitable blast means as will be hereinafter understood more fully.

Above the deck are arranged the hoods 39 all connected by suitable necks 40 to a common main 41 in which a suction is created so that the dust and other fine particles rising from the bed may be recovered if desired and at the same time be prevented from becoming a nuisance or a source of danger. The coal, in the form of coal dust, which is in said material may be also suitably recovered therefrom, and I may for that purpose, put it through a similar process to the present adjusted for taking care of "fines".

In connection with said suction hoods 39, adjustable louvers 42 are, however, provided therein and adjustable louvers 43 are additionally provided below the deck sections. These matters will be understandable from my hereinafter specified copending applications.

Further details as to the suction arrangement 30 and as to the air blast below the deck form no part of the present invention but are described and claimed in my copending applications Serial Numbers 448,493, filed April 30, 1930, and 554,254 filed July 31, 1931.

The above is intended for illustrative purposes and the operation thereof will be understood therefrom. The coal mixture is, however, fed onto the upper deck section at the left or feed end of the same. This deck section may be horizontal both longitudinally and transversely; or horizontal transversely and inclined upward or downward longitudinally; or inclined upward or downward transversely and horizontal or inclined upward or downward longitudinally. The riffles of this deck section may be parallel with the long side thereof or inclined laterally thereto. They may as high as an inch or more.

The inclined deck section has riffles parallel with the clean coal discharge edge or disposed laterally with respect thereto. This section extends generally laterally toward the feed end of the upper deck section and may be horizontal or inclined laterally or longitudinally as explained above regarding said upper deck section.

The movable deflectors 38 are set so that light gravity materials, which comprise the coal and which are forced to a position on top of the refuse, flow away from the ejectors to be discharged finally with the clean coal at the lower end of the inclined deck section.

The speed and capacity of the ejectors are regulated to remove refuse only so fast as it is received in the ejector pockets. By so regulating the capacity of the pockets, the material in time will be largely refuse or heavy gravity material. The pockets comprising the ejectors being limited in their capacity are always full and the refuse having a considerable depth of bed tends to over fill the pockets causing the material to take its natural plane of repose. Any lighter gravity materials that might accidentally be on the top of material in the pocket will drop off as the material takes its repose.

The space between the movable deflectors, 75

therefore, is maintained full of refuse as the speed of operation of the ejectors is so regulated as to remove the refuse only so fast as it is deposited in the space or pockets between the deflectors.

Materials in the upper deck section are regulated to maintain a constant depth of bed from the feed end to the beginning of the tapered baffle. The material in the section of the deck from the beginning of the tapered baffle to the ejectors may vary somewhat in depth. The material on the inclined section of the deck may vary in depth from the maximum depth at the top of the inclined section to the minimum depth at the bottom of the inclined section. This is the natural consequence, inasmuch as the discharge from the upper deck section to the inclined deck section is at the same rate as the feed to the table. The speed of travel of the material on the inclined deck section may be regulated to exceed the speed of travel in the upper deck section. As some of the material is ejected as refuse, less material is discharged as clean coal and, therefore, the depth of bed somewhat less at the lower end of the inclined section than in the upper deck section. These depths of bed, however, and speeds of travel may be regulated as desired if it is found convenient to maintain a uniform depth of bed throughout the upper and inclined sections of the deck.

As the material passes from the feed end of the deck toward the ejectors, stratification takes place, the heavier gravity particles depositing themselves in the lower strata of the bed and the lighter gravity particles rising to the upper strata of the bed. The heavier gravity particles in the lower strata, being confined between the riffles, are conveyed longitudinally and laterally along the surface of the deck by means of the motion applied to the table through mechanical means and deposited between the movable deflectors, this heavier gravity material piles up in these pockets and forces any lighter gravity materials that may be mixed with same to the upper strata of the bed. The deflectors are so inclined as to permit the lighter gravity material, under the action of air, to flow back toward the feed end of the table and join the other lighter gravity materials which are finally discharged as clean coal.

It should be understood that when the pervious deck is oscillated the materials advance forwardly along the main section 10 toward the front board 20 which acts as a banking wall for the uppermost strata which will then move laterally toward the inclined and rearwardly branching section 11. On account of the downward gradient of the upper surface of the layer of materials on the section 10 and on account of the depth of such material, that portion moving along the baffle plate 24 will move over the top of the same onto the inclined section 11. The tapering form of the baffle plate 24 delays this movement onto the section 11 until it is near the forward end of the baffle plate 24. Some of the material which finds its way over the upper edge of the baffle plate 24 tends to move transversely of the riffles on the section 11. The front board 20 on the section 11 is relied on to form a banking wall so that the uppermost strata tends to move rearwardly toward the rear wall of the section 11. Consequently, on account of the rearward branching of the section 11 the oscillation of the deck will stratify the materials more efficiently to secure movement of the lowermost

stratum toward the ejectors distributed along the front wall of the section 11. Furthermore, the banking action of the uppermost strata and the movement thereof toward the discharge opening 21 makes it desirable to have the deflector plates downwardly inclined along their upper edges as shown in Fig. 5. It will also be seen that after any ejector in the series has removed material from the lowermost stratum the remaining materials constitute a different mixture. Therefore the ejectors are a means of classifying progressively the materials removed according to their specific gravities so that the material which moves rearwardly and downwardly along the section 11 to the discharge opening 21 will be clean coal.

As the materials travel down the inclined deck section further stratification takes place and any materials heavier in gravity than the clean coal and referred to herein as refuse that has not been removed by previous ejectors is conveyed to succeeding ejectors. Finally all heavier gravity materials are removed with only clean coal remaining in the bed at the lower end of the inclined section. If at this point, it becomes necessary to remove a small amount of clean coal with the refuse in the last ejector, the material discharged by this ejector can be recirculated to the feed end of the table in order that a clean cut separation of coal from its refuse and impurities may be made.

I have found from experimentation and from practice that in order to produce free settling action in the coal bed which permits the heavier gravity materials to settle into the lower strata of the bed that certain effective buoyancies are required. The value of the buoyancies required are determined by the density of the materials being separated and the volumes of air required are determined by the density of the fluid stream. For example, where it is desired to suspend materials having a specific gravity of 1.40 or lighter in the upper strata of the bed and materials of gravity heavier than 1.40 in the lower strata, the buoyancy of the fluid stream is regulated so as to hold materials of 1.40 gravity and lighter, in suspension, while at the same time being insufficient to hold the heavier gravity materials in full suspension permitting them to descend into the lower strata. In this case, the heaviest gravity materials or materials of 1.75 and greater, for example, will be completely out of the suspension and in the lower strata of the bed. Materials between 1.40 and 1.70 gravity may be partially in suspension and between the uppermost and lowermost strata of the bed. Under the same conditions of buoyancy, these materials will eventually settle, but the time of settling will be greater than the time required for materials of 1.75 gravity and heavier, as per illustration shown on the drawings. Several methods may be employed for producing the desired settling action as illustrated on the drawings.

More effective stratification and separation of lighter gravity materials may be effected after the heavier gravity materials or material of 1.75 gravity and heavier are removed, by reducing the buoyancy of the fluid stream to a value that will permit free settling, holding the materials of 1.40 gravity and lighter in suspension and at the same time permitting materials heavier than 1.40 gravity to settle to the lower strata.

Assuming a constant depth of bed, and materials of 1.75 gravity and greater, the buoyancy is adjusted to permit materials of 1.75 gravity

and greater to settle to the lowermost stratum. After having removed materials of this gravity, the fluid stream may be altered so as to reduce the buoyancy to an extent where materials of 1.60 gravity, for example, are permitted to settle. Other sections of the deck are arranged progressively and the fluid stream adjusted so as to permit materials of 1.50 gravity, 1.45 gravity, etc. to settle successively to the lower strata on different sections of the deck. The result is that the ejectors nearest the feed end of the table discharge heavier gravity refuse, whereas the ejectors near the discharge end of the table discharge mostly lighter gravity refuse. The gravity of the refuse between these ejectors ranges from heavier to lighter.

One inherent characteristic of any type of blower is that as the resistance to the flow of air increases, the volume produced by a fan at a constant speed varies inversely with the resistance to the flow.

The buoyancy produced by an air flow is proportional to the volume and density of air and inversely to the resistance against which it flows. I have by means of experimental work determined the volumes of air required to flow through beds of different materials in order to produce the buoyancy required for free settling at certain specific gravities. Furthermore, the flow of air required can be regulated by applying perforated plates or sub-decks containing certain definite percentages of open area under the separating deck and at sufficient distance below the separating deck to permit the air to be distributed evenly through the separating deck. Knowing the volumes required for buoyancy at any condition of air density, the resistances of various materials to the flow of air, and the resistances of perforated plates and other pervious materials develop against the flow of air, I have been able to predetermine the volumes of air required (for any value of air density) to produce buoyancies of certain definite values required for free settling stratification.

I have by means of experimental work also determined the volumes of air required to produce the buoyancies for mixtures containing different ranges of sizes of constituent particles as well as for different percentages of various sizes in the mixture. Depending upon the character of the impurities in a mixture; the relative sizes and specific gravities of the respective particles comprising the impurities; and the relationship of the particles of impurities to the particles comprising the whole mixture of coal and impurities as to number, size and shape; I have found from experience that with certain mixtures air streams may be adjusted to produce and maintain buoyancies that permit the removal of certain sizes and shapes of particles of impurities of one specific gravity together with certain sizes and shapes of particles of impurities of other specific gravities. In other words, for example, refuse containing larger sized particles of 1.50 to 1.60 gravity materials may be settled under the influence of certain buoyancies and removed by means of the same ejectors and at the same time that smaller sized particles of 1.75 gravity or heavier are settled and removed.

Therefore, the invention hereindescribed further comprises the regulation of air streams and the maintenance of buoyancies of certain fixed and definite values, the settling and removal of impurities of certain specific gravities implying also that depending upon the mixtures under-

going the separating process a selection as to specific gravity also implies a selection as to size of particles removed as impurities.

I have found, for example, in separating minus one-half inch by zero mixtures that impurities of boney structure fairly large in size and approaching the clean coal concentrate in specific gravity, can be removed by means of the same ejectors and at the same time as impurities more dense in structure, very small in size and heavy in specific gravity, thus permitting the removal of the impurities of all sizes and specific gravities from a mixture; the impurities of certain sizes and specific gravities being removed by means of the same ejectors together with the impurities of other sizes and specific gravities; whereas, with certain other mixtures of different sizes and containing different ranges of sizes in the mixture the impurities contained in certain successive ejectors conform more closely to the progressive specific gravities mentioned.

From a consideration of the foregoing it will be understood that Fig. 7 illustrates the difference in time of settling required for material of different specific gravities in a bed of materials under the influence of air streams having a certain definite value of buoyancy throughout the deck area; that Fig. 8 illustrates a method for accelerating settling of heavy gravity materials by regulating the air streams, hence buoyancies and bed resistances, by means of a sub-deck and louvers which develop resistances to air flow, thereby reducing the volumes through various sections of the bed and deck and reducing buoyancies, allowing different gravity material to settle freely in different sections of deck; and that Fig. 9 illustrates a method for producing free settling of various gravity materials by regulating the depth of bed and hence the air volumes to develop the buoyancies required for free settling of different gravity materials in different sections of the deck.

In Figs. 7 and 8, the difference in pressure between the area above the bed and the area below the bottom of the table is the same throughout. Moreover, in Fig. 8, the difference in pressure between the decks and the pressure in the area below the table is variable by reason of the resistance of the sub-deck and/or louvers. The difference in pressure between areas A and D has a certain value; that between B and D a different value; and that between C and D a still different value.

As shown diagrammatically in Figs. 8 and 9, the space below the sub-deck is divided into separate rectangular sections each bounded by four vertical walls with an adjustable louver located in each section. Between the sub-deck and the upper deck rectangular or box-shaped spaces are also partitioned off. Such box-like chambers below the sub-deck communicate through the perforations in the sub-deck with the box-like chambers immediately above the same and such box-like chambers are distributed over the entire spaces below the main section 10 and the rearwardly branching and downwardly inclined section 11. In this manner the adjustable louvers in the lower box-like chambers may be relied on to regulate the fluid-pressure in accordance with the materials on the impervious deck sections as explained above. For instance, after the first ejector has removed the heaviest particles, the fluid-pressure may be decreased for the materials which are moved toward the next

ejector, and so on along the whole series of ejectors.

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

1. In a device of the character described, an upper deck section and an inclined deck section, a sideboard along the same rising above the deck surface sufficient height to prevent material flowing thereover, riffles on said sections of appreciably less height than said sideboard, and a baffle between said sections, extending from said sideboard toward the opposite portion of the deck and tapering from a height equal to the sideboard at the sideboard to a height equal to the height of the riffles at the end of the baffle.

2. A coal cleaning apparatus comprising a main perforated deck, a supplemental perforated deck branching laterally and rearwardly from one side of the forward end portion of said main deck, a plurality of spaced guiding devices on the main deck, a plurality of spaced riffles on the supplemental deck, means for stratifying the materials on said decks according to the specific gravities of the constituents thereof, means for progressively removing the lowermost strata from the forward edges of said decks and discharging the lightest material from that end of said supplemental deck remote from said main deck.

3. A coal cleaning apparatus comprising a deck, guiding means extending along said deck, means for stratifying materials on said deck according to the specific gravities of the constituents thereof, means for collecting the lightest gravity constituent, means comprising a plurality of ejectors for positively removing the remainder of said constituents in fractions of progressively decreasing specific gravities at a rate of speed substantially equal to the delivery thereof to said removing means, mechanism for positively driving said ejectors, and a plurality of deflectors one for each of said ejectors and each having an upper edge inclined downwardly toward said deck for guiding the remainder of said constituents to said ejectors while directing toward said collecting means the lightest gravity constituent.

4. A coal cleaning apparatus comprising a main pervious deck, a supplemental pervious deck branching rearwardly from the forward end portion of said main deck and inclined downwardly, riffles on both of said decks, means for stratifying materials on said decks according to the specific gravities of the constituents thereof and for causing said materials to advance therealong, means affording collection of clean coal from the end of said supplemental deck, and mechanism affording collection of the other constituents at the front end of said main deck and at the front side of said supplemental deck.

5. A coal cleaning apparatus comprising a main deck, a supplemental deck branching rearwardly from the forward end portion of said main deck, guiding means on both decks, means for stratifying materials on said decks according to the specific gravities of the constituents thereof and for causing said materials to advance therealong, means affording collection of the lightest gravity material from the lateral end of said supplemental deck, and means affording discharge at intervals along the front sides of said main and supplemental decks of the other constituents of said materials according to progressively decreasing specific gravities.

6. A coal cleaning apparatus comprising a main pervious deck, a supplemental pervious deck branching rearwardly from one side of the forward end portion of said main deck and inclined downwardly, means for stratifying materials on said decks according to the specific gravities of the constituents thereof and for causing said materials to advance therealong, means affording collection of the lightest gravity material from the lower end of said supplemental deck, and means affording discharge at intervals along the front sides of said main and supplemental decks of the other constituents of said materials according to progressively decreasing specific gravities.

7. A coal cleaning apparatus embodying a main pervious deck, a supplemental pervious deck branching rearwardly from the forward end portion of said main deck, riffles on both decks, means for stratifying materials on said decks according to the specific gravities of the constituents thereof and for causing said materials to advance therealong, means affording recovery of clean coal from the lateral end of said supplemental deck, and means affording recovery of the remainder of said constituents at the front sides of said main and supplemental decks, said last-named means comprising a plurality of spaced-apart ejectors distributed along said front sides.

8. A coal cleaning apparatus comprising a main pervious deck, a supplemental pervious deck branching rearwardly from the front end portion of said main deck, spaced riffles on both decks, means for stratifying materials on said decks according to the specific gravities of the constituents thereof and causing said materials to advance therealong, means affording recovery of the clean coal from the lateral end of said supplemental deck, upright banking walls at the front ends of said decks, a plurality of ejectors spaced apart and distributed along the front ends of said decks at the bases of said walls, and means for operating said ejectors to discharge the other constituents according to progressively decreasing specific gravities.

9. A coal cleaning apparatus comprising a main pervious deck, a supplemental pervious deck branching laterally and rearwardly from one side of the forward end portion of said main deck, a continuous upright wall extending transversely of the forward end of said main deck and the front side of said supplemental deck, a plurality of positively operated ejectors distributed along said wall, means for stratifying materials on said decks according to the specific gravities of the constituents thereof and for causing the lowermost strata to advance toward said wall and for causing the lightest gravity material to flow along said decks including the rear side portion of said supplemental deck to a discharge opening at the lateral end of said supplemental deck, a plurality of ejectors distributed along said wall, and guiding means on said decks for directing the lowermost strata to said ejectors.

10. A coal cleaning apparatus comprising an elongated pervious deck, side walls at the lateral edges of said deck, a transverse wall at the forward end of said deck, a supplemental deck branching rearwardly from an opening in the front end of one of said side walls, front and rear walls connected respectively to said transverse wall and to the adjacent side wall of said main deck, ejectors distributed along said front

walls, riffles on said decks leading to said ejectors, means for stratifying materials on said decks according to the specific gravities of the constituents thereof and to cause the lowermost strata to move along said riffles to said ejectors and to cause the lightest gravity material to move to a discharge opening at the end of said branching deck, and means for positively operating said ejectors.

11. A coal cleaning apparatus comprising a deck having an elongated section and a rearwardly branching section downwardly inclined, an upright banking wall on the forward end of said deck, a plurality of ejectors distributed along the forward end of said deck at the base of said wall, adjustable upright deflector plates one associated with each of said ejectors, spaced riffles on said deck and leading toward said banking wall, means for stratifying the materials on said deck according to the specific gravities of the constituents thereof, and means for operating said ejectors to recover the lowermost strata according to progressively decreasing specific gravities while the lightest gravity constituent is being collected from the end of said branching section.

12. In dry cleaning apparatus the combination with a deck having a main section and a rearwardly branching downwardly inclined supplemental section, a sideboard extending along that side of the main section adjacent to said supplemental section and rising above the surface of the deck of the main section sufficient to confine material to said deck, riffles on said sections of less height than said sideboard, and a baffle extending from the forward end of said sideboard with its upper edge tapering downwardly from approximately the height thereof to the space where said deck sections communicate.

13. In coal cleaning apparatus, the combination with a main deck, of a supplemental deck branching rearwardly from the forward end portion of said main deck, an upright banking wall at the front side of said supplemental deck, means for stratifying materials on said decks in accordance with the specific gravities thereof, an upright sideboard for that side of the main deck adjacent to said supplemental deck, a baffle connected to the forward end of said sideboard and tapering downwardly toward said banking wall, and means distributed along the front edge of said supplemental deck for effecting removal of fractions of the lowermost strata while the lightest gravity constituent flows rearwardly and laterally relatively to said banking wall and said baffle.

14. A coal cleaning apparatus comprising a main elongated deck having riffles set at an angle to the longitudinal axis thereof, means for feeding coal onto the deck, mechanism for operating the deck to form the coal into a bed and to feed

the resulting bed along the deck, a supplemental deck branching rearwardly from the main deck, means for stratifying the said bed of coal as it moves along the decks, relatively high retaining means along the main deck for preventing lateral discharge of coal therefrom and for directing the coal fractions which pass over the riffles of the main deck onto the supplemental deck, and discharge means for discharging successive layers of the stratified bed, the said discharge means being positioned along the main deck to discharge refuse fractions caught by the riffles thereof, and along the supplemental deck to discharge the refuse fractions which pass over the riffles of the main deck.

15. In a device of the character described, the combination with a deck having a main section and a laterally branching section, a sideboard extending along one side of the main section to the branching section and having sufficient height to prevent material from passing thereover, and a baffle extending along said deck between said sections and in alinement with said sideboard, said baffle tapering along its upper edge from the top of the sideboard toward said deck where the main section communicates with the branching section.

16. In a device of the character described, the combination with an upper deck section and an inclined deck section, of a sideboard extending along one side of said upper deck section to the upper end of the inclined deck section, riffles on both of said sections of less height than the height of said sideboard, and a baffle extending from said sideboard along the juncture between said sections, said baffle tapering downwardly from the height of the sideboard to the height of said riffles.

17. A coal cleaning apparatus adapted to stratify a bed of coal and comprising a main elongated deck, a supplemental deck branching from the main deck and inclined thereto, riffles on the decks, sideboards along the deck and meeting at an acute angle between the main deck and supplemental deck, and a baffle extending partially across the deck from where the sideboards meet at the said acute angle, the said baffle being disposed substantially as an extension of the sideboard extending along the inner edge of the main deck and having a height equal to the sideboards at the sideboards and gradually tapering to the same height as the riffles, the said baffle permitting materials of lowest specific gravity in the upper strata of the bed of coal to flow from the main deck to the supplemental deck at the point nearest the intersection of the baffle with the sideboards, while allowing successive intermediate strata of the bed to flow on to the supplemental deck at points successively nearer the opposite end of the main deck.

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