

May 1, 1945.

M. E. HAWORTH

2,374,865

GRAVITY SEPARATOR

Filed July 31, 1941

5 Sheets-Sheet 1

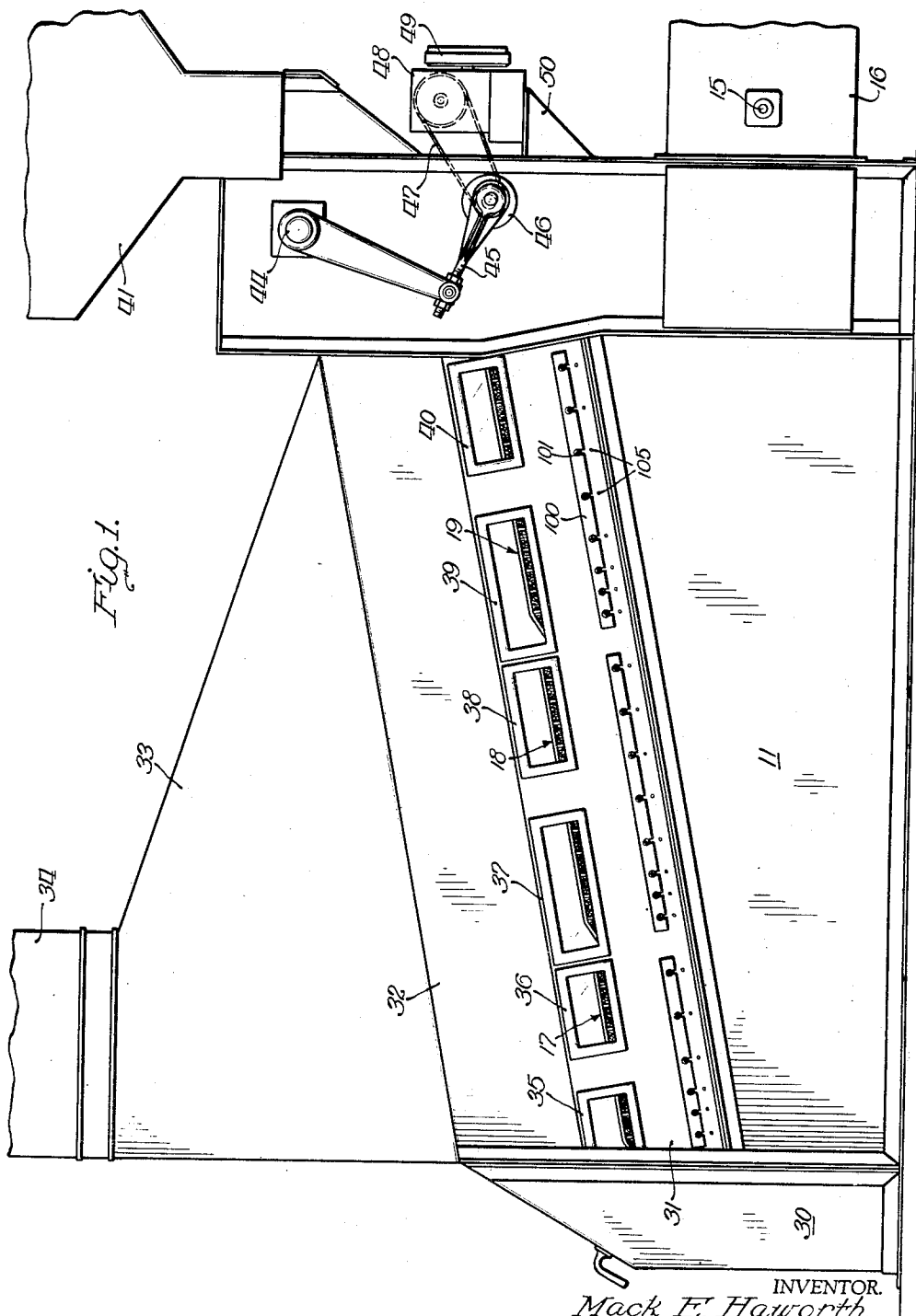


Fig. 1.

INVENTOR.
Mack E. Haworth
BY Richardson and Quin
Attys.

May 1, 1945.

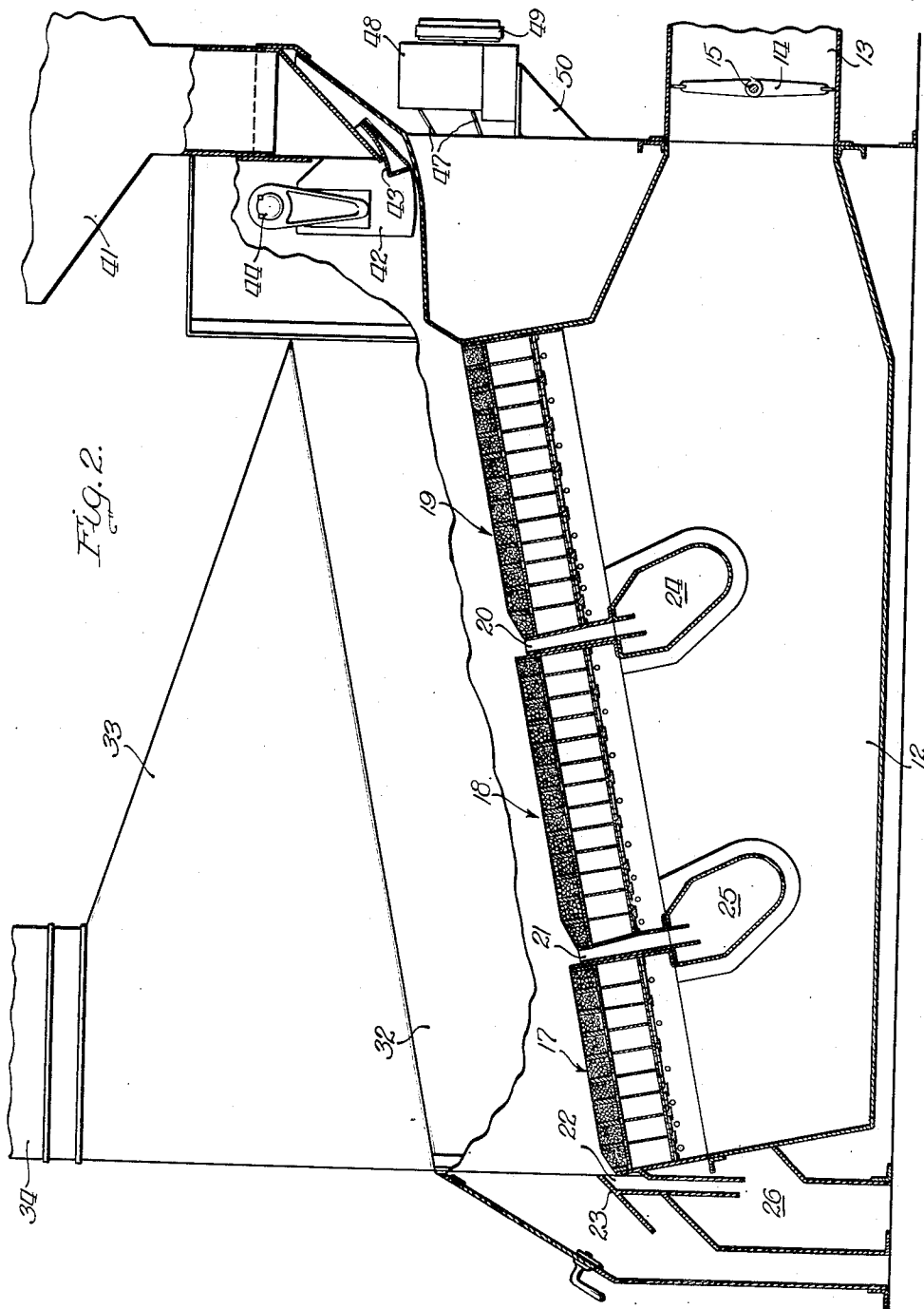
M. E. HAWORTH

2,374,865

GRAVITY SEPARATOR

Filed July 31, 1941

5 Sheets-Sheet 2



INVENTOR.

Mack E. Haworth

BY

Richardson and Quer
Attys.

May 1, 1945.

M. E. HAWORTH

2,374,865

GRAVITY SEPARATOR

Filed July 31, 1941

5 Sheets-Sheet 3

Fig. 3.

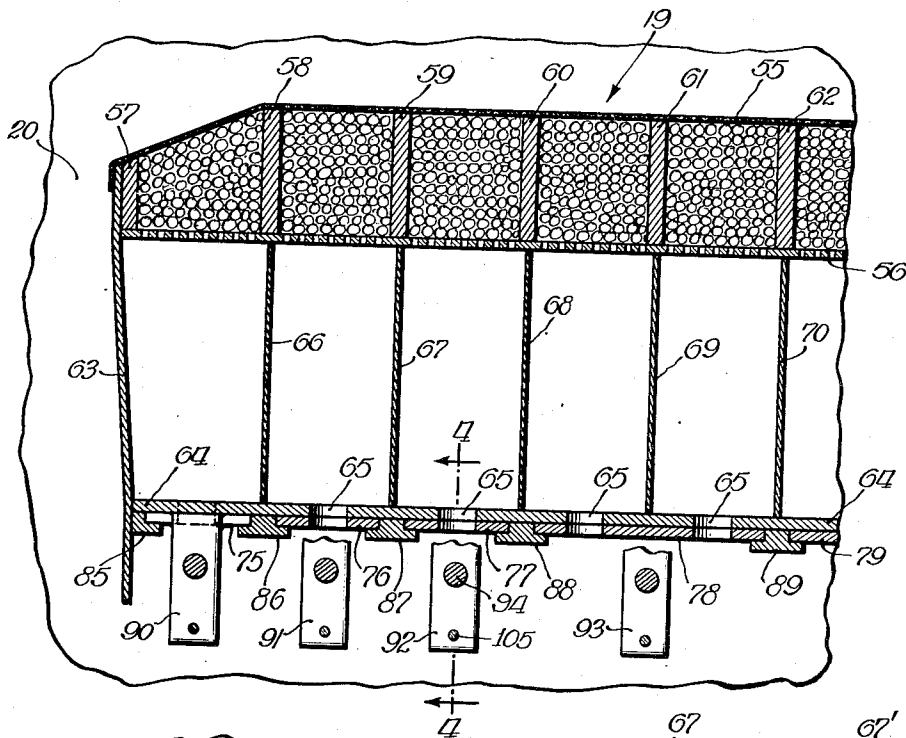


Fig. 4.

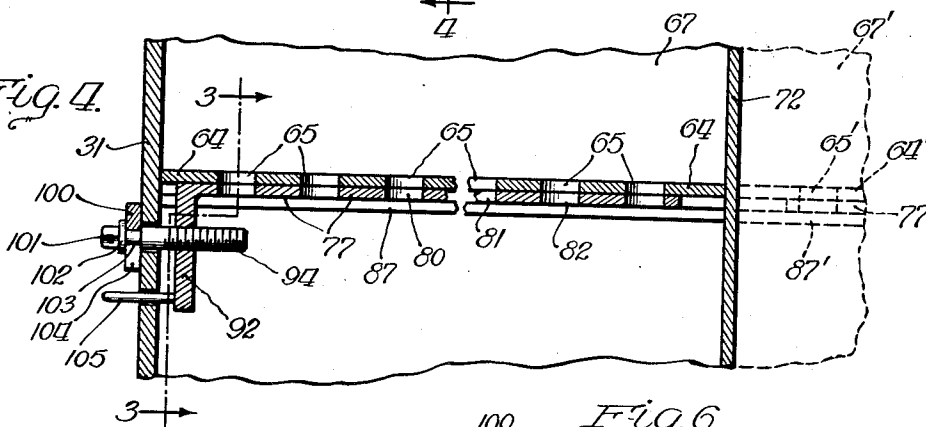


Fig. 5.

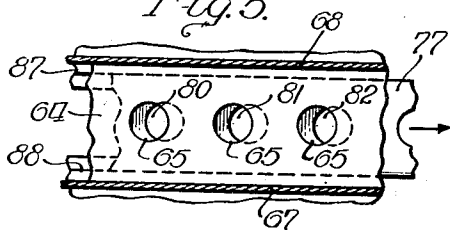
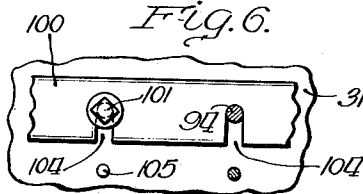


Fig. 6.



INVENTOR,
Mack E. Haworth
BY Richardson and
Attys.

May 1, 1945.

M. E. HAWORTH

2,374,865

GRAVITY SEPARATOR

Filed July 31, 1941

5 Sheets-Sheet 4

Fig. 7.

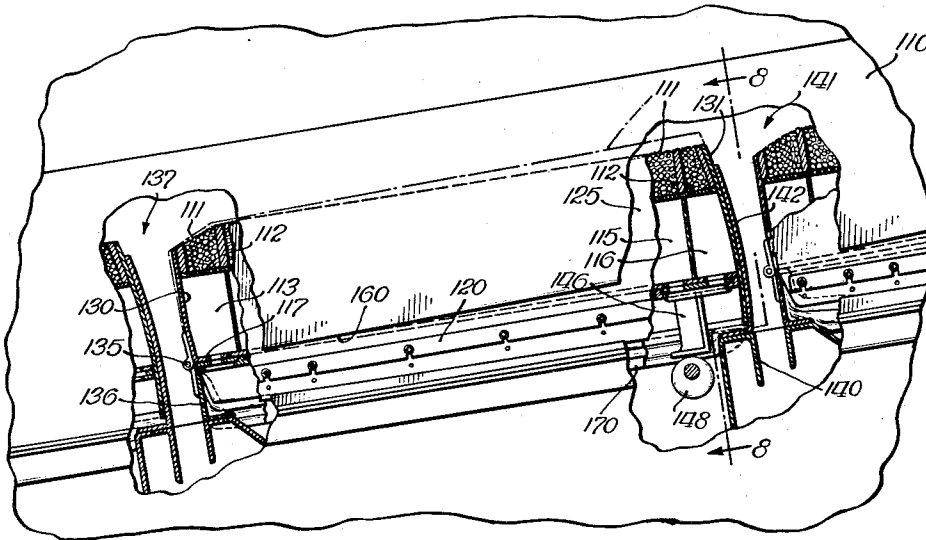


Fig. 8.

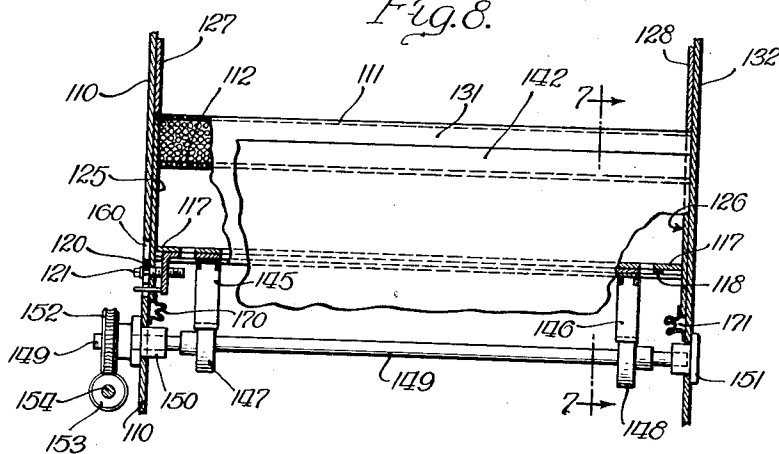
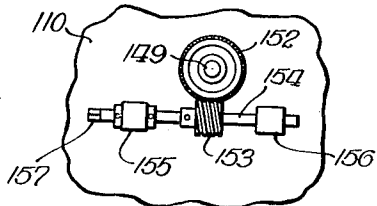


Fig. 9.



INVENTOR,
Mack E. Haworth
BY Richardson and Ames
Attys.

May 1, 1945.

M. E. HAWORTH

2,374,865

GRAVITY SEPARATOR

Filed July 31, 1941

5 Sheets-Sheet 5

Fig. 10.

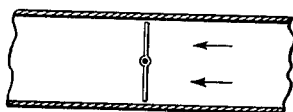


Fig. 11.

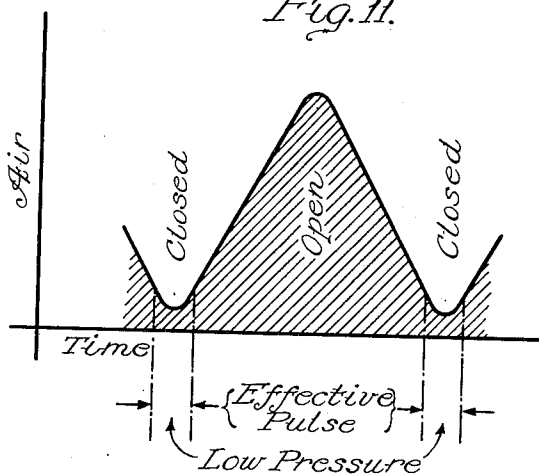


Fig. 12.

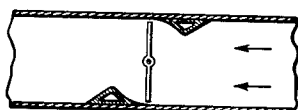


Fig. 13.

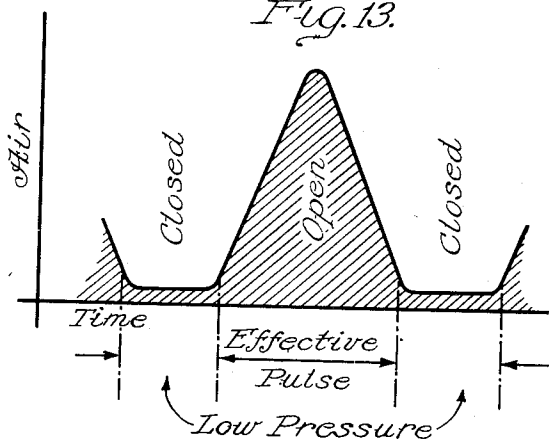


Fig. 14.

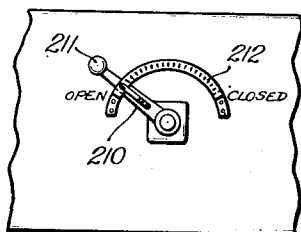
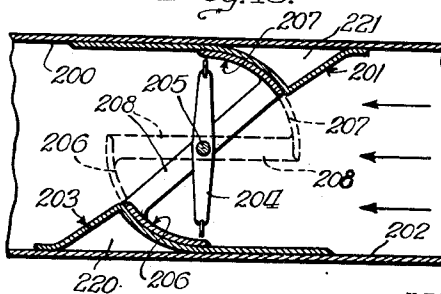


Fig. 15.



INVENTOR.

Mack E. Haworth

BY

Richardson and Auer
Attys.

UNITED STATES PATENT OFFICE

2,374,865

GRAVITY SEPARATOR

Mack E. Haworth, Birmingham, Ala., assignor to
Roberts and Schaefer Company, Chicago, Ill., a
corporation of Illinois

Application July 31, 1941, Serial No. 404,864

2 Claims. (Cl. 209—475)

This invention relates to gravity separators, and is particularly concerned with improvements which are applicable, but not limited, to the general class of separators known as dry cleaners, or air flow cleaners such, for example, as described in U. S. Patent No. 2,245,942, granted June 17, 1941.

Separators of this type are well known in the art and are widely used in industry, for example, for the purpose of cleaning materials such as coal, to remove undesired admixtures therefrom. Such a separator may comprise a trough-like chute or chamber provided with an air-pervious deck plate which may be disposed at an incline. Raw coal is supplied at one end and is caused to flow along the deck toward the other end of the chute. The flow of the layer or stream of material along the deck is determined by the incline of the deck and by the action of air currents rising through the pervious deck plate to agitate the material so as to bring about stratification according to the specific gravities of its component parts. The heavy particles such as bony coal, rock, slate, pyrite and the like, which in the case of coal constitute refuse, assume the lowermost position in the stratified stream and are discharged from the bottom thereof, the coal floating on top toward the discharge end. Auxiliary devices or machinery may be provided in such a separator to assist the desired stratification and proper discharge of coal as well as refuse, but the general feature outlined above, namely, the provision of the discharge chute or chamber, the air-pervious deck, and the air currents directed through the deck to lift and agitate the material for the purpose of stratification, are usually found in all air cleaners of this type.

The primary purpose of my invention resides in the provision of an air flow separator or cleaner which is more sensitive, and therefore more efficient, in its operation. The greater operative sensitivity is due to the provision of control features which adapt the separator for operation over a wider range of particle sizes and for more efficient operation in the case of finely divided materials. Some of the salient features and objects of the invention may be briefly stated as follows:

One object is realized by the provision of an air flow cleaner having a deck or material-receiving bed which is subdivided into separate sections representing, as it were, a series of individual decks, together with means for removing heavy material at the end of each section or deck.

Another feature is concerned with the provision of means in such a separator for subdividing the

deck or each section thereof into a number of individual air cells each controlling only a portion of the deck or deck section.

A further object has to do with valve control means whereby the inlet of air or air impulses into the individual air cells of the deck or deck sections may be governed, so as to provide for differential sectional adjustment according to the needs determined by the stream of material which is to be moved along the deck.

Another object relates to the provision of means for adjusting the incline of the deck or deck sections.

Still another object is realized by the provision of means for controlling the air inlet for the deck or deck sections and their air cells in common, so as to provide a uniform main air supply, together with means for adjusting the air supply according to the needs of the separator.

The above and other objects and features will appear from the detailed description which follows, with reference to the drawings, wherein

Fig. 1 is a diagrammatic side view of one embodiment of a separator;

Fig. 2 is a similar side view with part of the housing broken away and certain parts of the interior mechanism shown in section;

Fig. 3 is a sectional view of part of a deck or deck section taken along lines 3—3 in Fig. 4;

Fig. 4 is a section of an air-cell valve arrangement, taken along lines 4—4 in Fig. 3;

Fig. 5 is a plan view of the valve provided for one of the air cells;

Fig. 6 is a partial plan view of the mechanism for mounting valve control members;

Figs. 7 and 8 show side views and sections, respectively, of an embodiment wherein the incline of the individual deck sections is adjustable;

Fig. 9 shows a plan view of the operating mechanism for adjusting the incline of a deck or deck section;

Figs. 10 and 11 are diagrammatic views illustrating the action of a customary flutter valve for admitting air into the apparatus;

Figs. 12 and 13 are views similar to Figs. 10 and 11, but cover an improved flutter valve; and Figs. 14 and 15 show details of an improved flutter valve.

The drawings briefly described above are more or less diagrammatic and show only the salient parts of the machinery of the separator. Details which are not required for an understanding of the subject matter of this disclosure have been omitted. Elements or structures which may be assumed to be well known in the art have been

likewise omitted from the detailed description which follows. Like parts are numbered alike throughout the drawings.

Referring now particularly to Figs. 1 and 2, numeral 11 indicates generally the lower part of the machine which houses an air box or chamber 12 (Fig. 2). Air in a substantially steady stream under pressure is supplied to or injected into this air chamber through the duct 13 which is provided with a rotary valve 14. This valve is rotated during the operation of the machine and thus ejects air under pressure in the form of impulses in accordance with its rotation. The duct 13 may be rectangular and the valve 14 therefore may be made in the form of a vane which is rotatable around the shaft 15. The shaft may be mounted at its ends in suitable bearings in the housing 16, as indicated in Fig. 1. In the central part of the machine, above the air chamber 12, suitably mounted and supported on beams and girders, is the air-pervious deck comprising in this instance the individual decks or deck sections generally indicated at 17, 18 and 19. These decks extend transversely across the machine. They are mounted in this embodiment stationary on an incline, as shown in the drawings, and at the forward end of each deck is provided a chute. The chute 20 discharges heavy material from the deck 19, chute 21 discharges heavy material from the deck or deck section 18, and chute 22 discharges middlings from the deck section 17. The clean coal (it being assumed that the machine is used as a coal cleaner) is discharged over the discharge gate member 23 shown in Fig. 2 at the left hand end of the apparatus. The discharge chute 20 connects with the compartment 24; discharge chute 21 with the compartment 25; and discharge chute 22 with the compartment 26. The clean coal is discharged into a separate compartment, as shown. The material may be removed from these compartments by any approved or desirable means which are not shown in order to keep the disclosure as simple as possible and to limit it to the subject matter necessary for understanding the invention. It may be remarked at this point that material discharged into any of the discharge compartments, and particularly that discharged into the compartment 26, may be re-circulated as desired.

The operating parts of the separator, including the deck or deck sections, discharge chutes and compartments, as well as the air chamber 12, shown in Fig. 2, are closed to the outside by a casing, the lower part of which is indicated at 11 (Fig. 1). The forward casing portion 30 closes the machine at the front end and may be provided with a suitable door. The middlemost portion is likewise enclosed by walls such as 31 and 32. These side walls extend on each side of the deck or deck sections, forming with the deck a trough over which the stream of material flows from right to left for stratification and discharge. Attached to the casing walls 32 is a hood 33, terminating in a funnel 34 for withdrawing the dust which develops during separation. Along each side of the apparatus may be provided windows such as indicated in Fig. 1 at 35-40, inclusive, so as to permit observation of the operation inside the cleaner during the working thereof.

The raw material is supplied from a hopper 41 through the medium of an oscillating supply valve comprising end plates 42 connected crosswise by the angular tray 43. This valve is mounted on a shaft 44 which is oscillated through

the medium of an arm 45 mounted on an eccentric 46. The latter is rotated through the medium of a suitable drive, for example, a belt or chain drive 47, which is actuated by a motor 48. Numeral 49 indicates a speed reduction mechanism for the motor, and 50 indicates its mounting. The shaft 15 carrying the flutter valve 14 may also be rotated from said drive, for example, through the medium of a suitable chain or belt operated from the same shaft which drives the eccentric 46 for oscillating the supply valve shaft 44.

The structure of the deck or deck sections will now be discussed with reference to Figs. 3-6, inclusive.

Fig. 3 represents a longitudinal section of the front end of a deck or deck section, for example, the section 19 which discharges heavy material into the chute 20. The deck comprises an air-pervious top deck plate 55 and an air-pervious intermediate plate 56. These plates are spaced from each other, as shown, and the resulting space is transversely subdivided by means of partitions such as 57-62. The compartments resulting from this subdivision are filled with a material resistant to but permeable by the air stream directed upwardly in a manner that will be described presently. Marbles or the like may be used for this purpose, as described in detail in the previously mentioned patent. The front end of the deck or deck section is closed by a plate 63, and at the bottom is provided a plate 64 which is equipped with transversely extending rows of holes or apertures 65. Each row of holes extends underneath a corresponding air cell or compartment of the deck. The partitions extending from the air-pervious intermediate deck plate 56 down to the apertured plate 64 are indicated by numerals 66-70, inclusive. Individual apertured bars or plates may be used to form the bottom plate 64. The deck is thus subdivided to form a number of individual air cells into which air may be injected through the holes or apertures 65.

A central longitudinal partition 72 may be provided in a separator of unusual width, as shown in Fig. 4. This partition may be placed substantially in the middle of the separator, forming with one side wall 31 thereof a trough over which the material moves for stratification and discharge, and forming with the opposite side wall of the separator a similar trough provided with an air-pervious deck subdivided into individual air cells exactly as the deck shown in the drawings. The right half is shown in Fig. 4 in dotted lines, the individual parts being designated by the same but primed reference numerals.

In order to control the stream of air or air pulses through the holes 65 in the stationary bottom plates 64 into the individual air cells, I have provided each air cell with a valve comprising a valve bar such as 75-79, inclusive, as shown in Fig. 3. Each valve bar, such as 77, for example, is provided with apertures or holes, such as 80, 81, 82, for alignment with the corresponding holes or apertures 65 in the fixed bottom plate 64. The valve bar 75 is movably mounted in brackets 85, 86; the valve bar 76 is likewise movable in brackets 86, 87; the valve bar 77 is movable in brackets 87, 88; and the valve bar 78 is movably mounted in brackets 88, 89. Each valve bar is provided at its front end with an extension indicated at Fig. 3 by the numerals 90-93, inclusive. The operating mechanism for these valve bars comprises, as in the case of the valve bar 77 shown in Fig. 4, a screw such as 94 which is rotatably

mounted in the side wall 31 and engages a threaded hole in the extension 92. The mounting of these valve screws is particularly apparent from Figs. 4 and 6. Numeral 31 indicates the side wall of the casing; 100 indicates a notched retaining bar. The head of the screw 94 is squared as indicated at 101, and the screw is provided with a collar 102 and a reduced portion 103 which is engaged by the notch 104 on the retainer bar 100. One such retainer bar is used for holding several valve adjusting screws. In the example shown in Fig. 1 one such retainer bar is provided for all the adjusting screws of each deck section.

The wall 31 of the casing is also provided with a number of small openings each for the reception of an indicator pin such as 105 which is attached in the case of the valve bar 77 to the extension 92, as shown in Fig. 4. The extent to which the pin projects from the casing wall indicates the setting and adjustment of the valve for the corresponding air cell of the deck.

It will be apparent from the description given so far that air supplied through the duct 13 by way of the flutter valve 14 (Fig. 2) enters the air chamber 12 in the form of pressure impulses according to the rotary speed of the flutter valve and is directed upwardly through the more or less aligned openings 80 and 85 in the valve bars and in the bottom plates 64. Each air cell of the deck or deck section will thus be supplied individually with air pulses which are directed through the air-resistant filling in the upper portion of the deck cells and finally escape through the air-pervious deck plate 55 to bring about the agitation and lifting of the material and its stratification, as previously mentioned and as is well known. Air valves for the individual air cells as shown provide the operator with an important control medium. He can adjust these air valves along the entire deck and all deck sections thereof so as to admit just the right amount of air into each and every section of the deck. The feature is important particularly in the cleaning of material of small particle size, also in connection with material containing moisture. In case the material masses at one place or another along the deck, requiring more air at this particularly section, the operator can actuate the corresponding valve and admit either more or less air, as desired or required by the material to be treated. The indicator pins 105 indicate to the operator the positions of the various air valves.

Attention is called to the fact that the air cells near the left end of each deck or deck section are provided with individual valves. For example, referring to Fig. 3, the first three air cells, counting from left to right, are each provided with individual valves 75, 76, 77, respectively; the next two cells, however, have a common control 93 which is the extension from the valve plate 78 serving these two air cells. The same is true of the remaining air cells in this deck section, and identical conditions prevail in the example shown in the decks or deck sections 18 and 17. This particular distribution of the air valves is advantageous because I have found that a more sensitive control is required at the discharge end of the deck than in the remaining portion thereof.

Figs. 7-9, inclusive, illustrate a portion of an air flow cleaner including the features described above and adding thereto the feature of adjusting the incline of the deck or deck sections. Numeral 110 indicates the side wall of the casing of

the apparatus corresponding to the side wall 31, 32 in Figs. 1 and 2, with the observation windows omitted. These windows may, of course, be provided if desired. The feature of adjusting the incline of the deck or of each deck section may be described in connection with the centrally disposed deck shown in Fig. 7. The deck again comprises a pervious top deck plate such as 111, a pervious intermediate plate 112, the space between these pervious plates being subdivided by suitable partitions to form upper compartments containing material such as marbles, as in the previously discussed case. The lower part is likewise subdivided to provide air cells such as indicated in Fig. 7, at 113-116. A bottom plate 117 with rows of transversely extending holes is again provided in this embodiment, as already discussed. These rows of valve holes may be closed by valve plates or bars such as 118 (Fig. 8) or aligned for the admission of air into the corresponding air cell with the holes in the bottom plate. The valve bars are again mounted and may be operated as discussed in connection with Figs. 3-6, inclusive. The operating mechanism is also shown in Figs. 7 and 8, comprising a common retainer bar 120 which holds the various valve screws such as 121 for operating the valve bar 118.

The deck used in this embodiment is provided with internal downwardly extending side walls 125 and 126 (Fig. 8). Extensions 127 and 128 form a trough with the pervious top plate 111. The operating mechanism, including the retainer bar 120 is mounted on the side wall 125 of the deck. The deck is also provided with a front wall 130 and a slightly curved back wall 131. The deck or deck section thus is shaped somewhat like a rectangular hood with a pervious deck on top and downwardly depending walls on all sides which extend beyond the bottom plate 117. The side walls fit into the casing walls 110 and 132, as shown in Fig. 8. In case the machine should be of unusual width, it can again be subdivided longitudinally into two parallel troughs. The valves will then also be subdivided and operating means therefor are provided on either side of the apparatus.

An inspection of the previously discussed embodiment will disclose that these structures are similar with respect to the provisions of the side walls. In the structure Figs. 7-8, the deck has its own side walls; in the structure Figs. 1-6, the casing furnishes the side walls for the deck. The walls extend in both structures below the bottom plate of the deck, forming an enclosure which is open at the bottom for connecting with the air chamber.

The front wall 130 of the unit shown in Figs. 7-9 is hinged mounted at 135 on a cross-bar or bracket 136 extending from the corresponding wall of the discharge chute 137. From the bottom member 140 of the discharge chute 141 at the other end of the unit extends a shield 142. This shield is fixed and covers part of the rear wall 131 of the deck section or deck unit. At the bottom of the deck section near the rear end thereof are provided downwardly extending legs 145 and 146. These legs normally rest on cam-like members 147 and 148 mounted on a shaft 149 which in turn is rotatably mounted in the bearings 150, 151 in the opposite outside casing walls 110 and 132. The shaft 149 extends out of the casing wall through the bearing 150 at one end and is provided with a worm gear 152 for engagement with a worm 153 mounted on a shaft

154 which is rotatable in bearings 155, 156 mounted on the outside casing wall, in this instance on the wall 110. One end of the shaft 154 may be squared as indicated at 167, for the purpose of rotating the worm gear to rotate the shaft 149 and thereby the cams 147 and 148, to move the corresponding deck at the rear end up or down as desired, and as is apparent from the drawings. The worm gear prevents any slipping-back from an adjusted position.

The outside casing wall 110 is provided with a cut-out 160 which is tapered as shown, widening from left to right, so as to permit the retaining bar 120 and the screws and other mechanism connected with it to move up and down according to the setting of the cams 147 and 148. The position of the retaining bar 120 with respect to the edges of the cut-out 160 indicates the position of incline of the deck.

The front wall 130 and the back wall 131 close each unit at the opposite ends thereof. The wall 131 slides in back of the shield 142 responsive to adjustment up or down through the medium of the cams. The side walls 125 and 126 seal the unit transversely. However, in order to prevent the escape of air, I have provided flexible seals 170 and 171, as shown in Figs. 7 and 8, each seal being attached at the top to the corresponding inside wall of the deck and at the bottom to the inside of the corresponding casing wall.

The cam control for adjusting the incline of the deck provides for uniform operation. Different means may be used, however, for obtaining substantially the same results. It is possible, for example, to provide bracket members on the deck which project laterally to the outside and to dispose screws or the like underneath such brackets. These screws may be held in suitable stationary mounting members arranged outside on the side of the machine. The deck would thus be provided on each side, at the rear end thereof, with such a laterally projecting bracket, and a screw such as mentioned would be disposed underneath each bracket. Upon turning the screws in their stationary mountings on each side of the machine they would lower or raise the brackets and thereby the deck to adjust its incline.

The operation in each embodiment (Figs. 1-2 and Figs. 7-9) is similar. Air under pressure is admitted, if desired, in a constant stream or in impulses as described through the duct 13 shown in Fig. 2. The air fills the air chamber 12 underneath the deck and underneath each deck section and has a tendency to escape upwardly. According to the adjustment of the valves underneath each air cell, the air flows upwardly and then escapes through the air-pervious deck where it encounters the stream of material. The raw material is fed from the hopper 41 onto the tray 43 which oscillates so as to push measured amounts of material from right to left from the feed end of the machine onto the deck. The incline of the deck, in conjunction with the air currents rising from underneath, cause the material to flow in a stream downwardly from right to left of the deck. The heavy material settles in the lowermost stratum of the material stream, while the coal floats to the top. Heavy material is discharged through the first discharge chute 20, the remaining material moving on over the center deck 18 (deck 111 in Fig. 7). Heavy material is again discharged through the chute 21 shown in Fig. 2, or in the embodiment, Fig. 7,

through the chute 137. The remaining material continues to stream and flow downwardly over the last deck to the discharge 22 where the middlings are discharged into the compartment 26 while the coal is discharged over the gate 23 into the coal compartment at the left hand end of the machine. According to the type of material, its condition, size, etc., the operator will set the valves for the individual air cells and, if the machine is made according to the embodiments Figs. 7-9, he can also adjust the incline of each deck section individually. If the operator observes congestion at one place or another on the deck, or if he finds upon testing the material discharged into any of the discharge compartments that it is not of the quality desired, he will operate the air valves so as to adjust and to correct the flow of air into the individual air cells or compartments of the deck. He can thus provide sectionally for an increase or decrease of air supply throughout the entire length of the deck until the air supply is just right to meet the desired operating conditions. The operator may also adjust the incline of one deck or the other to such conditions as may arise in operation. He is thus able to provide a fine adjustment for practically any operating condition.

In the examples discussed above, it was assumed that a simple air supply flutter valve was provided, such as shown in Fig. 2 and as diagrammatically indicated in Fig. 10. This air valve furnishes air impulses somewhat as indicated in the diagram shown in Fig. 11. The effective air impulse furnished by the flutter valve is shown in the shaded portion of the diagram. When the valve is wide-open, that is, when the vane 14 shown in Fig. 2 is in parallel with the upper and lower walls of the valve casing, the maximum amount of air will be in the air chamber 12. When the valve is closed, that is, when it is in the condition shown in Figs. 10 and 2, air will be admitted into the air box or air chamber 12 only due to the leakage that occurs around the valve. This produces periods of low pressure, as indicated in Fig. 11, which are relatively short compared with the periods of high pressure or the effective air impulses. The shape of the curve shown in Fig. 11 is arbitrary and is intended solely for illustrative purposes, no particular time or air pressure or rotary speed of the valve having been considered. The diagram is intended merely to indicate in a general way the relation of low pressure (valve closed) to high pressure (valve open).

In Fig. 12 is shown a modified shielded flutter valve. Again there is an air duct, as described previously, and also an air vane or member of the general shape shown in Fig. 2. However, I have provided arcuate shields at the top and bottom of the casing, which extend transversely of the rectangular air duct casing at the top and bottom thereof. These shields lengthen the periods of low pressure admitted through the air duct in the direction of the arrows into the air box which is at the left of the air duct, as shown in Figs. 1 and 2. With such a shielded valve is obtained a curve somewhat as shown in Fig. 13. The periods of low pressure interposed between the effective pulses are lengthened. The effective pulse is steeper than with a normal flutter valve, because the lengthening of the low pressure periods is, of course, obtained at the expense of the effective pulses. The shielded valve, as diagrammatically shown in Fig. 12, may com-

prise merely the two arcuate shields which may be of bent sheet metal suitably attached at the top and bottom of the air duct.

A modification of such a shielded flutter valve, including an adjustable feature, is indicated in Figs. 14 and 15. Fig. 14 shows the air duct from the side in plan view, and Fig. 15 is a longitudinal section through the air duct. At the top inside wall 200 of the air duct is attached a curved shield 201 consisting of a suitably shaped sheet, and on the bottom wall 202 of the air duct is provided another similarly curved sheet 203. The ends of these shields may be welded, riveted or otherwise suitably attached to the walls of the duct. Considering only the provision of such shields as shown at 201 and 203 in Fig. 15, the structure diagrammatically indicated in Fig. 12 is obtained. The air pulse curve resulting from the operation of such a valve would then be relatively fixed except as to some modifications that may result from the air pressure used and from the speed of the valve that may obtain at any time. The valve vane 204 is attached to a rotatable shaft 205 which may be driven in any desirable manner from the common drive mechanism shown in Figs. 1 and 2.

In order to provide for adjustment of the high pressure periods with respect to the low pressure periods, I use an additional adjustable shield comprising two curved plates 206 and 207 which extend transversely across the air duct and are rotatable within the curved portion of the fixed shields 201 and 203. These shields 206 and 207 are connected at opposite ends by suitable cross bars, one of which is indicated at 208. These cross bars are rotatably mounted by means of suitable bearing bushings so as to be rotatable with respect to the shaft 205. At one side of the casing the bearing bushing for these cross bars extends to the outside and is provided with the lever 210 shown in Fig. 14 which is equipped with a knob or handle 211 and is operable with respect to a quadrant 212. Suitable markings may be provided so as to inform the operator of the position of the setting of the adjusting shields. The setting of the arm 210 as shown in Fig. 14 corresponds to the setting of the adjustable shields 206 and 207, as shown in full lines, in Fig. 15. When the arm 210 is rotated to the right, that is, toward the closing position, the shields 206 and 207 will be rotated into the position in which they are shown in dotted lines in Fig. 15. The periods of low pressure are then lengthened beyond the fixed ratio determined by the shields 203 and 201. The relation of the low pressure to the high pressure periods would be, assuming a setting of the valve as shown in Fig. 15, approximately one-fourth of the pulse curve. Assuming the extreme closed position shown in dotted lines in Fig. 15, the low pressure periods would be approximately one-half of the pulse curve. The operator thus is enabled, within wide limits, to control the relation of low pressure and high pressure periods of the air pulses admitted into the machine.

The auxiliary rotatable shields 206, 207 may be arranged differently. For example, they may be placed within the spaces 220, 221 of the fixed shields in sliding engagement with the curved inside surfaces thereof. The sloping walls 201, 203 would be provided with suitable transverse slots or cut-outs for permitting the projection and retraction of the movable shields. The provision of suitable stops which may be desirable

in the embodiment Fig. 15 would then be taken care of by the fixed shields.

The invention has been described in connection with a separator of the air-flow type. Certain features may be applicable to different types of separators, operating with fluid media other than air, and even to different machinery. It is therefore understood that it is not intended to limit the use of the invention narrowly to the equipment shown and specifically described.

Changes may be made within the scope and spirit of the appended claims wherein I have defined what I believe is new and desire to have protected by Letters Patent of the United States.

I claim:

1. In a separator of the class described, a deck over which comminuted material is caused to move from feed to discharge end for separation according to the specific gravities of its component parts, said deck comprising an air pervious deck plate, side walls extending above and below said deck plate to form a trough thereabove and the side walls of an air compartment therebelow, a pivotally mounted front wall joined with said side walls at the forward end of said deck, a curved wall joined with said side walls at the rear end of said deck, a fixed curved shield adjacent said curved wall of the deck, brackets extending downwardly from said deck near the rear end thereof, rotatable cam means for engagement with said brackets, means for rotating said cam means to lift the rear end of said deck for adjusting the incline thereof, a housing for enclosing the side walls of said deck, flexible means for coupling said side walls with said housing inside thereof, and a tapering cutout in said housing exposing a portion of at least one of said side walls to permit observation of the angular displacement thereof responsive to adjustment of the incline of the deck.

2. Apparatus for separating comminuted material in accordance with the specific gravities of its particles having a material receiving structure comprising an air pervious deck plate, side walls for said deck plate, one secured thereto at either side thereof, which extend above and below such deck plate to form therewith an upwardly exposed material receiving trough and a downwardly exposed air receiving channel, an end wall joined with said side walls at either end of said deck plate, the end wall joined with the side walls of said deck at the rearward end thereof being of convex configuration, an air supply structure comprising a housing having side walls for enclosing the side walls of said deck and forming an air chamber therebelow communicating with said air receiving channel, flexible means for coupling the side walls of said deck with the inside of the side walls of said housing, means for pivotally mounting in said housing the forward end of said deck, means for displacing the deck at the rearward end for the purpose of adjusting its incline within said housing, a concave shield fixedly disposed within said housing for engagement with said convex end wall, said shield coacting with said convex end wall in the manner of a seal to maintain supply of air from the air chamber of said housing to the air receiving channel of said material receiving structure in any angular displaced position thereof and means formed at the outside of said housing for observing the angular displacement of said deck responsive to adjustment of the incline thereof.

MACK E. HAWORTH.