

Jan. 30, 1940.

G. H. FRASER

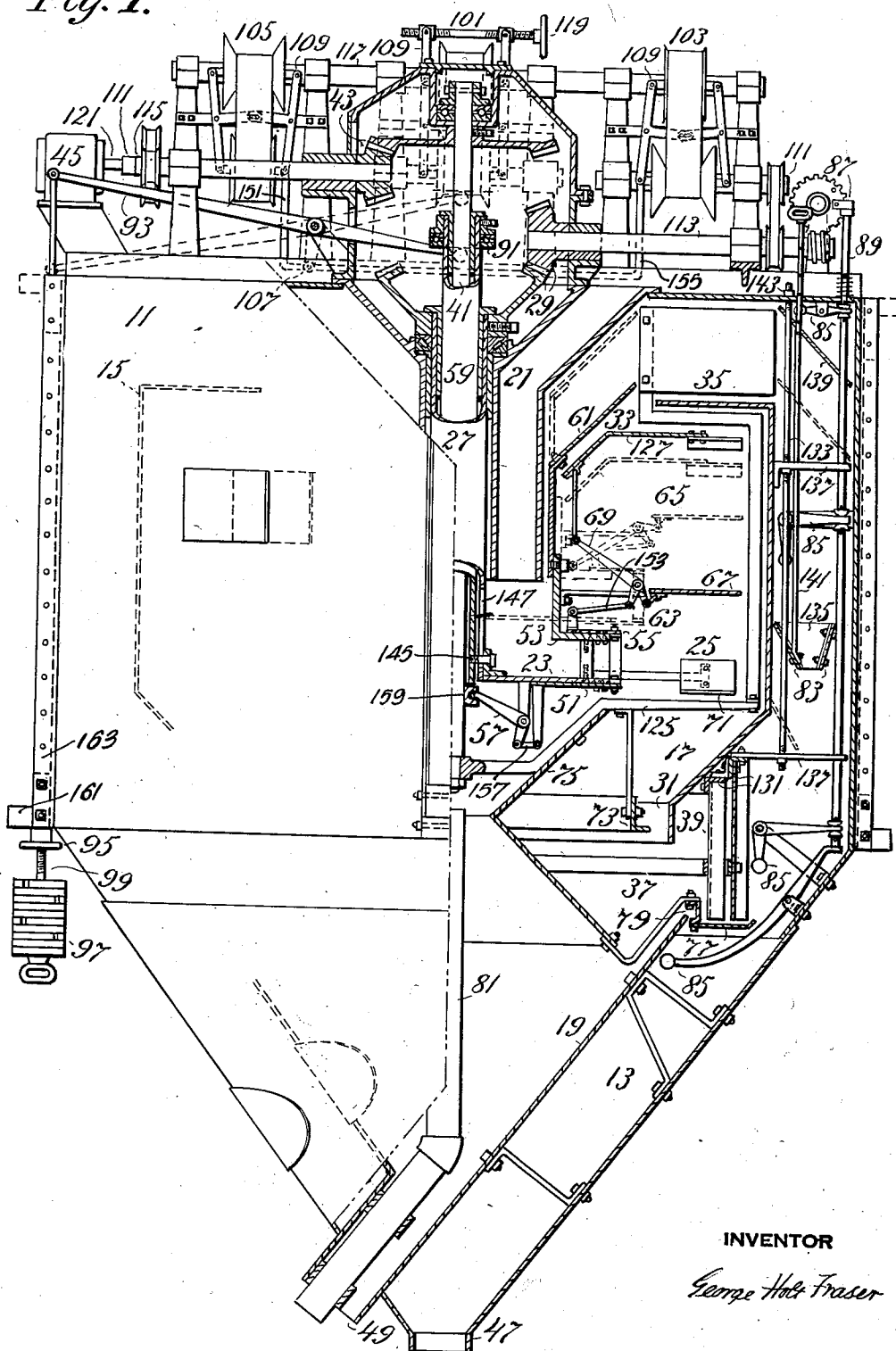
2,188,430

AIR OR CURRENT SEPARATOR

Original Filed Jan. 10, 1935

3 Sheets-Sheet 1

Fig. 1.



INVENTOR

George Holt Fraser

Jan. 30, 1940.

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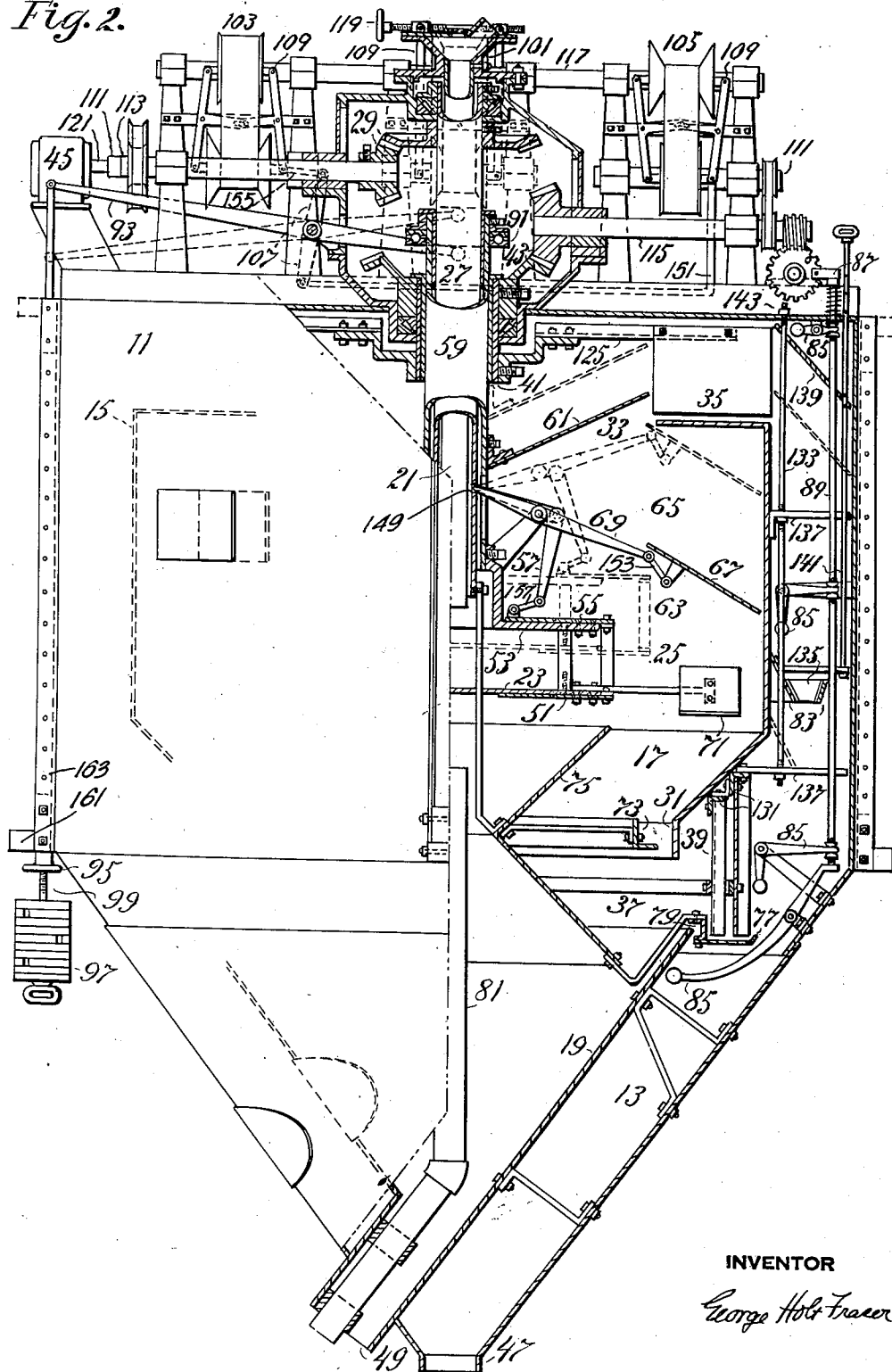
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Fig. 2.



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Fig. 3.

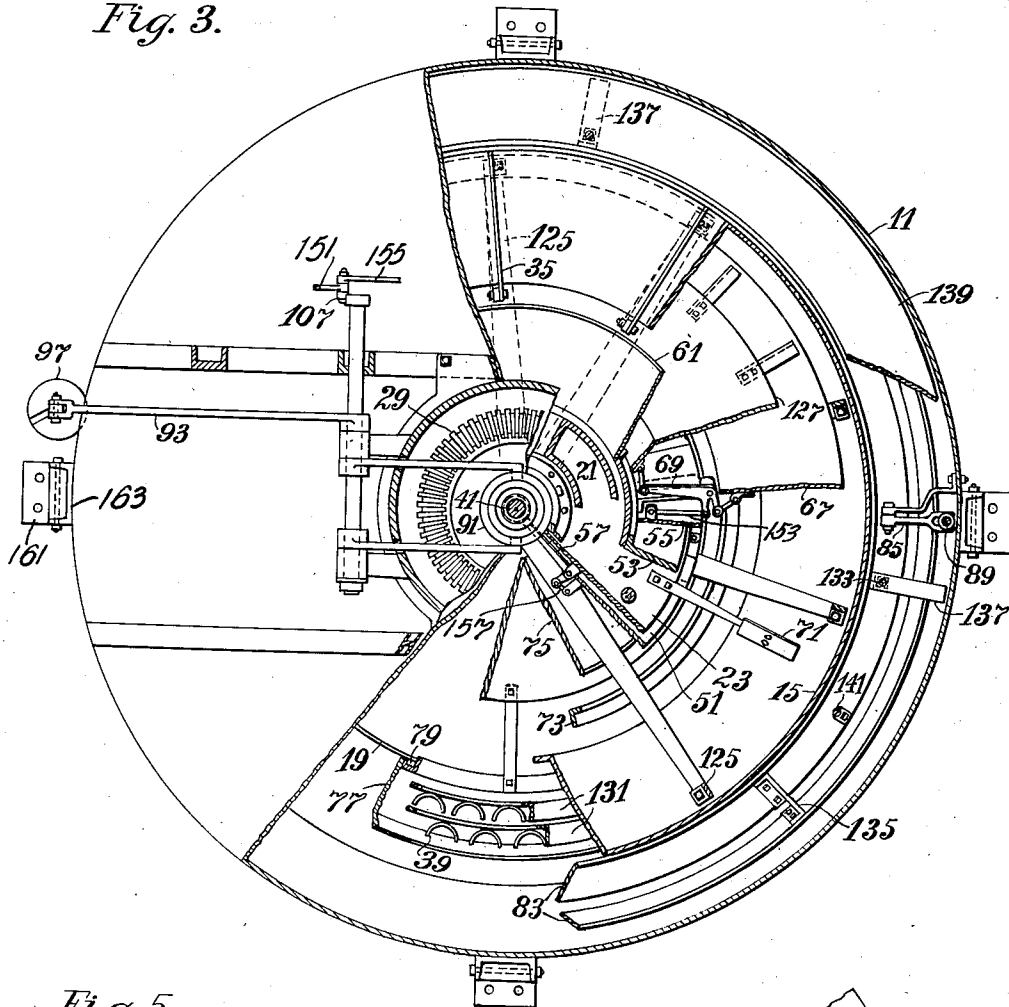


Fig. 5.

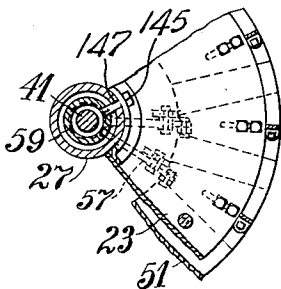
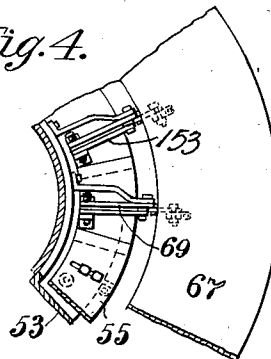


Fig.4.



INVENTOR

George Holt Fraser

UNITED STATES PATENT OFFICE

2,188,430

AIR OR CURRENT SEPARATOR

George Holt Fraser, Brooklyn, N. Y.

Application January 10, 1935, Serial No. 1,173

Renewed July 18, 1939

22 Claims. (Cl. 209—139)

This invention relates to pneumatic or other current separators for separating fine from coarse or light from heavy material, and aims to provide improvements in such separators especially applicable to such separators of the types shown in my patents—

No. 1,542,050 granted June 16, 1925 on my application Serial No. 281,445 filed March 8, 1919;

No. 1,834,095 granted Dec. 1, 1931 on my application Serial No. 26,033 filed April 27, 1925;

No. 1,876,516 granted Sept. 6, 1932 on my application Serial No. 737,411 filed Sept. 12, 1924;

No. 1,987,615 issued Jan. 15, 1935 on my application Serial No. 687,359 filed Jan. 19, 1924;

No. 1,992,942 issued March 5, 1935 on my application Serial No. 459,930 filed June 9, 1930;

No. 2,055,484 issued Sept. 29, 1936 on my application Serial No. 514,199 filed Feb. 7, 1931;

No. 2,055,485 issued Sept. 29, 1936 on my application Serial No. 714,961 filed March 10, 1934;

No. 2,113,586 issued April 12, 1938 on my application Serial No. 606,407 filed April 20, 1932,

and No. 2,148,452 issued Feb. 28, 1939 on my application Serial No. 584,140 filed Dec. 31, 1931.

Other types of such separators are set forth in my applications—

Serial No. 628,678 filed August 13, 1932;

Serial No. 628,679 filed August 13, 1932;

Serial No. 38,777 filed August 31, 1935;

Serial No. 55,423 filed Dec. 20, 1935;

Serial No. 80,258 filed May 18, 1936;

Serial No. 93,210 filed July 29, 1936, and

Serial No. 141,534 filed May 8, 1937.

This application contains subject matter formerly included in my earlier application Serial No. 91 filed Jan. 2, 1925, other subject matter of which has been protected by claims in my said Patent No. 1,834,095, and in my said Patent No. 1,876,516.

This application contains subject matter formerly included in my said application Serial No. 606,407, other subject matter of which has been protected by claims in my said Patent No. 2,113,586, and other subject matter of which is claimed in my said applications Serial No. 55,423, Serial No. 80,258, and Serial No. 93,210.

This application contains subject matter formerly included in my earlier application Serial No. 628,678, other subject matter of which has been claimed in my said application Serial No. 141,534.

The object of this invention is to provide improved means for varying the action of a pneumatic or other fluid current separator by varying the velocity and path of the current stream and

the manner in which the material is distributed.

A further object of my invention is to provide an improved form of rotating valve for the outlet of the separating chamber.

A further object of my invention is to provide improved means for simultaneously varying the speed of rotation of the fan and the position of the distributor.

A further object of my invention is to provide improved means for simultaneously varying the speed of rotation of the distributor coincidentally with variation in the position of the latter.

A further object of my invention is to provide means for simultaneously varying the radial extent of the distributor and the position of the valve.

A further object of my invention is to provide means for simultaneously reversely vertically varying the positions of the distributor and of a baffle below and adjacent the upper outlet.

For accomplishing these objects the invention preferably provides various features of improvement either of which may be applied in any desired manner to a separator having either an annular feed conduit or a central feed pipe, but which I prefer to combine, and apply and use together, in any current separator, as shown in the accompanying drawings, in which—

Fig. 1 is a side elevation partly cut in vertical axial mid-section of an annular feed conduit air separator provided with the preferred form and combination of my improvements;

Fig. 2 is a similar view of a central feed conduit air separator provided therewith;

Fig. 3 is a fragmentary cross section of the separator shown in Fig. 1, the left hand side of the view being cut on the plane of the fulcrum of the counterbalanced lever, and the other parts of the view being stepped down and cut on planes, the one extended above the fan blades, and the others extended immediately above the upper baffle, immediately above the annular baffle, immediately above the distributor, immediately below the latter, and through the filter vanes, respectively;

Fig. 4 is a fragmentary detailed plan view of the lower baffle and its radial segments and their operating levers, and

Fig. 5 is a fragmentary detailed plan view of the distributor, showing its radial segments and their operating levers.

Referring to the drawings, in which the same numbers indicate similar parts of an air separator, 11 is the outer casing enclosing a settling chamber 13, 15 is the inner casing enclosing a

separating chamber 17, 19 is a coarse material receiver, 21 is a supply conduit, 23 is a rotary distributor, 25 is the distributor chamber, 27 is the distributor drive shaft, 29 are its drive gears, 31 is the lower current inlet to the separating chamber, 63 is the upward current passage therein, 33 is the upper current outlet therefrom, 61 is a rotary valve at the outlet and 127 is a rotary upper baffle under the outlet, 35 are the blower fan blades, 125 are the fan spokes, 37 is the return current passage, 39 is a filter consisting of one or more rings of spaced vertical vanes across the return passage 37, for intercepting and dropping through their lower ends fine material in the current returning from the settling chamber, 41 is the fan drive shaft, 43 are the fan gears, 45 is a variable speed motor or other primary driver for the rotary parts, 47 is the outlet for fine material, and 49 is the outlet for coarse material.

71 are the circumferentially spaced uptossers around and revoluble with the distributor 23, which are shown as inclined for uptossing material in the zone of distribution when they are rotated in clockwise direction; 73 is a rotary retarder shelf revoluble with the fan spokes 125 and depended therefrom to within the lower inlet 31; 75 is the revoluble tubular partition depended from and revoluble with the fan spokes 125, for revolubly defining the return current passage 37; 77 is a rotary shelf under the ends of the filter vanes 39, for resisting leakage therebelow; 79 is a rotary grooved ring around the upper edge of the receiver 19, for resisting leakage therearound; 81 is a vapor vent outlet extended from within the inner casing 15 to externally of the outer casing 11; 83 are the adjustable jet rings between the inner and outer casings, for downwardly jetting the current outwardly of the filter 39; 85 are jarrer hammers for jarring these and the filter and tailings receiver; 87 is a jarrer striker therefor; 89 is a jarrer anvil between and in operative relation to the hammers 85 and the striker 87.

These may be of any suitable construction for spreading the material to be separated across the upward passage and causing a current to flow up through the separating chamber and upper outlet into the settling chamber, and to return through the filter to the lower inlet, for separating and floating fine material into the settling chamber and dropping coarser material into the coarse receiver.

The outer casing 11 is shown as enclosing a settling chamber 13, and the inner casing 15 is shown as within and in spaced relation thereto, and as having a lower current inlet 31, upward passage 63, and upper outlet 33, in communication with the settling chamber 13, and as affording an endless current passage or path 37 extended up through and down around the inner casing, through the filter 39, and above the tailings receiver 19.

The current circulation means is shown as a rotary blower means or fan blades 35, revoluble between the inner and outer casings and around the outlet 33, for causing a separating current to circulate in an endless path up through and down around the separating chamber.

The distributor 23 is shown as rotary for the rotatable supply and distribution of material to be separated in the distribution chamber 25, and as vertically adjustable for vertically varying the zone of said distribution, and as having a rotary ring of segments 51 which are inwardly and outwardly slidably movably adjustable, for

radially varying the zone of distribution, for varying the separation. The distributor is shown as surrounded by circumferentially spaced revoluble uptossers 71, revoluble in the zone of distribution, and shown as inclined for uptossing material therefrom when the uptossers are revolved in clockwise direction.

The distributor 23 is shown as having a hub or lower baffle 53 in vertically fixed spaced relation to and movable vertically with it, which is shown as provided with a rotary ring of segments 55 which are radially adjustable by inwardly and outwardly slidable movement, for radially varying the width of the lower baffle 53 and the width of the distribution chamber 25 adjacent the zone of distribution.

The blower means is shown as of the type which is revoluble at variable speed relatively to the distribution means, and as revolved by a variable speed driver 105, shown as a conventional variable speed device of the type in which reversely axially movable conical pulleys are coincidentally moved by adjuster levers 109, for transmitting rotation from their constant shaft 117 at variable speed to their variable shaft 111, which latter is shown as belted to a blower gear shaft 115, from which rotation is transmitted through blower gears 43 to a vertically stationary blower drive shaft 41, connected by spoke means 125 to the fan blades 35, for revolving the latter at variable speed.

The distribution means is shown as of a type which is revoluble relatively to the circulation means, and as revolved by a variable speed driver 103, shown as said conventional type having reversely axially movable conical pulleys coincidentally moved by shifter levers 109, for transmitting rotation at variable speed from their constant speed shaft 117 to their variable shaft 111, which latter is shown as belted to a distributor gear shaft 113, for rotating the distributor shaft 27 and the distributor 23 at variable speed, and preferably relatively to the fan blades 35.

The constant speed shaft 117 of the variable speed drivers 105 and 103 is shown as the variable speed shaft of a similar conventional variable speed driver 101, the adjustment levers 109 of which are manually adjusted by a screw 119, and a constant speed shaft 111 of which is shown as revolved by the shaft 121 of a variable speed motor or other primary driver 45.

The distributor 23 is shown as splined on its drive shaft 27 by a screw 145 slidable in a slot 147 therein, by which screw the distributor is carried by a tubular vertically adjustable suspender 59, revolubly mounted on an upwardly and downwardly movable bearing 91, mounted on a non-rotary adjustment lever 93, which lever is adjusted by a lock nut 95 adjustably screwed on a rod 99, which lever and the distributor are shown as counterbalanced by adjustable counter weights 97, by tilting which lever the distributor 23 may be vertically movably adjusted, for varying the height of the zone of distribution.

The current space regulation means is shown as comprising a rotary upper baffle 127 below and adjacent the upper outlet, for defining the space through which the current may flow to the latter, and vertically movably adjustable for vertically varying said space, for thereby varying the velocity of the current, for varying the separation, which baffle is shown as vertically spaced from and sustained from and revoluble with the distributor 23.

The filter vanes 39 are shown as depended

from conically arranged angle rings 131, and these and the inner casing 115 are shown as adjustably carried and radially positioned by slidable brackets 137, adjustably carried by screw threaded rods 133, which are adjustably mounted on the top of the outer casing by screw threaded nuts 143.

The fan blades 35 are shown as surrounded by a conical deflector 139, which is carried by and vertically adjustable with a suspender rod 141, which vertically adjustably sustains the jet rings 83 and whirl checks 135 between and connecting the latter.

As thus far described these parts may be any suitable parts for the circulation of a separating current, and for the variation of its velocity, and for the distribution in said current of material to be separated thereby, and for the vertical or radial variation of the zone of distribution, those shown being similar to corresponding parts claimed in my said patents and in my said companion applications.

In a separator of this general type it is sometimes desirable that the velocity of the separating current may be varied coincidently with vertical or radial variation of the zone of distribution without throttling the current space, in order to eliminate the resistance to such circulation incident to throttling the space through which the current may flow, and one feature of my present invention provides for varying the velocity of the current by variation of the circulation means itself coincidently with variation of the zone of distribution, which I preferably accomplish in the construction shown by providing between and common to the distribution adjustment means and the variable speed blower drive means a coincident current velocity variation connection, as 151, shown as a link connected to an arm 107 on the distributor adjustment lever 93 and connected to the shifter 109 of the variable speed blower driver 105, in such manner that as the distributor 23 is movably adjusted by vertical adjustment of its bearing 91 when the lever 93 is tilted, the blower driver 105 will be varied and will correspondingly vary the speed of rotation of the fan blades 35, thereby varying the velocity of the separating current coincidently with variation of the zone of distribution, and, when arranged as shown in Fig. 1, increasing such velocity coincidently with vertical elevation or radial diminution of said zone.

In some separators of this general type it is desirable to vary the velocity of the current by increasing the space through which the current may flow past the upper baffle coincidently with vertical or radial variation of the zone of distribution, and my invention preferably accomplishes this by making the upper baffle 127 movable relatively to or reversely to the distributor 23 coincidently with movable adjustment thereof, preferably by sustaining the baffle from and connecting it to the latter by providing a motion change or a reverse motion connection therebetween, as 153, shown as a lever 69 and a link 153, which is shown as connected to the radially movable segments 55 in such manner that as these segments are moved upwardly and outwardly to vary the zone of distribution, such movement will be translated into downward movement of the baffle 127, whereby the latter will be moved from an upper position for diminishing said velocity, toward an open position for increasing said velocity, coincidently with elevation or radial diminution of the zone of distribution, as distinguished from

the upper baffle in my said applications Serial No. 55,423 and Serial No. 93,210 in which the upper baffle is in vertically fixed relation to and is moved with the distributor instead of relatively thereto.

In separators of the type in which the width of the zone of distribution is radially variable, as by having around the distributor 23 or its hub 53 a rotary ring of inwardly and outwardly adjustably slidable segments 51 or 55, it is desirable that the velocity of distribution should be varied coincidently with the variation of the width of the zone of distribution, in order that this velocity may suffice to project the material across the width of the zone, and may be suited to that permitting effective separation, and my present invention provides for varying the velocity of distribution coincidently with variation of the zone of distribution, preferably by varying the speed of rotation of the distributor 23 coincidently with vertical or radial variation of said zone, preferably as shown in Fig. 1 by providing a coincident adjustment connection therebetween, as 155, shown as a link connected to the arm 107 of the distributor adjustment lever 93, in operative relation to the distributor and connected to the shifter 109 of the variable speed driver 103, in such manner that as the distributor 23 is movably adjusted by tilting the lever 93 the driver 103 will be varied and will vary the speed of rotation of the distributor coincidently with movable adjustment thereof, whereby to vary the velocity of distribution coincidently with variation of the zone of distribution, and preferably as shown to decrease said velocity coincidently with decrease in the width of said zone, or with vertical elevation of the latter.

In separators of this general type it is desirable to simultaneously vertically and radially vary the zone of distribution, and my invention provides for effecting both such variations, and preferably for effecting them coincidently, preferably as shown by making the distributor vertically movably adjustable and by providing it with one or more rotary rings of collectively inwardly and outwardly slidable segments 51 and 55, slidably connected to it in such manner that they may be outwardly slid coincidently with upward adjustment of the distributor, for reducing the width of the zone of distribution simultaneously with elevation thereof, and inwardly slid coincidently with downward adjustment of the distributor, for increasing the width of the zone of distribution simultaneously with depression thereof, whereby to afford a high and narrow zone for coarse separation, or a low and wide zone for fine separation.

Any suitable means may be employed for effecting such coincident vertical and radial variation of the zone of distribution, but for effecting it in an annular feed conduit separator in which the distributor 23 is splined on and rotated by a shaft 27, and the fan blades 35 are rotated by a vertically stationary fan shaft 41 which is revolvable relatively to the shaft 27, I prefer to slidably carry the segments 51 and 55 from the distributor 23, and to radially move them relatively thereto, for which I preferably provide segment vertical and radial coincident adjustment means, as 157, shown as comprising bell cranks 57, shown as fulcrumed to the distributor and vertically movable therewith, and as having one arm connected by links 157 to the segments 51 and the other arm revolvably engaged in the groove of a collar 159 fixed on the shaft 41 below the distributor 23 and

affording a revoluble connection between the shaft 41 and the bell cranks 57, in such manner that as vertical adjustment of the distributor raises the fulcrum of the bell cranks 57 their inner ends will be vertically stationarily held by the grooved collar 159 and they will be thereby caused to tilt and radially slide the segments 51 and 55, which will thereby be movably adjusted inwardly and outwardly coincidently with vertical movable adjustment of the distributor, whereby the height and width of the zone of distribution will be simultaneously varied.

In separators of the type having movably adjustable lower distribution means and a vertically spaced upper baffle, it is desirable that the current path in the upward passage 63 therebetween should be varied relatively to and coincidently with movable adjustment of the distribution means, and my invention preferably provides for this as shown in Fig. 1, by providing an annular baffle 67 around the upward passage 63, which is movably adjustable relatively to the distributor 23 and the upper baffle 127, from a lower position adjacent the distribution chamber 25, for affording a narrow passage therefrom and a substantial selection chamber 65 thereabove, to an upper position, a relatively greater distance above the distributor 23 and a relatively lesser distance below the upper baffle 127, coincidently with vertical adjustment of the distributor, for affording a more uniform path for the current in the passage 63, when the distributor is vertically adjusted for coarse separation. Preferably in such a construction the annular baffle 67 is moved by and coincidently with radial movement of the segments 55, and by and coincidently with movement of the lever 69, to an outer arm of which it is shown as connected in such manner that as the lever 69 is tilted by outward movement of the segments 55 the annular baffle 67 will be simultaneously raised relatively to the latter, and thereby will increase the space therebetween through which the current may flow from the distribution chamber, and will decrease the space between the annular baffle 67 and the upper baffle 127 through which the current may flow between these, which latter space will be further decreased by the depression of the baffle 127 incident to such tilting of the lever 69.

In some separators of the type having an upper baffle below the upper outlet for defining the space therebetween through which the current may flow, it is also desirable to vary the velocity of the current by varying the space above the outlet through which the current may flow, as by means of a rotary valve 61 which is vertically adjustable above the upper baffle, and my present invention provides for availing of such space variation, and for sustaining and adjusting such a valve, without unnecessarily increasing the height of the separator, preferably as shown in Fig. 1 by making the upper baffle 127 with a recessed inner upper side in the shape of an inverted cone, and by making the upper valve 61 of inverted conical shape, and by disposing it opposite and making it movably adjustable into said recess, and preferably provides for sustaining and adjusting it by mounting it on the hub 53 of the distributor 23 in such manner that it will rotate with the latter and be vertically adjusted thereby simultaneously therewith and in the same direction and to the same extent as the distributor is adjusted, and simultaneously reversely to the coincident adjustment of the baffle 127 from and relatively to the distributor, where-

by when the distributor 23 is downwardly adjusted the valve 61 will be coincidently adjusted toward a closed position in which its lower portion will telescopically enter and be encircled by the inner recessed portion of the baffle 127, and when the distributor is upwardly adjusted the valve 61 will be simultaneously adjusted to an open position, in which it will be spaced above the upper baffle 127.

In separators having an annular feed conduit 21 around a blower drive shaft 41, it is desirable that the downflow to the distributor of material to be distributed by the latter should not be intersected or molested by the drive connection between the blower drive shaft and the fan blades, and my present invention preferably provides for avoiding such molestation in the construction shown in Fig. 1, by disposing the spoke means 125 a distance below the distributor 23 and below the zone of distribution, and by extending them radially outwardly therebelow, and upwardly without and around said zone and outwardly of and past the annular baffle 67 and the upper baffle 127 and the upper valve 61, and by connecting them thereabove to the fan blades 35, whereby the latter may be vertically stationarily sustained from inwardly of the relatively revoluble distributor shaft 27, and the distributor and baffles and valve may be vertically adjusted and may be revolved relatively to the blower spoke means without molestation from the latter, and the spoke means will be below and without the path of descent of material to the distributor, and below and around the zone of distribution and separation.

This disposition of the spoke means 125 facilitates suspension therefrom of the retarder shelf 73, the tubular partition 75, the shelf 77, and the grooved ring 79, from the blower shaft 41, with which they are shown as revoluble in Fig. 1.

As thus far described, and as shown in Fig. 1, my improvements as set forth are availed of in a separator having an annular feed conduit, a distributor drive shaft inwardly thereof, a blower drive shaft within and surrounded by the distributor shaft and carrying the vertically stationary rotary parts, and having an upper baffle below and adjacent the upper outlet, but it will be understood my improvements can be availed of in whole or in part with other types of separators, and can be modified to suit the requirements thereof.

One such modification is shown in Fig. 2, which shows my improvements applied to a separator having a central feed pipe 21, surrounded by a distributor shaft 27, which is surrounded by the distributor suspender pipe 59, revolvably suspended from and vertically adjusted by the bearing 91, which suspender is surrounded by a tubular blower shaft 41, on which the fan spokes 125 are mounted above the upper valve 61. In this construction the upper baffle 127 is eliminated, and the annular baffle 67 is vertically movable from adjacent the distribution chamber 25 to adjacent the upper outlet 33, for eliminating the selection chamber 65 for coarse separation. In this construction the vertically stationary revoluble parts are suspended from the distributor shaft 27, and are revolved by it.

In this construction the distributor 23 is suspended from its hub or lower baffle 53, and the latter is fixed to the suspender 59, and has the bell cranks 57 and levers 69 fulcrumed to it with their inner ends extended through vertical slots 147 in the suspender 59 and in engagement with holes or recesses 149 inwardly thereof in the shaft 75

27, in such manner that, as the suspender is raised to elevate the distributor, the bell cranks 57 and levers 69 will be tilted to radially slide the segmental plates 51 and 55, and to vertically adjust the annular baffle 67, coincidentally with vertical adjustment of the suspender 59.

In this construction the valve 61 and hub 53 are connected to the suspender 59 in vertically fixed relation, so that vertical movement of the latter will move them in the same direction and to the same extent at the same time, and thereby move the valve toward an open position with elevation of the distributor, or toward a closed position with depression thereof.

In this construction the coincident connections 151 and 155 between the lever 93 and the variable speed distributor driver 103 and fan driver 105 are adapted to decrease the speed of rotation of the distributor coincidentally with elevation or expansion thereof, and to increase the velocity of the current by increasing the speed of rotation of the fan blades coincidentally with elevation or expansion of the distributor or elevation of the current space regulation valve 61. In other respects the parts in this construction are similar to those before described and bear similar reference numerals.

In operation the separator is started at mid-adjustment and mean speed, and is then adjusted as required for the fineness of separation desired. For very fine separation the distributor and lower baffle will be lowered and contracted and the upper valve or upper baffle will throttle the upper outlet, and the outer baffle will provide a large selection chamber above it and below the outlet, so that the separating current will be mild and of great volume, and the distributor will rotate rapidly for spreading the material across a wide distribution chamber, and the blower will rotate slowly for producing a gentle current. For very coarse separation the distributor will be raised and expanded for providing a narrow distribution chamber, and will be rotated slowly for spreading the material across the narrow chamber, and the upper valve or baffle will be opened, and the outer baffle adjusted for providing a uniform current passage to the fan blades, which will be rotated rapidly for generating a current of sufficient intensity to separate coarse material. The separator may be easily adjusted for separating one or the other of these products or any intermediate product, and this may be done during rotation without stopping operation.

Preferably the casing 11 is provided with feet 161 which are adjustable and reversible, and is provided with vertical legs 163 to which these feet are adjustably connected.

Although for the purpose of illustrating the applicability of my present improvements I have shown them as utilized with a separator in which a vertically adjustable distributor is spaced its vertically adjustable distance below the orifice of a supply conduit and its vertically adjustable distance above vertically fixed spoke means extended past it to and carrying and rotating fan blades above it, and said distributor as encircling an annular supply conduit, and adjustment means for said distributor extended down inwardly of said conduit and outwardly said distance below said distributor, and adjustment means for a valve or a baffle extended down inwardly of and outwardly below and up around said conduit, said distributor so spaced, said spoke means, and said adjustment means, are not specifically claimed herein, being claimed in

my said companion application Serial No. 141,534.

Although for the purpose of illustrating the applicability of my present improvements I have shown them as utilized with a separator having a rotary open top tubular partition wall 75 spaced inwardly of the lower inlet to the separating chamber and partitioning the return current passage to the latter from a tailings receptacle therebelow, and affording communication between said chamber and said receptacle, said rotary tubular partition wall is not claimed herein, being claimed in my said application Serial No. 80,258.

Although for the purpose of illustrating the applicability of my present improvements I have shown them as utilized with a separator having a rotary annular tailings retarder 73 around and above the return current passage and within and above and inwardly of the lower inlet of a separating chamber, said rotary retarder is not claimed herein, being claimed in my said application Serial No. 80,258.

Although for the purpose of illustrating the applicability of my present improvements I have shown them as applied to a separator having a vertical rotary ring 79 inwardly of and extended from above to below the lower ends of a ring of circumferentially spaced material interceptor baffles 39, such a vertical rotary ring is not claimed herein, being claimed in my said application Serial No. 38,777.

Although for the purpose of illustrating the applicability of my present improvements I have shown them as applied to a separator having an annular baffle 67 within the separating chamber and around the upward current passage therein and movable from above and adjacent a movable distributor to around and adjacent the upper outlet from said separating chamber, and so movable with and to a greater extent than a vertically movable valve above said outlet and a vertically movable distributor below the latter, said annular baffle so movable is not specifically claimed herein, being generically claimed in my said application Serial No. 80,258.

Although for the purpose of illustrating the applicability of my present improvements I have shown them as applied to a separator having a vertically movable valve and a vertically movable distributor and a vertically movable connection therebetween all in vertically fixed relation and simultaneously vertically movable in the same direction and to the same extent, a vertically movable valve and a vertically movable distributor and a vertically movable connection therebetween in vertically fixed relation and simultaneously vertically movable in the same direction and to the same extent are not claimed herein, being claimed in my said companion application Serial No. 80,258.

What I claim is:

1. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith, variable current circulation means in communication with said passage, for the upward circulation of a separating current therein, for the separation of material therein, and variable for varying the velocity of said current, for varying said separation, distribution means within said upward passage, for the supply and distribution therein of ma-

terial to be separated by said current, and movably adjustable, for varying the zone of said distribution, for varying said separation, and distributor adjustment means in operative relation to said distribution means for movably adjusting the latter; the combination therewith of a connection between and common to said current circulation means and said distribution means, for varying the former in response to movable adjustment of the latter, in operative relation to each thereof, and being operable to vary said current circulation means in response to movable adjustment of said distribution means, and thereby to vary the velocity of said current with variation of the zone of said distribution.

2. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith and affording a communication passage between and in communication with said chambers, rotary current circulation means in communication with said passages, for circulating a separating current up through said upward passage, for the separation of material therein, and for circulating said current through said communication passage, variable speed rotation means in operative relation to said circulation means for revolving the latter, and variable for varying the speed of revolution thereof, for varying the velocity of said current, for varying the separation, distribution means within said upward passage, for the supply and distribution therein of material to be separated by said current, and movably adjustable for varying the zone of said distribution, for varying said separation, and distributor adjustment means in operative relation to said distribution means, for movably adjusting the latter; the combination therewith of an operative connection between said variable speed means and said distribution means, constructed and arranged to vary said variable speed means in response to adjustment of said distribution means.

3. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith and affording a communication passage between and in communication with said chambers, revoluble current circulation means in communication with said passages for the upward circulation of a separating current in said upward passage, for the separation of material therein, and for the circulation of said current through said communication passage, and revoluble at variable speed for varying the velocity of said current, for varying said separation, distribution means within said upward passage, for the supply and distribution therein of material to be separated by said current, and vertically adjustable for varying the height of the zone of said distribution, for varying said separation, and distributor adjustment means in operative relation to said distribution means, for vertically adjusting the latter; the combination therewith of a coincident operative connection between and common to and in operative relation to said circulation means and said distribution means, for varying the former coincidentally with vertical adjustment of the latter, operated with said vertical adjustment of said distribution means, and when so operated op-

erative to vary the speed of revolution of said circulation means coincidentally with said vertical adjustment of said distribution means, and thereby to vary the velocity of said current coincidentally with vertical variation of the zone of said distribution.

4. In the separator specified in claim 2, said coincident connection being operable to increase the speed of revolution of said current circulation means coincidentally with upward adjustment of said distribution means, and being thereby operable to increase the velocity of said current coincidentally with elevation of the zone of distribution.

5. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith, and affording a communication passage between and in communication with said chambers, rotary current circulation means in communication with said passages, for the upward circulation of a separating current in said upward passage, for the separation of material therein, and for the circulation of said current through said communication passage, variable speed rotation means in operative relation to said circulation means for revolving the latter, and variable for varying the speed of revolution thereof, for varying the velocity of said current, for varying the separation, distribution means within said upward passage, for the supply and distribution therein of material to be separated by said current, and radially movably adjustable for radially varying the width of the zone of said distribution, for varying said separation, and distributor radial adjustment means in operative relation to said distribution means, and movable for radially movably adjusting the latter; the combination therewith of an operative connection between said variable speed means and said radial adjustment means, operative to simultaneously vary said variable speed means and said radial adjustment means.

6. In the separator specified in claim 5, said operative connection being operable to increase the speed of revolution of said variable speed means coincidentally with radial increase of the size of said distribution means, whereby to increase the speed of revolution of said circulation means coincidentally with diminution of the width of said zone of distribution, and thereby to increase the velocity of said current coincidentally with decrease in the zone of said distribution.

7. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith and affording a communication passage between and in communication with said chambers, revoluble current circulation means in communication with said passages, for the upward circulation of the separating current in said upward passage for the separation of material therein and for the circulation of said current through said communication passage, and revoluble at variable speed for varying the velocity of said current, for varying said separation, distribution means within a lower portion of said upward passage, for the supply and distribution therein of material to be separated by said current, baffle means within said upward passage and spaced below said outlet and above said distribution means, comprising a rotary ring of segments having current

passage edges above said distribution means and below said outlet, for defining the space between through which said current may flow, said segments being inwardly and outwardly slidably adjustable, for radially varying the width of said space, for varying said separation below said baffle means, and segment adjustment means in operative relation to said baffle means, for radially sliding said segments; the combination therewith of a coincident operative connection between said circulation means and said baffle adjustment means, operative to simultaneously vary the speed of revolution of said circulation means and said radial adjustment means.

8. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith and affording a communication passage between and in communication with said chambers, revoluble current circulation means in communication with said passages for the upward circulation of the separating current in said upward passage for the separation of material therein, and for the circulation of said current through said communication passage, and revoluble at variable speed for varying the velocity of said current, for varying said separation, distribution means within a lower portion of said upward passage, for the supply and distribution therein of material to be separated by said current, upper baffle means below and adjacent said upper outlet and above said upward passage, for defining the space through which said current may flow therefrom, and vertically adjustable for varying said space, for varying the velocity of said current, for varying said separation, and baffle adjustment means in operative relation to said baffle, and adjustably movable for vertically adjusting the latter; the combination therewith of a coincident operative connection between said circulation means and said baffle adjustment means, operative to simultaneously vary the speed of revolution of said circulation means and said vertical adjustment means.

9. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith, current circulation means in communication with said passage for the upward circulation therein of a separating current, for the separation of material therein, rotary distribution means within said upward passage, for the supply and rotatable distribution therein of material to be separated by said current, and movably adjustable for varying the zone of said distribution, variable speed rotation means in operative relation to said distribution means for rotating the latter, and variable for varying the speed of rotation thereof, for varying the velocity of said distribution, and distributor adjustment means in operative relation to said distribution means and movable for movably adjusting the latter; the combination therewith of a coincident operative connection between and common to and in operative relation to said distributor adjustment means and to said speed variation means, operative to vary the latter coincidentally with adjustment movement of the former, and thereby to vary the velocity of said distribution coincidentally with variation of the zone of said distribution.

10. In a current separator comprising, a set-

ling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith, current circulation means in communication with said passage, for the upward circulation of a separating current therein, for the separation of material therein, rotary distribution means within said upward passage, for the supply and rotatable distribution therein of material to be separated by said current, and revoluble at variable speed, for varying the velocity of said distribution, for varying said separation, variable speed rotation means in operative relation to said distribution means, for rotating the latter at variable speed, a rotary ring of segments around said distribution means, having outer edges for radially defining the width of the zone of said distribution, and inwardly and outwardly slidable for increasing and decreasing said width, for varying said separation, and segment adjustment means in operative relation to said segments and adjustably movable for radially sliding the latter; the combination therewith of a coincident operative connection between and common to and in operative relation to said rotation means and said segment adjustment means, for varying the speed of rotation of the former coincidentally with adjustment movement of the latter, operated with said adjustment movement of said adjustment means, and when so operated operative to increase the speed of revolution of said distribution means coincidentally with inward slidable movement of said segments, and thereby to increase the velocity of said distribution coincidentally with increase in the width of the zone of said distribution.

11. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith, revoluble current circulation means in communication with said passage, for the upward circulation of a separating current therein, for the separation of material therein, and revoluble at variable speed for varying the velocity of said current, for varying said separation, rotary distribution means within said upward passage, for the supply and rotatable distribution of material therein to be separated by said current, movably adjustable, for varying the zone of said distribution, for varying the separation, and revoluble at variable speed, for varying the velocity of said distribution, for varying said separation, said circulation means and said distribution means being relatively revoluble, variable speed rotation means in operative relation to said circulation means and said distribution means respectively, for relatively rotating each thereof at variable speeds of revolution, and distributor adjustment means in operative relation to said distribution means and adjustably movable for movably adjusting the latter; the combination therewith of a coincident operative connection between and common to and in operative relation to said adjustment means and to said variable rotation means respectively, for relatively varying the latter coincidentally with adjustment movement of the former, operated with said adjustment movement of said adjustment means, and when so operated operative to relatively vary the speeds of revolution of said variable rotation means respectively coincidentally with said adjustment movement of said adjustment means, and thereby to vary the velocity of said current and the velocity of said distribution.

coincidentally with variation of the zone of said distribution.

12. In a separator comprising a settling chamber and a separating chamber, an inlet at the bottom and an outlet at the top of the separating chamber, said inlet and outlet affording communication between the separating and settling chambers; a fan arranged to produce a current of air through said inlet into said separating chamber, upwardly through said separating chamber, and through said outlet into said settling chamber; a rotary distributor in said separating chamber; means for feeding material to be separated to said distributor; said distributor being adjustable as to its radial extent; a valve plate positioned above and adjacent the outlet, and adjustable toward and from the outlet to vary the space through which said current may flow from said separating chamber; the combination therewith of a common adjustment means for said valve plate and distributor, constructed and arranged to coincidentally adjust the radial extent of said distributor and adjust said valve plate relative to said outlet, thereby simultaneously varying the radial extent of the zone of distribution and the velocity of the current.

13. In a separator comprising a settling chamber and a separating chamber, an inlet at the bottom and an outlet at the top of said separating chamber, said inlet and outlet affording communication between the separating and settling chambers; a fan arranged to produce a current of air through said inlet into said separating chamber, upwardly through the separating chamber and through said outlet into the settling chamber; a rotary distributor in said separating chamber; means for feeding material to be separated to said distributor; said distributor comprising a ring of radially slidable segments the outer edges of which form the outer edges of the distributor; and a plate positioned below and adjacent said outlet and adjustable toward and from said outlet to vary the space through which current may flow to said outlet from the separating chamber; the combination therewith of a common adjustment means for said plate and said distributor segments, constructed and arranged to coincidentally move said distributor segments radially and adjust said plate relative to said outlet, thereby simultaneously varying the radial extent of the zone of distribution and the velocity of the current.

14. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith, current circulation means in communication with said passage for the upward circulation of a separating current therein, distribution means within a lower portion of said passage, for the supply and distribution therein of material to be separated by said current, and vertically adjustable, for varying the height of the zone of said distribution, for varying said separation, upper baffle means below and adjacent said upper outlet and above said upward passage, for defining the space through which said current may flow therefrom, and movably adjustable relatively to said distribution means, for varying said space, for varying the velocity of said current, for varying said separation, and adjustment means in operative relation to said distribution means and said upper baffle means, and adjustably movable for movably adjusting

each thereof; the combination therewith of a motion change coincident operative connection between and common to said distribution means and said upper baffle means, for movably adjusting the latter coincidentally with movable adjustment of the former, in operative relation to and operated with movable adjustment of said distribution means, and in operative relation to and operative to movably adjust said upper baffle means relatively to and coincidentally with movable adjustment of said distribution means, and being thereby operable to vary said space and the velocity of said current coincidentally with variation of the zone of said distribution.

15. In the separator specified in claim 14, said coincident operative connection between said distribution means and said upper baffle means being a reverse motion connection, and being operable coincidentally with movable adjustment of said distribution means in one direction to movably adjust said upper baffle means in a reverse direction.

16. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith, current circulation means in communication with said passage, for the upward circulation of a separating current therein, for the separation of material therein, distribution means within said passage for the supply and distribution therein of material to be separated by said current, and vertically adjustable, for vertically varying the zone of said distribution, for varying said separation, a rotary ring of segments within said passage, having current passage edges for defining the path therein of said current, and radially adjustable by inward and outward movement, for radially varying said path for varying the separation, adjustment means in operative relation to and for vertically adjusting said distribution means, and support means in operative relation to and for supporting said parts; the combination therewith of a connection between and common to said distribution means and said segments, operative to radially movably adjust the latter in response to vertical movable adjustment of the former.

17. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upward current passage and an upper current outlet in communication therewith, rotary current circulation means in communication with said passage for the upward circulation of a separating current therein, for the separation of material therein, and revoluble at variable speed for varying the velocity of said current, for varying said separation, variable speed rotation means in operative relation to said circulation means for rotating the latter, and adjustable for varying the speed of said rotation thereof, for varying said velocity, rotary distribution means within said passage, for the supply and rotatable distribution therein of material to be separated by said current, rotatable relatively to said rotation means, and movably adjustable, for varying the zone of said distribution, for varying said separation rotary means in operative relation to and for rotating said distribution means, adjustment means in operative relation to and adjustably movable for movably adjusting said distribution means, and support means in operative relation to and for supporting said parts; the combination therewith of an adjustment connection between and

common to and in operative relation to said variable rotation means and said distribution means, for simultaneously adjusting each thereof, revolvably connected to one thereof, operated with movable adjustment to said distribution means, and when so operated being operable during rotation of the latter to adjust said rotation means simultaneously with movable adjustment of said distribution means, and thereby to vary the velocity of said current coincidentally with variation of the zone of said distribution.

18. In a current separator comprising, a settling chamber, a separating chamber therein having a lower current inlet and an upper current outlet, a fan above and in communication with said outlet, a rotary distributor plate in said separating chamber, and a rotary ring of radially slidable segments in said separating chamber; the combination therewith of non-rotary adjustment means externally mounted on said separator, a shaft rotatably carried by said adjustment means and rotating said ring of segments, and connections between said shaft and said segments constructed and arranged to cause radial movement of said segments when the position of said shaft is changed by said adjustment means.

19. A current separator for grading materials comprising, an outer casing enclosing a settling chamber, an inner casing enclosing a separating chamber having a lower inlet and an upper outlet in communication with said settling chamber, rotary fan blades above and having inner edges around said outlet, for causing a fluid current to flow up through said separating chamber and return through said settling chamber, for separating and floating fine material into the latter, a downward supply conduit in said separating chamber, for downwardly supplying material to be separated therein, and a distributor in said separating chamber, opposite and below said conduit, for intercepting said downward supply, and for outwardly distributing said material in said current; the combination therewith of an inverted conical, vertically adjustable, rotary valve, inwardly of said inner edges of and encircled by said blades, above and adjacent said outlet, for defining the space through which said current may flow therethrough, vertically adjustable for varying said space, for varying said

current and separation, rotatable for rotatably discharging fine material from said valve, upwardly and outwardly extended opposite said outlet, and adapted to upwardly and outwardly deflect said current from said outlet and radially toward said inner edges.

20. In a separator, comprising a casing enclosing a current passage, a casing enclosing a separating chamber having a lower current inlet and an upward current passage and an upper current outlet in communication with said passage, supply means having an outlet orifice within said separating chamber at a level materially lower than said outlet, supplying material to be separated in said upward passage, current circulation means in communication with said upward passage, upflowing a separating current therethrough, movable distribution means within said upward passage, distributing therein said material, and varying the zone of said distribution, comprising a distributor member below said orifice, defining said zone, movable current space variation means in communication with one of said passages, defining the space past said variation means through which said current may flow, and varying said space and the velocity of said current, said movable parts being relatively movable, and support means for said parts; the combination therewith of simultaneous relative adjustment means common to and simultaneously adjusting said movable parts, in operative relation to said movable parts, and constructed and arranged to simultaneously relatively adjust said distribution means and said current space variation means, and means for operating said simultaneous means.

21. In the separator specified in claim 20, said simultaneous relative adjustment means being constructed and arranged to, during said simultaneous adjustment, adjust one of said relatively movable parts vertically relatively to the other of said relatively movable parts simultaneously with adjustment movement of the latter.

22. In the separator specified in claim 20, said simultaneous relative adjustment means being constructed and arranged to, during said simultaneous adjustment, simultaneously adjust said relatively movable parts in reverse directions.