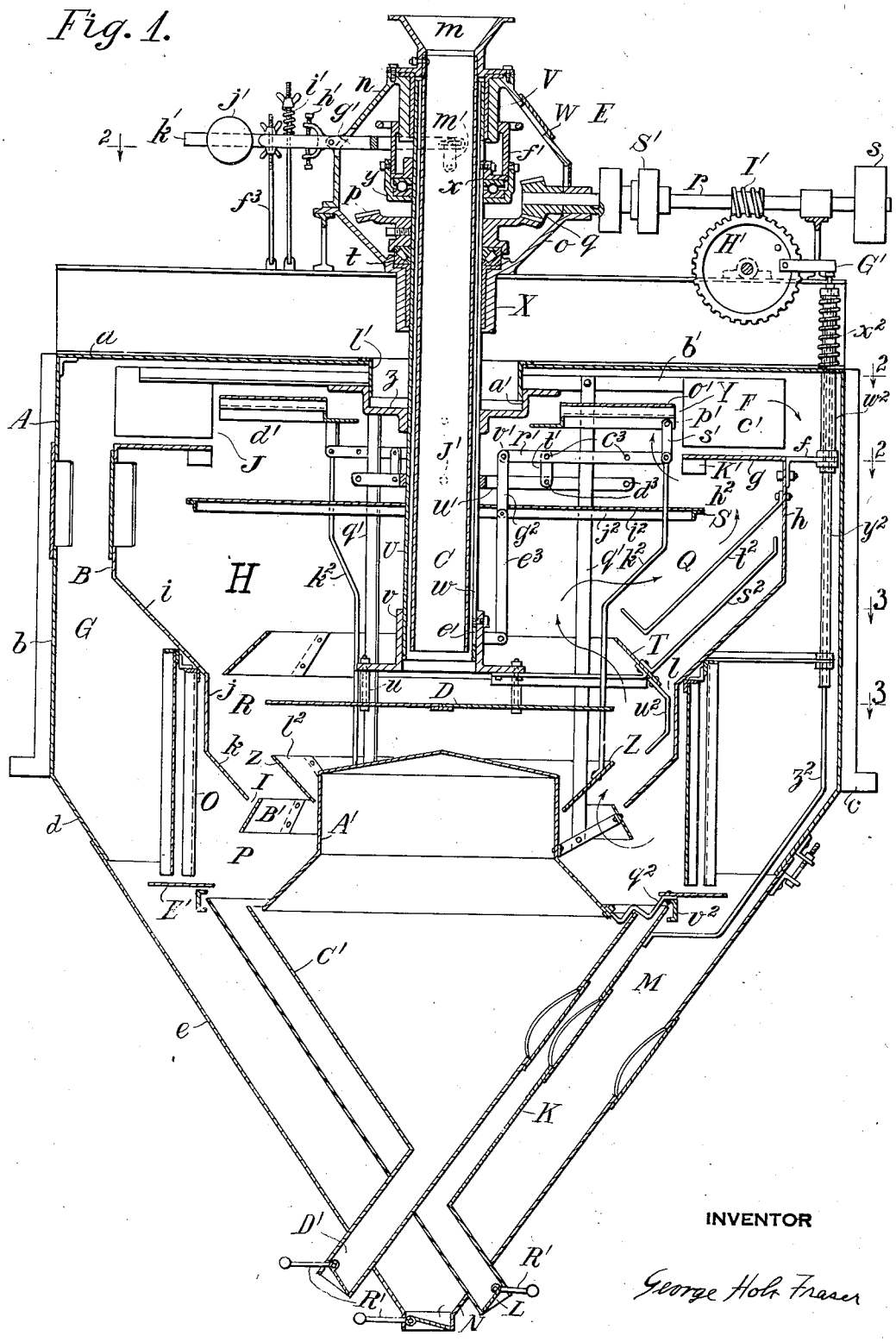
Jan. 30, 1940. G. H. FRASER 2,188,431

AIR AND OTHER SEPARATOR

Original Filed April 20, 1932 2 Sheets-Sheet 1

Fig. 1.



INVENTOR

George Holt Fraser

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Original Filed April 20, 1932 2 Sheets-Sheet 2

Fig. 2.

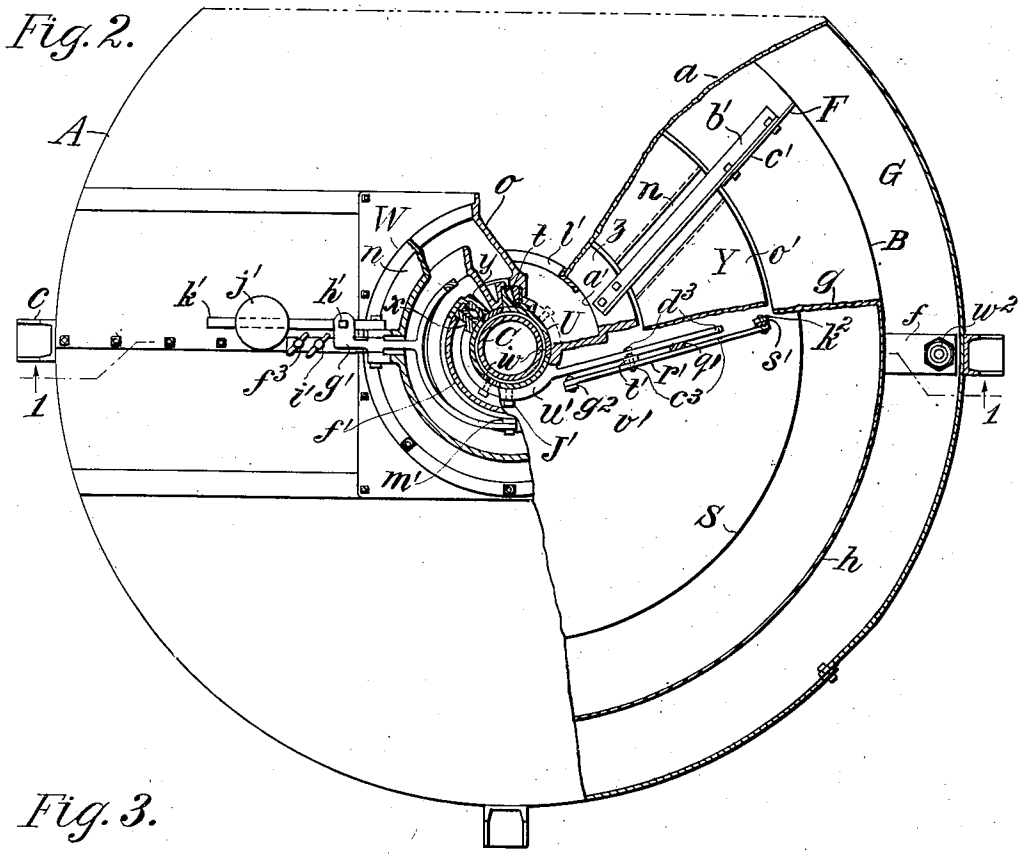
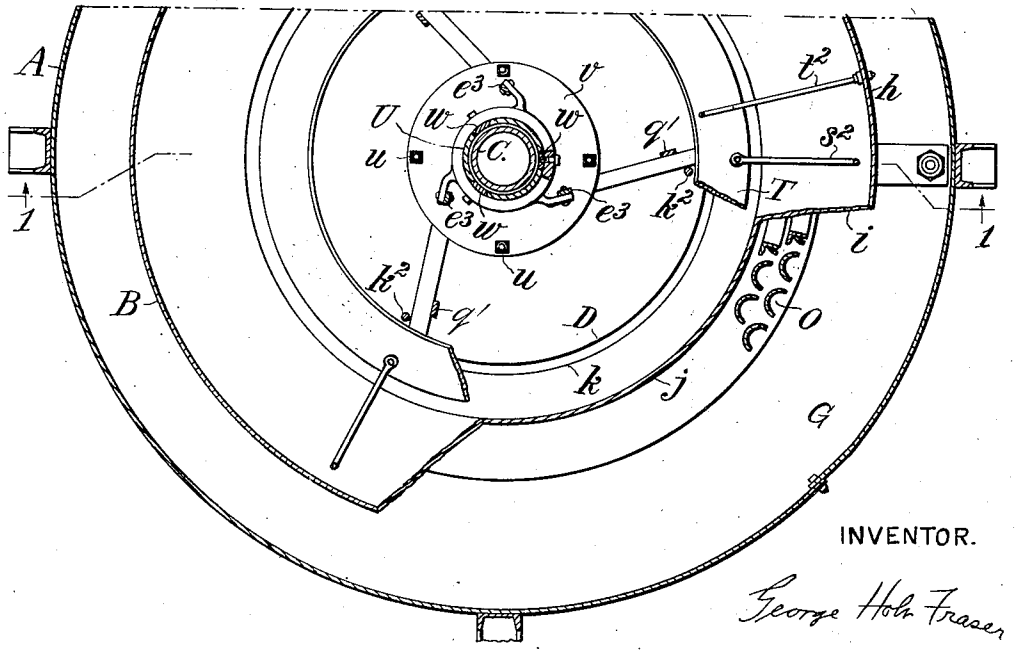


Fig. 3.



INVENTOR.

George Holt Fraser

Patented Jan. 30, 1940 2,188,431

UNITED STATES PATENT OFFICE

2,188,431

AIR AND OTHER SEPARATOR

George Holt Fraser, Brooklyn, N. Y.

Original application April 20, 1932, Serial No. 606,407. Divided and this application December 20, 1935, Serial No. 55,423

7 Claims. (Cl. 209—139)

This is a division of my original application Serial No. 606,407, now Patent No. 2,113,586, filed April 20, 1932.

This invention relates to separators or classifiers in which a fluid current is used to separate fine from coarse or light from heavy material, and aims to improve such devices.

Such separators usually comprise a settling chamber, a separating chamber having a lower current inlet and an upward current passage and an upper current outlet in communication therewith, distribution means within said passage, for the supply and distribution of material to be separated therein, and movably variable for varying such distribution, blower means for upflowing a separating current through said passage, for the separation of fine material therein, and current space variation means in the path of said current for defining the space through which such current may flow, and movably variable for varying said space, for varying the velocity of said current, for varying said separation.

Material to be separated has entered in one type of such a separator through a central feed pipe surrounded by a tubular drive shaft, and in another type thereof it has entered through an annular feed conduit around the drive shaft of the separator. My present improvements may be availed of with either such type.

Such a feed conduit has terminated in a supply orifice above and adjacent the distribution means.

The distribution means has been rotary, and, by a special operation, has been vertically or radially movably adjustable, for vertically varying the zone of distribution or for radially varying its width, by said special operation.

The current velocity regulation means has comprised rotary current space variation means, as an upper rotary valve above the upper outlet, or an upper rotary baffle below and adjacent the upper outlet, or a lower valve above and adjacent the lower inlet, for defining the space through which the current may flow. One or more of these, by another special operation, has been movably variable for varying said space, for varying the velocity of the current, by said other special operation.

Types of such separators are shown in my Patents Numbers 1,542,050 granted June 16, 1925. on my application Serial No. 281,445 filed March 8, 1919; 1,834,095 granted Dec. 1, 1931, on my application Serial No. 26,033 filed April 27, 1925; 1,876,516 granted September 6, 1932, on my application Serial No. 737,411 filed September 12, 1924; 1,987,615 granted Jan. 15, 1935, on my application Serial No. 687,359 filed Jan. 19, 1924; 1,992,942 granted March 5, 1935, on my application Serial No. 459,930 filed June 9, 1930; 2,055,484 granted September 29, 1936, on my application Serial No. 514,199 filed Feb. 7, 1931; 2,055,485 granted September 29, 1936, on my application Serial No. 714,961 filed March 10, 1934; 2,113,586 granted April 12, 1938, on my application Serial No. 606,407 filed April 20, 1932, and 2,148,452 granted Feb. 28, 1939, on my application Serial No. 584,140 filed Dec. 31, 1931.

Other types of such separators are shown in my co-pending applications Serial No. 1,173 filed Jan. 10, 1935; Serial No. 38,777 filed August 31, 1935; Serial No. 80,258 filed May 18, 1936, as a division of said application Serial No. 1,173, and Serial No. 93,210 filed July 29, 1936, as a division of my said application Serial No. 606,407.

This application contains subject matter originally set forth 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. 1,173, Serial No. 38,777, Serial No. 80,258, and Serial No. 93,210.

The object of this invention is to provide improved means for varying the action of a pneumatic or other fluid current separators 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 improved means for simultaneously varying said velocity and path and said manner in which the material is distributed.

A further object of my invention is to provide improved means for effecting said variations by one operation or manipulation.

A further object of my invention is to provide means for varying said velocity and path and the manner in which the material is distributed, including a member carried by the driving shaft and connected to the distributor and the current

space variation means, and simultaneously adjusting each of the latter relatively to said shaft.

A further object of my invention is to provide means for simultaneously relatively varying the velocity and the path of the current stream and the manner in which the material is distributed.

A further object of my invention is to provide means for varying said velocity and path coincidently with vertical movement of the distributor in response to variations in the weight of the material to be distributed sustained by the distributor.

To this end in carrying out the preferred utilization of my present improvements, when utilized with a lower distributor which is movably adjustable for varying the distribution, and with vertically spaced rotary current space variation means which is movably adjustable for regulating the velocity of the current, I make these coincidently movably adjustable and provided coincident adjustment means therefor revoluble with the space variation means, in operative relation to both and operable at one operation to coincidently adjustably move them collectively and preferably simultaneously, whereby coincidently with variation of the zone of said distribution to simultaneously vary said velocity; and I preferably provide such coincidently movable distribution means and current space variation means are collectively, and preferably simultaneously relatively or reversely movable at one operation; and when utilized with the said weight responsively vertically moved distributor claimed in my said original application, I preferably provide distributor sustained and operated coincident adjustment means for automatically regulating said velocity coincidently with weight responsive movement of said distributor; and when utilized with a vertically adjustable distributor, for vertically varying the zone of distribution, and with current space variation means movable between an open and a closed position for varying said velocity, I preferably provide for decreasing said velocity coincidently with elevation of said zone, and for increasing said velocity coincidently with lowering of said zone; and I provide various other features of improvement, all of which will be hereinafter more fully set forth.

In the accompanying drawings, which show a part of those originally included in my said original appliaction, and bear corresponding reference letters—

Fig. 1 is a vertical axial midsection, showing a central supply conduit air separator provided with the preferred form of my present improvements, cut approximately on the plane of the line 1—1 in Fig. 2, and looking in the direction of the arrows;

Fig. 2 is a plan view thereof, partly in horizontal sections, cut approximately on the planes of the lines 2 in Fig. 1, and

Fig. 3 is a fragmentary horizontal section thereof cut approximately on the planes of the lines 3 in Fig. 1.

Referring to the drawings, let A indicate the outer casing, B the inner casing, C the fed conduit, D the distributor, R the distribution chamber, E the drive mechanism, F the blower, G the settling chamber, M the dust chamber, H the separating chamber, I its lower inlet, J its upper outlet, S the upper baffle below and adjacent the upper outlet, Y the upper valve above the outlet, J, Z the lower valve above the inlet, I, N the dust outlet, K the coarse tailings receiver, L the coarse tailings outlet, C' the fine tailings receiver, D' the fine tailings outlet, R' gravity valves for the outlets N, L and D', A' the rotary partition between the fine tailings receiver C' and the lower inlet, for defining the return current passage P thereto, O the fine interceptor vanes or annular filter across the return current passage, E' the rotary shelf or discharger under these vanes, *v2* the rotary grooved ring below the shelf E' and around the tailings cone K, B' the conical tailings retarder below the inlet I and around the return passage P, T the conical annular lower baffle around the distributor D, U the distributor drive shaft around the feed pipe C, V and X the upper and lower bearings therefor, *p* the drive gear thereon, *q* its drive pinion, *r* its drive shaft, W the gear casing, *w* the distributor suspenders, *y* the vertically movable distributor sustained bearing, and *g'* the counterbalancing adjuster lever therefor, of the separator shown in my said original application Serial No. 606,407, now Patent No. 2,113,586.

These parts may be of any usual or suitable construction for receiving material to be separated, distributing it in the separating chamber, and causing a separating current to circulate up through and to return below the latter, to separate fine material therein, and to float such material into the settling chamber, and to return between the filter vanes and through the return current passage into the lower inlet, and to drop coarser material across the return current passage and toward the tailings receiver K.

As shown the casing A consists of a flat sectional top *a*, separably fitted to a side wall *b* consisting of separably connected sections carried by feet *c*, and having a conical lower part *d*, separably fitting into a lower dust cone *e*, for enclosing the settling chamber G and the dust chamber M.

As shown the inner casing B is within and in spaced relation to the outer casing and carried therefrom by brackets *f*, and has an annular top wall *g* encircling the outlet J, a large cylindrical side wall *h* encircling a large expansion or selection chamber Q in the upper part of the separating chamber H, an inclined wall *i*, a small cylindrical side wall *j* encircling a lower distribution chamber R in a lower part of the separating chamber, and a lower conical wall *k* encircling the inlet I and spaced above the open end of the tailings receiver K sufficiently to afford a return current passage P between the inner casing and its receiver.

As shown the feed pipe C is suspended from a hopper *m* with its lower orifice within the separating chamber.

As shown the distributor D is a vertically adjustable flat sectionalized rotary ring or disc within the distribution chamber R and opposite and spaced below the feed pipe C, for receiving therefrom material to be separated and for centrifugally distributing such material across the space between the outer periphery of the distributor and the inner wall of the inner casing.

As shown the blower F comprises substantially radially extended fan spokes *b'* and blades *c'*, depended from their upper edges therefrom, which are revoluble in the space between the top wall *a* of the outer casing and the top wall *g* of the inner casing, for outblowing current from the outlet J into the settling chamber G, and for causing it to circulate down through the latter and in through the interceptor O and the return passage P, and up through the inlet I and the distribution chamber R and the selection

chamber Q, to the outlet J. These spokes *b'* are shown as carried by a fan hub *z*, having an upper recess *a'* revolubly fitting around an annular flanged collar *l'* the flange of which rests on the wall *a* which collar affords a removable closure between this wall and this hub.

As shown the upper baffle S is vertically adjustable below and adjacent the upper outlet J, for varying the space therebetween through which the current may flow, for varying the intensity of the current, and is constructed of flat segmental plates *i2* carried by radial spokes *j2*, and is spaced above the distributor, for defining the height of the selection chamber Q therebetween.

As shown the upper valve Y is vertically movable in a valve chamber *d'* above the outlet J and below the spokes *b'*, and is encircled by the blades *c'*, and is constructed of segmental plates *o'* the side edges of which are bent downwardly and then outwardly and are separably fastened to the upper horizontal leg of adjacent radially extended angles *p'*, and affords recesses *n'* opposite and below the spokes *b'* for receiving the latter when the valve is fully raised, whereby to permit raising of the plates *o'* to flush with the top of the fan blades when the valve is in its open position, to then permit utilization of the entire superficial area of the blades.

As shown the lower valve Z is vertically movable and consists of an inverted conical ring of segments *l2* separably connected at *m2*.

As shown the partition A', retarder B', shelf E', and annular groove *v2* are vertically stationarily carried from the spokes *b'* by suspenders *q'* which sustain these parts from the blower F, and which rotate these parts and the baffle S, and the valves Y and Z, with the blower.

As shown the baffle S and the valves Y and Z and the distributor D are vertically slideable relatively to the impeller *q'*, and are rotatable therewith.

As shown the fan hub *z* is fastened on the shaft U, and the distributor hub *v* is vertically slideably carried thereon, and the shaft U rotates these rotatable parts in the same direction at the same time.

As shown the upper valve Y and the lower valve Z are connected together by a vertically movable connection *k2*, which vertically moves them in the same direction at the same time, as claimed in my said original application, and the baffle S is connected to the upper valve Y by a reverse motion connection *r'*, which vertically moves one by and in reverse direction to, the movement of the other, for coincidently reversely moving one from the other, as claimed in my said original application.

As shown the distribution means comprises in vertically fixed relation a distributor member or plate D below the supply orifice and the zone of distribution, for defining said zone, connectors *u* depended across said zone, and a distributor hub *v* above and adjacent said zone, for defining the latter, which hub is slidably connected or splined to and revoluble with the shaft U, and is vertically sustained by vertically slideable suspenders *w*, which are connected to the hub *v* and extended upwardly therefrom through the fan hub *z* and the bearing X and gear *p* to and through a vertically adjustable distributor ball bearing *y*, with which they are rotatably connected by means of a collar *x* to which the upper ends of the suspenders *w* are attached. The suspenders *w* are shown as narrow rods having beveled edges slidably fitted in correspondingly beveled edges of the slots *e'* in the shaft U, and thereby positioned therein with their outer faces flush with the periphery of this shaft, and held in position therein by the inner periphery of the hubs *v* and *z*, the bearings X and *t*, the gear *p*, and the bearing *y*. The slots *e'* are shown as sufficiently longer than the rods *w* to permit the desired vertical movement of the latter.

As shown the distributor bearing *y* is non-rotary and anti-frictionally rotatably sustains the distributor D, and is vertically slideable on the shaft for vertically adjusting the distributor, and is separably connected to the collar *x*, as by a tubular ring *f'*, detachably connected to the bearing *y* above the collar *x* and in movable engagement with the upper bearing V.

As shown the distributor is sustained and vertically adjusted by an operator lever *g'*, shown as fulcrumed on the gear case W and as connected to the bearing *y* by links *m'*, which lever is tilted by a screw *f3* to set the distributor in its desired normal vertical position suitable to the separation to be effected, in which position the distributor may be yieldably held by adjusting a spring *i'* relatively to the lever *g'* to yieldably poise the latter in its desired position after it has been released by the screw *f3*, whereupon the distributor may be vertically movably responsive to variations in the weight of the stream of material to be separated flowing on to it, as claimed in my said original application.

As shown the distributor is counterbalanced by an adjustable counterweight *j'*, carried by a counterbalanced lever *k'* which is fulcrumed to the lever *g'* and connected to the lever by adjustable screws *h'*, by adjusting which to suit the inclined position of the lever *g'*, the lever *k'* may be fixed thereto in a horizontal position, and may from such position counterbalance the distributor in any position to which it has been vertically adjusted, as claimed in my said original application.

As shown the annular lower baffle T is between the distribution and selection chambers, and is a sectionalized conical ring, carried by and rotatable and vertically movable with the distributor hub *v*, and carries an inclined and upwardly extended rotary scraper *s2*, spaced above the inclined wall *i* and adjacent the vertical wall *h* of the inner casing, and a downwardly extended and inwardly inclined scraper *u2*, adjacent the wall *j* and spaced above the wall *k* of the distribution chamber R, which scrapers rotatably resist adherence of material to these walls.

As shown the wall *h* is provided with a non-rotary scraper *t2*, spaced above the annular baffle T and operable to resist accumulation of material thereon, these scrapers being adjacent an annular trough shaped tramp pocket or outlet *l* for permitting descent of such material between the annular baffle T and the wall *j*.

As shown the retarded B' is a sectionalized conical ring within the inlet I and spaced around the partition A' and above the return current passage P, for retarding discharge from the inlet I and precipitating it through the passage P toward the tailings cone K, as claimed in my said original application.

As shown the shelf E' is a flat ring below the open lower ends of the filter vanes O, and the grooved ring *v2* is a vertical ring below and carried by the shelf E' and around the upper edge of the cone K, and both rings are connected with the partition A' by one or more spokes *q2*, and

are rotatable as claimed in my said original application.

As shown the inner casing B is carried by a bracket *f* from a vertical pipe *w2*, and the interceptor O is carried by a vertical pipe *y2* within said pipe, and the tailings cone K is carried by a rod *z2* within the pipe *y2*, which pipes are yieldably sustained from the top wall *a* by a spring *x2*, and are vertically jarred by a revoluble swinging hammer G', carried by a worm gear H', slowly revolved by a worm I' on the drive shaft *r*, which is rotated by a pulley *s*. As shown whirl checks *k'*, in the current passage *h2*, around the upper outlet *J* are depended from the upper wall *g*.

As shown the dust and tailings outlets from the separator are closed by gravity valves R'.

As thus far described in detail the parts specified are those shown and include those claimed, in my said original application Serial No. 606,407, and as claimed therein contemplate a special operation for variation of the zone of distribution, and another special operation for regulation of the space through which the current may flow.

My present improvements in current separators, having movably adjustable lower distribution means, and having movably adjustable rotary current space variation means, vertically spaced a substantial distance from said distribution means, aim, at one operation to vary the zone of distribution and the space through which the separating current may flow, and to effect both these variations inwardly of and below the outer casing, and through or within or across said distance, and above said zone, and coincidently and preferably collectively and simultaneously relatively or reversely, and preferably manually or automatically with variations in the weight of the stream of material to be separated which is sustained by the distributor and by adjustment means including a member mounted on the distributor drive shaft and connected to the distributor and the current space variation means and constructed to simultaneously adjust the distributor and the current space variation means relatively to said shaft coincidently with and in response to movement of the adjustment means.

Any suitable means may be employed for attaining any of these aims, but I prefer to simultaneously attain all of them in a single separator, and for that purpose to use the construction shown in my said original application Serial No. 606,407 as the preferred form for availing of that part of my said original invention as originally set forth therein to which my present application applies.

To this end I preferably provide a coincident adjustment means for the distributor and the current space variation means, comprising the members indicated generally by *v'*, which members interconnect the distributor and the current space variation means in such a manner that adjustment of the one causes a simultaneous movement of the other.

In the particular embodiment of my invention shown in the accompanying drawings, the distributor comprises the rotatable, vertically adjustable plate D, and the current space variation means comprises the rotatable, vertically adjustable upper and lower valves Y and Z, and the upper baffle S, respectively. The valves Y and Z are shown as interconnected by a member *k2*, whereby in this particular embodiment they move coincidently equal distances in the same direction. The adjustment means *v'* comprises a lever *r'*, which is shown as fulcrumed at *t'*. The distributor D, and the valves Y and Z of the current space variation means, are connected to the lever *r'*, on opposite sides of its fulcrum whereby the distributor and these valves move coincidently in opposite directions.

Suitable connections are provided between the lever *r'* and the distributor D. The link *e3* below the baffle S, and the link *g2* above the latter, serve as such connections in the constructions shown. The valves Y and Z of the current space variation means are also connected to the lever *r'* through suitable connections, such as the members *s'* and *k2*, shown as such connections.

In the particular embodiment of my invention shown in the accompanying drawings the distributor D is rotatably suspended from the non-rotary adjustment means *g'*, and sustains the connection *e3* and the upper baffle S in such manner that these are moved by and coincidently with movement of the distributor, and in the same direction and to the same extent as said movement. In this embodiment the distributor D sustains the coincident connection *v'* and the valves Y and Z, which in this embodiment are moved by the distributor in reverse direction to the direction of movement of the latter.

The lever *r'* is shown as provided with inner and outer fulcrum holes *c3*, and as detachably fulcrumed at its inner hole to a spider *u'*, which is fixed on the shaft U by a set screw J', and the arms of which have inner and outer holes *d3* in juxtaposition to the inner and outer fulcrum holes *c3* of the lever *r'*, in either of which holes *d3* a shiftable fulcrum member *t'* may be fastened so that its upper end is coincident with the adjacent fulcrum hole *c3* of the lever *r'*, to convert the lever *r'* into a motion multiplication or motion reduction or motion change member, and thereby to relatively vary the coincident movement transmitted between the distribution means and the current space variation.

The simultaneous adjustment means *v'* is preferably disposed and mounted inwardly of and below the outer casing and below the blower means and the upper valve Y, and entirely above the zone of distribution, so that molestation of it by distributed material will be avoided, and preferably comprises a means, as *e3*, upwardly extended within the separating chamber from a spaced distance above said zone and from an upper part of the hub *v* of the distribution means, toward the baffle S and the valve Y, and a means, as *s'*, extended inwardly of and below the outer casing downwardly from and below the valve Y toward the distribution means, and the lever *r'* between and connecting the means *e3* and *s'*, in such manner that when the distribution means and the valve Y are relatively or reversely movable parts, the simultaneous means will simultaneously relatively or reversely move them.

The lever *r'* is preferably mounted on the shaft U by being fulcrumed to the spider *u'*, which is preferably mounted thereon below the blower means and the valve Y, and above the zone of distribution, so that the spider and the lever will not be molested by distributed material, and the blower means will not be subjected to the weight of the simultaneous adjustment means and the distribution means and current space variation means, and these may be adjusted relatively to and independently of the blower means. The simultaneous adjustment means is prefer-

ably extended, as by a rod *k2*, through and below the zone of distribution and into operative relation to the lower valve Z, in such manner that it moves this simultaneously to the upper valve Y coincidently with and reversely to adjustment movement of the distribution means, and the connection *e3* is preferably in vertically fixed relation to the distribution means and the upper baffle S, and constructed to simultaneously adjust these in the same direction and to the same extent, for coincidently similarly simultaneously vertically varying both.

As shown the distribution means and the valve Y are relatively and reversely adjusted by the simultaneous adjustment means *v'*, which is shown as operated from one and adjusting the other therefrom coincidently with adjustment movement thereof, and as relative or reverse adjustment means between and common to both, and is in communication with both within or through the material distance therebetween, as by being extended from one through said distance toward the other, or by being connected across said distance with each.

Any suitable means may be employed for effecting the one operation for manipulating the coincident adjustment means either manually or automatically, but I prefer to manually effect such manipulation by tilting the lever *g'* to thereby movably adjust the distributor D, to the hub *v* of which the link *e3* of the coincident adjustment means *v'* is shown as connected.

According to another feature, my said invention provides for weight responsively automatically effecting such operation, and when the distributor D is vertically movably responsive to variations in the weight of the stream of material to be separated sustained by it, as claimed in my said original application Serial No. 606,407, I preferably utilize its weight responsive movement to effect said coincident adjustment, preferably by connecting the coincident adjustment means *v'* with the hub *v* of the distributor by the link *e3* as shown, whereby weight responsive vertical movement of the distributor will be translated into coincident movable adjustment of the current space variation means, and thereby the velocity of the current will be varied coincidently with variations in the weight of said stream.

As shown I preferably provide for automatically effecting such coincident adjustments coincidently with variations in the stress of the separating current, and when the upper baffle S is vertically movably responsive to said stress, as claimed in my said original application, I preferably utilize its movement in response to variations in said stress to automatically effect said coincident adjustment, and thereby to effect variation of said zone and of the velocity of said current coincidently, for which purpose I preferably connect the upper baffle S to the distributor D and to the coincident adjustment means *v'*, as by connecting the link *e3* to the upper baffle S and to the hub *v* of the distributor D, in such manner that upward stress of the current under the baffle S will be transmitted to and tend to raise the distributor D and to elevate the zone of distribution, and will be transmitted to and tend to coincidently close the upper valve Y and the lower valve Z, and thereby to diminish said space through which the current may flow simultaneously with said elevation. The link *e3* preferably extends through the chamber Q.

The reference letters used in the drawings represent the following parts respectively:

A the outer casing,
B the inner casing,
C the feed conduit,
D the distributor,
E the drive mechanism,
F the blower means,
G the settling chamber,
H the separating chamber,
I the lower inlet,
J the upper outlet,
K the coarse receiver,
L the coarse outlet,
M the dust chamber,
N the dust outlet,
O the fine intercepter,
P the return current passage,
Q the selection chamber,
R the distribution chamber,
S the upper baffle,
T the annular baffle,
U the drive pipe,
V the upper bearing,
W the gear case,
X the lower bearing,
Y the upper valve,
Z the lower valve,
A' the inlet partition,
B' the tailings retarder,
C' the middlings cone,
D' the middlings outlet,
E' the shelf below the filter O,
G' the jarrer hammer,
H' the jarrer gear,
I' the jarrer worm,
J' the set screws,
K' the whirl checks,
R' the discharge valves,
a the outer top wall,
b the outer side wall,
c the feet,
d the outer apron,
e the dust cone,
f the inner casing brackets,
g the inner top wall,
h the inner side wall,
i the inner casing cone,
j the distribution chamber wall,
k the inner apron,
l the grit return around the baffle T,
m the feed hopper,
n the gear cover,
o the gear base,
p the drive gear,
q the drive pinion,
r the drive shaft,
s the drive pulley,
t the gear bearing,
u the distributor connectors,
v the distributor hub,
w the distributor suspenders,
x the suspender collar,
y the distributor bearing,
z the fan hub,
a' the fan hub recess,
b' the fan spokes,
c' the fan blades,
d' the upper valve chamber,
e' the slots in the shaft U,
f' the ring in the bearing *y*,
g' the distributor lever,
h' the adjusting screws thereon,
i' the spring for the lever *g'*,
j' the counterweight,

k' the counterbalancer lever,
l' the collar in the recess a',
m' the links on the lever g',
n' the recesses in the valve Y,
o' the plates of the valve Y,
p' the angles of the valve Y,
q' the impellers suspended from the spokes b',
r' the valve levers,
s' the valve links,
t' the lever fulcrum members,
u' the fulcrum spider,
v' the coincident adjustment means between the distributor D and valve Y,
$g2$ the link between the lever r' and baffle S,
$h2$ the current passage above the baffle S,
$i2$ the segments of the baffle S,
$j2$ the radial spokes of the baffle S,
$k2$ the rods connecting the lever r' with the lower valve Z,
$l2$ the segments of the valve Z,
$q2$ the spokes for the shelf E',
$s2$ the scraper on the baffle T,
$t2$ the scraper on the wall h,
$u2$ the scraper below the baffle T,
$v2$ the grooved ring around the cone M,
$w2$ the suspender for the inner casing B,
$x2$ the spring therefor,
$y2$ the suspender for the filter O,
$z2$ the suspender for the cone K,
$c3$ the fulcrum holes in the lever r',
$d3$ the post holes in the spider u',
$e3$ the connection between the link $g2$ and the distributor hub v, and
$f3$ the adjusting screw for the distributor lever g'.

In operation, with the constructions shown, at one manipulation the zone of distribution and the space through which the current may flow may be simultaneously relatively varied, the desired variation of said zone and regulation of said space may be coincidently manually established, variations of both coincidently with variations in the weight of the stream of material sustained by the distributor may be automatically coincidently effected, and variations of both coincidently with variations of the pressure of the separating current under the upper baffle may be automatically coincidently effected.

It will be seen that my invention provides improvements which can be availed of in whole or in part, and it will be understood that the invention is not limited to the particular details of construction, arrangement, use, or combination of features, set forth as illustrating its preferred form, since it may be employed, in whole or in part, according to such modifications of any of these as circumstances, or the judgment of those skilled in the art, may dictate, without departing from the spirit of the invention.

According to another feature of my said invention, when the current space variation means and the distribution means are connected together and coincidently moved, as by the connection v', I preferably provide for collectively counterbalancing, collectively yieldably responsively movably sustaining, and collectively moving, these means at one operation, and by one collective adjuster, as by the lever g', by which these means are collectively sustained, and by one operation of which they are collectively moved, preferably from without the casing A and above the drive gear p, and when these means are rotary, I preferably make their collective adjuster g' non-rotary, and provide a rotatable connection between it and these means for collectively sustaining the latter from it. As shown the weight of the baffle S is compressively transmitted by the link $e3$ to the hub v of the distributor D, and the baffle and distributor are collectively responsively sustained and vertically moved by the lever g' through the medium of the suspenders w and the bearing y, and the lesser weight of the valves Y and Z is resisted by the lever r' and the links $g2$ and $e3$, and the stress of this lesser weight is counteractingly transmitted thereby to the hub v, and operable in part to counterbalance the weight of the distributor D, and is transmitted through the suspenders w to the lever g', and is yieldably counterpoised by the latter, which collectively sustains the weights of the distributor D and the baffle S and resists the counter-stress incident to the weights of the valves Y and Z.

When the current space variation means and the vertically spaced distribution means are vertically movable, and are rotatable together in the same direction at the same time, I preferably slideably connect them to the impellers q', so that they may slide vertically thereon, and will be caused to rotate together thereby, whereby to rotate the current space variation means and the vertically stationary partition A', retarder B', shelf E', and groove $v2$ from the fan hub z, and to sustain these vertically stationary parts therefrom.

When my collective adjuster g' is used with a bearing y which is vertically slideable on a vertically stationary shaft U, which collectively rotates the adjustable rotary parts within the inner casing B, and when these parts are collectively sustained from the bearing y, as by vertically movable suspenders w, revolubly connected to the bearing y, as by a collar x, this construction facilitates disposing and extending the collective suspension means inwardly of the adjustable parts and of the bearing for their drive shaft U, and past and above this bearing, and permits disposing the collective adjuster g' above the drive gear p, and thereby facilitates its manipulation.

What I claim is:

1. 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, weight responsive material sustenance distribution means within said upward passage, sustaining and distributing therein said material, and weight responsively movable with variations in the weight of said material sustained by said distribution means, varying the zone of said distribution with variations in said weight, 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, and support means supporting said parts; the combination therewith of simultaneous adjustment means common to said distribution means and said space variation means,

simultaneously adjusting one from the other of said movable parts, in operative relation to each of said movable parts, and constructed and arranged to adjust said space variation means from said distribution means simultaneously with said weight responsive movement of the latter.

2. 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 supplying material to be separated in said upward passage, rotary blower means in communication with and upflowing a separating current through said upward passage, comprising spoke means extended above said outlet and fan blades above and around said outlet, rotary and movable distribution means within said upward passage, distributing therein said material and varying the zone of said distribution, rotary and movable current space variation means in communication with one of said passages, defining the space past said current space variation means through which said current may flow, and varying said space and the velocity of said current, rotary shaft means in operative relation to and rotating said rotary parts, said movable parts being relatively movable and being respectively movable relatively to said shaft means, and support means for said parts; the combination therewith of simultaneous adjustment means in operative relation to and simultaneously adjusting said movable parts, said adjustment means including a motion change means mounted on said shaft means and connected to said distribution means and said current space variation means, and constructed and arranged to during simultaneous adjustment movement of said movable parts simultaneously move said distribution means and said current space variation means each relatively to the other and to said shaft means, and means for operating said adjustment means.

3. 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 supplying material to be separated in said upward passage, rotary blower means in communication with and upflowing a separating current through said upward passage, comprising spoke means extended above said outlet and fan blades above and around said outlet, rotary and movable distribution means within said upward passage, distributing therein said material and varying the zone of said distribution, a rotary and movable current space variation means in communication with one of said passages, defining the space past said current space variation means through which said current may flow, and varying said space and the velocity of said current, rotary shaft means in operative relation to and rotating said rotary parts said movable parts being relatively movable and being respectively movable relatively to said shaft means, and support means for said parts; the combination therewith of simultaneous adjustment means in operative relation to and simultaneously adjusting said movable parts, said adjustment means including a motion reversal means mounted on said shaft means and connected to said distribution means and said current space variation means, and constructed and arranged to during simultaneous adjustment movement of said movable parts simultaneously move said distribution means and said current space variation means relatively to said shaft means and in reverse directions, and means for operating said adjustment means.

4. 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 supplying material to be separated in said upward passage, current circulation means in communication with and upflowing a separating current through said upward passage, movable distribution means within said upward passage, distributing therein said material and varying the zone of said distribution, a movable valve above and adjacent said outlet, defining the space past said valve 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 valve, and means for operating said simultaneous means.

5. 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 supplying material to be separated in said upward passage, current circulation means in communication with and upflowing a separating current through said upward passage, movable distribution means within said upward passage, distributing therein said material and varying the zone of said distribution, a movable lower valve below said distribution means and adjacent said inlet, defining the space past said valve through which said current may flow, and varying said space and the velocity of said current, and support means for said parts; the combination therewith of a simultaneous adjustment means in operative relation to and simultaneously adjusting said distribution means and said lower valve, and constructed and arranged to simultaneously adjust said distribution means and said lower valve, and means for operating said adjustment means.

6. In the separator specified in claim 4, 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.

7. In the separator specified in claim 4, said simultaneous relative adjustment means being constructed and arranged to, during said simultaneous adjustment, simultaneously adjust said relatively movable parts in reverse directions.

GEORGE HOLT FRASER.