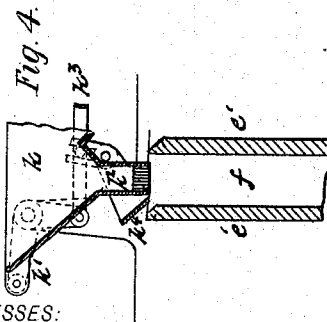
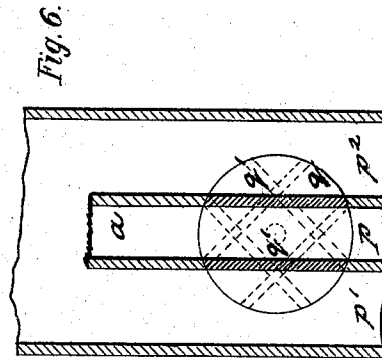
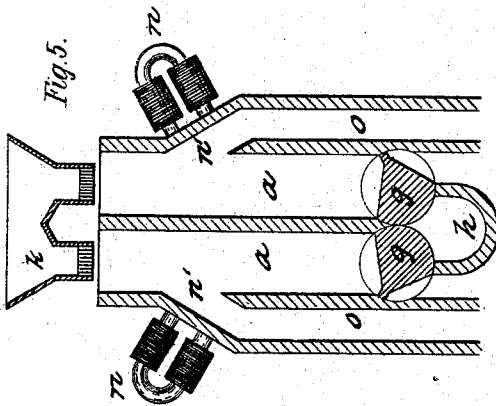
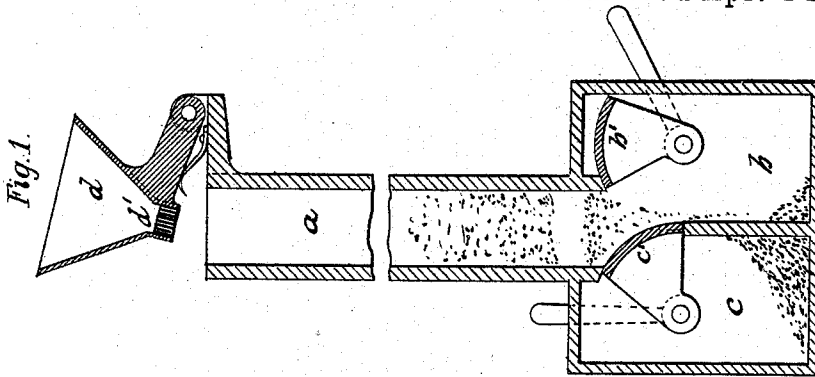


A. SHEDLOCK.

APPARATUS FOR SEPARATING AND CONCENTRATING.

No. 558,213.

Patented Apr. 14, 1896.



WITNESSES:

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APPARATUS FOR SEPARATING AND CONCENTRATING.

SPECIFICATION forming part of Letters Patent No. 558,213, dated April 14, 1896.

Application filed May 22, 1895. Serial No. 550,248. (No model.)

To all whom it may concern:

Be it known that I, ALFRED SHEDLOCK, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Separating and Concentrating, of which the following is a specification.

My improved apparatus is designed for the separation and concentration of materials in a broken, granular, or pulverized condition, and the principle upon which the operation of the machine proceeds is generally that when such broken, granulated, or pulverized material is permitted to fall by gravity through a resisting medium, which may be a fluid—as, for instance, air—or a liquid—as, for instance, water—the particles of the material descending through the resisting medium will separate or form in horizontal strata according to their densities or the resisting action upon them of the medium through which they fall; and my invention contemplates the segregation of such horizontal strata as may be desired.

My invention further contemplates that regulated quantities of the material shall be allowed to fall through a quiescent column of the resisting medium, and that the corresponding strata of successive charges shall be respectively segregated and collected in a receptacle, the organization of apparatus being such that the operation may proceed continuously, the means for segregation and collection being operated in proper unison with intermittently-operating feeding devices. Where the material contains two elements—as, for instance, a precious metal and the waste or gangue of the ore that carries it—it will only be necessary to segregate and collect the strata containing the precious metal, and the gangue may be collected or allowed to pass into another receptacle, from whence it may be discharged from the machine. Where, however, the material contains three or more constituents or materials that will respectively separate into divided strata, I may segregate and collect the corresponding strata of successive charges into their proper respective receptacles.

I have found by practical demonstration that it is highly desirable that the successive

charges of material that are allowed to fall by gravity through the resisting medium should be relatively small in order that the different particles may freely separate in the resisting medium and fall therein without obstructing each other. Further, this is desirable because by so feeding small charges the column of resisting medium through which they fall may be relatively short. I have also found that the width or thickness of the column of resisting medium through which the material falls should desirably be narrow in order that the segregating devices or means for effecting the collection of the corresponding strata of successive charges may have a small distance through which to operate, and it is therefore highly desirable that the column of resisting medium shall have a length in a horizontal plane relatively great as compared with its width in the same plane, and in fact that such horizontal length should be considerable, and in fact as long as may be found feasible in the practical operation of my improved organization, for it will be apparent that the devices for effecting the segregation and collection of the different strata in their respective receptacles may be readily made of considerable length, but will only have to be operated through a relatively short distance—viz., through a distance equal to or less than the thickness or width of the column of the resisting medium.

I have practically demonstrated that with such an organization employing a column of resisting medium relatively narrow and long in horizontal plane I can handle large quantities of ore and yet feed relatively small quantities per unit of superficial area of the surface of the column of resisting medium. It will now be apparent that with an apparatus so organized and operating I may employ a number of columns of resisting medium arranged side by side and each having feeding devices and devices for segregating the horizontal strata or effecting their collection in their respective receptacles and to operate all the feeding devices and the segregating devices, respectively, in proper unison to, by their conjoint and timely action, effect the desired end.

The perfection or degree of separation into horizontal strata during the fall of the mate-

rial through the resisting medium and the consequent perfection of segregation or concentration will be determined by the distance the material is allowed to fall through the resisting medium—that is to say, by the height of the column of resisting medium and by the action of the medium upon the particles of the material—and this can be regulated to the desired extent according to the special requirements in any given case and may in a measure be determined by the fact whether or not the parts so segregated and concentrated are to be submitted to a further similar operation. I have found in practice, however, that in many grades of ores bearing precious metals that by feeding relatively small quantities of the material at a time, so that the particles have a free and unobstructed fall, a relatively short column of resisting medium may be employed. Thus I have in practice effected the concentration of a gold-bearing ore to approximately one-thirtieth of its bulk and have collected practically all of the precious metal in the concentrate by employing a column of resisting medium, such as water, about eight inches in height. I prefer to prepare the ore for treatment in my improved organization of apparatus by grouping the divided granular or pulverized material into batches, each having its particles approximately of uniform size and treating each batch separately in an apparatus adjusted for that particular batch of particular material. I have found in practice also that it is highly desirable when the resisting medium through which the divided material is allowed to fall is a liquid to wet or moisten the material with such liquid before delivering it into the column of resisting medium, as by so doing the different particles of the material will freely separate from each other in the resisting medium and will start on their downward passage substantially simultaneously.

My invention also comprehends an organization in which, where material containing magnetic elements is treated, the magnetic particles shall by the influence of a magnetic field be diverted from the descending material at a point above that where the segregation of the strata is effected.

My invention consists, therefore, in certain organizations of apparatus designed to fulfill the requirements hereinbefore specified, which organizations are hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 shows a simple organization of apparatus illustrative of my invention. Fig. 2 is a side elevation, partly in section, of an organized machine adapted to operate in accordance with and to produce the results contemplated by my invention; Fig. 3, a plan view of the same; Fig. 4, a detached view showing the upper end of one of the passages containing the resisting medium and one of the spouts of the feeding-hopper represented in its lower position.

Fig. 5 is a detached view illustrating the manner in which I employ a magnetic field of force in connection with the other features of my invention, and Fig. 6 represents a modification in the valve mechanism or gate mechanism by which I effect the segregation or collection of corresponding strata of the material being treated.

In Fig. 1 I have shown detached and in a simple form an organization illustrative of my invention. This figure shows a box or vessel having a vertical passage or channel *a*, comparatively narrow, as shown, but of any desired width from front to back. Its length or depth will be determined by the separating medium used therein and the grade or condition of the material to be heated. The lower part of the vessel is divided into two compartments *b* and *c*, provided with cylindrically-formed gates *b'* and *c'*, adapted to be moved so as to extend from their respective sides of the channel *a* to the upper edge of the dividing-partition of the chambers or compartments *b* and *c*. At the upper end of the channel is shown a feeding device *d* consisting of a hopper hinged to the top of the vessel and having a grating or sieve *d'* in the discharging-spout.

Now when a granulated or pulverized material or a mixture of materials is dropped down the channel *a* in suitable amount, which may be done if it be contained in the hopper *d* by suddenly jarring the hopper, the heavier particles of the material or those parts of it least resisted by the medium in the vessel will fall faster than the other particles and the material will form into strata or layers more or less defined, according to the depth of the channel. When the lower layer has passed beyond the gate *c'* on its passage into the chamber *b*, the gate *b'* will be closed and the gate *c'* opened, and the remainder of the material will then pass by the gate *b'* and enter the chamber *c*. Thus one operation will be completed, and the gates *b'* and *c'* being set in the positions they occupy in the drawings another quantity of material will be fed into the channel and its particles separated in like manner, and so on. If the material be an ore or metallic sand, the metallic particles will be deposited in the chamber *b* and the lighter particles deposited in the chamber *c*, from which chambers they may be removed by means of openings in the sides of the chambers.

The distance through which the material is allowed to fall before the division of the strata takes place will determine the perfection of separation or degree of concentration. This distance may be sufficient to allow practically all of the metallic particles to be separated from the other particles of the material, and if air be the medium contained in the vessel then this distance of fall will be much greater than if water or other liquid be used. It will be seen that by this simple apparatus various divisions of the material or mixture of materials

rials may be made by a proper manipulation of the apparatus—as, for instance, the largest or heaviest particles of the lowest stratum and the smallest or lightest particles of the upper stratum may be deposited in one of the chambers and the medium particles of the middle stratum deposited in the other chamber.

It is found desirable to have the particles of the material surrounded with the medium through which they are to fall before being dropped therein, and this may be done by causing the discharge-spout of the hopper d to enter the surface of the liquid when a liquid is used, when the hopper is suddenly depressed to jar a quantity of the material from it through the grating d' , the said grating then taking up some of the liquid and so causing the material in the lower part of the hopper to be soaked therewith.

Any form of feeding device may be used; but the one here shown is found to answer well, the mesh of the grating or sieve d' , being somewhat larger than the size of the particles of the material, allowing them to fall freely when the hopper is jarred, but retaining them when the hopper is at rest.

A preferred form of apparatus adapted for practical use is shown at Figs. 2 and 3. In these the box or vessel e is by the vertical partition $e'e'$ divided at its upper part into a number of separating channels or passages ff , of which there may be any desired number in one apparatus. At the lower ends of these channels or passages ff are located the valves or gates, which in this case are of a construction different from those shown in Fig. 1. These gates $g g$ are cylindrical and have bearings in the sides of the vessel e and are each formed with pockets or openings g^2 , which respectively constitute the lower ends of the passages when the valves are set in their two positions. Below the valves $g g$ are placed the channeled chutes $h h$, each intermediately arranged between two adjacent passages ff and inclined downwardly toward one side of the box e , at which side are openings $h' h'$ for the material deposited therein to be discharged into a chamber i at this side of the box e . The bottom of this chamber, as well as the bottom of the main box e , is inclined toward one end of the apparatus, at which end are placed, respectively, elevators j and j' for removing the separated parts of the material from the apparatus. These elevators may be arranged to extend under the whole of the separating devices, so that the materials will fall directly thereon.

A hopper k , supported on the top of the vessel e by means of the bell-crank levers k' , is provided with a spout for each of the vertical passages ff , in the lower ends of which spouts are held the gratings $k^2 k^2$. The two bell-crank levers $k' k'$ are joined together by the rods $k^3 k^3$, thus causing them to work in unison and the hopper k to move in a practically vertical path when operated.

It has been found that when the lower ends

of the spouts of the hopper leave the liquid after a feeding operation has taken place globules of liquid are taken up, which are liable to subsequently fall and carry with them some of the material from the gratings into the liquid at a time when the upper part of the liquid columns should be free from material. To correct this, a drip-guard h^4 is provided, consisting of a plate pivoted by its upturned ends to each of the spouts of the hopper and arranged to hang under the spout when the hopper is raised, as shown in Fig. 2. These drip-guards h^4 are controlled by the rods k^3 , which have pins extending into slotted projections from the sides of the drip-guards in such manner that when the hopper falls the drip-guards are moved so as to be at the sides of the spouts, as shown at Fig. 4, thus leaving the ends of the spouts clear and causing any of the material that may be on the drip-guards to fall into the liquid at the same time the spouts deposit their charges of material.

A shaft l , rotating in bearings at one end of the vessel e , is provided with a cone-pulley l' , and carries a cam-disk m , which has a notch m' in its periphery, into which the rod k^5 falls when a feeding operation is to take place, the upper end of said rod being connected to one of the bell-crank levers, as shown, and its lower end or a roller thereon resting normally on the periphery of the cam-disk. This rod k^5 is adjustable as to its length, by which adjustment the height the hopper is raised may be set. The distance the hopper is allowed to fall is determined by the stops $k^6 k^6$.

On the side of the cam-disk m is adjustably secured the two cam-plates $m^2 m^3$, which control the movement of the gates $g g$ through the medium of the rod m^4 , horizontally placed with a roller on its end arranged to be acted upon by the cam-plates $m^2 m^3$, and the pairs of segmental gears $g^3 g^3$, secured to the ends of the shafts of the valves $g g$, each alternate gear being connected by a pin or pivot to the rod m^4 .

The operation is as follows: The shaft l being rotated at a uniform rate of speed and at such a speed that each operation will be performed in the least time necessary therefor, which will be governed by the depth of the passages ff and the grade of the materials being separated, and the cam-plates $m^2 m^3$ being set to actuate the valves at the right times, the hopper k is suddenly dropped and again quickly raised, thereby causing given suitable amounts of the material to be deposited in the fluid in the passages ff , which material falling through the fluid the heavier particles or those least resisted in their descent by the fluid will fall onto the uppermost pockets $g' g'$ of the valves or gates $g g$, said valves then being by the cam-plate m^3 quickly turned, so as to deposit the material thereon into the channeled chutes $h h$, and the other pockets or sides $g^2 g^2$ of valves brought uppermost to receive the gangue or other ma-

- terial which when the valves are turned back in the position shown by the cam-plate m^2 is deposited into the bottom part of the vessel e and removed therefrom by the elevator j' .
- 5 The material from the chutes h enters the chamber i and is removed therefrom by the elevator j . The two elevators are carried by one shaft and rotated by the belt i^2 from the shaft l .
- 10 An attachment for removing the particles of the material having magnetic properties (shown at Fig. 5) consists of magnets n , arranged at the sides of the vertical passage of a separator having a dividing or separating
- 15 gate of the character before described. These magnets are arranged to laterally attract such magnetic particles through the openings n' into the passages or chambers o , leaving the balance of the material to be separated in the
- 20 manner before described when it is desired to do so.

The modified form of the apparatus, Fig. 6, is adapted to separate the material into three grades or lots, and shows one vertical channel or passage and three receiving-chambers, the central one p being in line with the central passage, and the others p' arranged at the sides. The gate q , located at the juncture of the passage and chambers, has two flat

30 vanes or blades q' , formed to constitute a continuation of the sides of the passage and the central chamber p , when the valve or gate is set in the position shown, to open communication between the passage a and said

35 chamber. When the valve or gate q is set in either of the two other positions indicated by the dotted lines, communication is opened, respectively, between the passage and the side chambers. It will be readily seen that

40 by a proper manipulation of this valve three different strata of the material falling through the passage a may be separated and the corresponding strata of several operations segregated. It will be seen that with this apparatus or its equivalent the separation of

45 mixtures of materials and the concentration of ores may be carried out to any extent, and different combinations or segregations of the different horizontal strata of the material will

50 readily suggest themselves when the treatment of any particular mixture of materials calls for different segregations than those described. Thus it will be seen that by the employment of valve mechanism or gate mechanism located at the base of the column of

55 resisting medium I am enabled to segregate or effect the collection in their proper receptacles of corresponding horizontal strata of successive charges of material that are allowed to fall through the column of the

60 resisting medium, and that such valve mechanism or gate mechanism may vary in general structure or in detail. Thus, as shown in Fig. 1, the horizontal strata of the heaviest

65 material of a charge is allowed to fall directly into the chamber b , after which the entrance to such chamber is closed by the valve or

gate b' , and the entrance to the chamber c is opened by the movement of the valve c' , and the gangue or lighter particles of material then fall into the chamber c . A substantially similar operation occurs in the organization illustrated in Fig. 6, except that there are two segregations or concentrations of horizontal strata from the gangue or refuse. In

75 Figs. 2 and 5 the valve mechanism or gate mechanism is of somewhat different structure—that is to say, the lower strata (*i. e.*, the heavier material first arriving at the valve or gate) is received into a receptacle formed in the cylindrical valve or gate. Then when

80 the gate is operated such heavy or concentrated material is by the rotation of the valve delivered to the chute or chamber h , another surface or pocket of the cylindrical gate or valve presented to the bottom of the column of resisting medium to receive the gangue,

85 and the gangue thus received is, when the gate or valve is restored to the normal position, delivered into the general receptacle formed by the box e . However, in either event, the material forming the corresponding horizontal strata of successive charges of material arrives at the bottom of the column of resisting medium and is collected in the

90 proper receptacle.

From what has been said the desirability or value will now be apparent of my improved organization, in which the columns of resisting medium are relatively long horizontally as compared with their width or thickness. It is obvious that the gate mechanism or valve mechanism, such as g , or c' , or q , may be of any desired or suitable length and yet have a relatively short distance to travel to effect the desired segregation or concentration of the strata at the base of the column of resisting medium. Thus while I only feed at each operation a relatively small quantity of material per square inch of the superficial area of the top of the column of resisting medium, such column having considerable length horizontally, the amount of material fed at each charge is relatively large and the amount treated per day is considerable, as each operation occupies but a few seconds of

100 time. I have shown in Fig. 2 six passages in which the columns of resisting medium are contained, but it is obvious that there might be many more. It will be obvious that if each passage containing the column of resisting medium is substantially square or cylindrical in horizontal section such a multiplication of feeding devices, valve or gate mechanism and operating mechanism would be required as to render the machine relatively

105 complex and correspondingly difficult to operate with uniform results and keep in repair, aside, of course, from the initial expense of manufacture. I consider, therefore, that the employment of columns of resisting medium relatively long horizontally as compared with their thickness in connection with means for intermittently feeding properly-regulated

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charges of material at the top of the column and means for segregating or effecting the collection of corresponding strata of successive charges in their respective chambers or receptacles at the base of the columns a material and important feature of my invention.

I have now described in general terms the mode of operation and purpose of my invention, and I have described and illustrated apparatus embodying my invention and which I have found by practical demonstration to be suitable and well adapted to the purpose. It is obvious, however, that skilled mechanics, and particularly those familiar with the art to which my invention relates, may modify the construction which I have illustrated without departing from the principle or essential characteristics thereof.

I claim as my invention—

1. In an apparatus for separating materials in the granular or pulverized state, the combination of a vessel having a vertical passage or channel and chambers communicating therewith, gate or valve mechanism located at a suitable distance below the top of the channel for effecting the collection of the different horizontal strata or parts of the material into the different chambers, and an intermittently-acting feeding device at the upper part of the vertical channel for dropping the material therein intermittently in determined quantities.

2. In an apparatus for separating materials in the granular or pulverized state, the combination of a vessel having a vertical passage or channel and chambers communicating therewith, gate or valve mechanism located at a suitable distance below the top of the channel for effecting the collection of the different horizontal strata or parts of the material into the different chambers, and an intermittently-acting feeding device at the upper part of the vertical channel for dropping the material therein intermittently in determined quantities and means for operating the gate or valve mechanism and the feeding device in unison.

3. In an apparatus for separating materials in a granular or pulverized state, the combination of a vessel having a vertical passage or channel, and chambers communicating therewith, gate or valve mechanism located at a suitable distance below the top of the channel for effecting the collection of the different horizontal strata or parts of the material into the different chambers, a feeding device at the upper part of the vertical channel for dropping the material therein, a guard device adapted to come beneath the feed device after each actuation thereof, and means for operating the feed device, its guard and the gate or valve mechanism in unison.

4. In an apparatus for separating materials in a granular or pulverized state, the combination of a vessel having a vertical passage or channel, a quiescent column of liquid-resisting medium contained therein, chambers communicating therewith, also filled with said

liquid, gate or valve mechanism located at a suitable distance below the top of the channel for effecting the collection of the horizontal strata or parts of the material into the different chambers, an intermittently-acting feeding device at the upper part of the vertical channel for dropping the material therein intermittently in determined quantities, and mechanism operatively connected with the gate or valve mechanism and the feed devices respectively for operating them in proper time or unison.

5. In an apparatus for separating materials in a granular or pulverized state, the combination of a vessel having a vertical passage or channel, a quiescent column of liquid-resisting medium contained therein, chambers communicating therewith, gate or valve mechanism located at a suitable distance below the top of the channel for effecting the collection of the different horizontal strata or parts of the material into the different chambers, an intermittently-actuated feeding device at the upper part of the vertical channel, adapted to be brought into contact with the surface of the liquid column at each actuation thereof, a drip-guard adapted to come under the bottom of the feed device after each actuation thereof, and means for operating the feed device, its drip-guard, and the gate or valve mechanism in unison.

6. In an apparatus for separating materials in a granular or pulverized state, the combination of a vessel having a vertical passage or channel relatively long as compared with its width in horizontal section, an intermittently-actuated feeding device at the upper part of the vertical channel, for intermittently feeding the material simultaneously approximately throughout the length of the channel, means located at a suitable distance below the top of the channel and intermittently operating for effecting the segregation or collection of the respective horizontal strata of succeeding charges of material, and mechanism for operating such segregating or collecting means and the feeding device in unison.

7. In an apparatus for separating materials in a granular or pulverized state, the combination of a vessel having a vertical passage or channel relatively long as compared with its width in horizontal section, a quiescent column of liquid-resisting medium in said passage, chambers communicating with the passage by correspondingly-elongated openings, such chambers and openings being filled with the liquid-resisting medium, elongated gate or valve mechanism located at such openings, a relatively long and narrow feed device at the upper part of the vertical channel, means for operating in unison the gate or valve mechanism and the feed device, and an elongated drip-guard.

8. In an apparatus for separating materials in a granular or pulverized state, the combination of a vessel having a vertical passage,

relatively long and narrow as compared with its width in horizontal section, a quiescent column of liquid-resisting medium occupying such passage, chambers communicating with the passage by openings correspondingly elongated, and filled with the liquid-resisting medium, means for intermittently feeding into the top of the column charges of material simultaneously approximately throughout the horizontal length of the liquid column, correspondingly elongated gate or valve mechanism for effecting the collection of the corresponding strata of successive charges of material in their respective chambers, and means for effecting the intermittent feed and actuation of the gate or valve mechanism in unison.

9. In an apparatus for separating materials in a granular or pulverized state, the combination of a vessel having a vertical passage, a quiescent column of liquid-resisting medium contained therein, a chamber communicating with the base of the column and filled with the liquid, means for intermittently feeding to the top of the column relatively small regulated quantities of material, gate or valve mechanism also located at the base of the column, for effecting the collection of the heavier particles of successive feeds or charges that first arrive at the base of the column in a suitable receptacle separate from the gangue or lighter particles that arrive at the base of the column later, and means for operating the feed devices and the gate or valve mechanism intermittently in proper time or unison.

10. In an apparatus for separating materials in a granular or pulverized state, the combination of a vessel having a series of vertical passages, a quiescent column of liquid-resisting medium contained in each passage, a chamber connected with the base of each column of resisting medium and filled with the liquid, means for intermittently feeding regulated relatively small quantities of material into the top of each column, gate or valve mechanism located at the base of each column for effecting the collection in the respective chambers of the heavier particles of each feed or charge first to arrive at the base of the column separate from the gangue or lighter particles that arrive later at the base of the column, and means for operating the several feed devices, and the several gate or valve mechanisms simultaneously and intermittently in proper time or unison.

11. In an apparatus for separating materials in a granular or pulverized state, the combination of a vessel having a vertical passage, an intermittently-acting feeding device for intermittently feeding material at the top of the passage in determined quantities, gate or valve mechanism located at a suitable distance below the top of the passage for effecting the collection or segregation of the corresponding horizontal strata of succeeding charges of material, means for creating a magnetic field within such passage above the

point of segregation, whereby magnetic particles contained in the material are diverted into a separate passage or chamber, and means for effecting the intermittent feed and segregation in proper time or unison.

12. In an apparatus for separating materials in the granular or pulverized state, the combination of a vessel having a vertical passage or channel and chambers communicating with the lower part thereof, a cylindrical gate or valve having pockets or openings arranged to open communication between the vertical passage and the different chambers when the valve or gate is set in different positions, and a feeding device at the upper end of the passage adapted to intermittently drop suitable quantities of the materials therein, and means for operating the valve or gate and the feeding device in unison.

13. In an apparatus for separating materials in the granular or pulverized state, the combination of a vessel having a vertical passage or channel and chambers communicating with the lower part thereof, a feeding device having a grated spout at its lower end, means for intermittently jarring or imparting sudden vertical movements thereto, and a gate or valve at the juncture of the vertical passage and the receiving-chambers of the vessel.

14. In an apparatus for separating materials in the granulated or pulverized state, the combination of a vessel having a vertical passage or channel and chambers communicating with the lower part thereof, a feeding device having a grated spout at its lower end, means for intermittently jarring or imparting sudden vertical movements thereto, and a drip-guard constructed and operated to extend immediately beneath the spout of the feeding device when it is in its upper position and to be at the side thereof when it is in its lower position.

15. In an apparatus for separating materials in the granulated or pulverized state, the combination of a vessel having a vertical passage or channel and chambers communicating with the lower part thereof, a feeding device having a grated spout at its lower end, means for intermittently jarring or imparting sudden vertical movements thereto, a drip-guard constructed and operated to extend immediately beneath the spout of the feeding device when it is in its upper position and to be at the side thereof when it is in its lower position, and a gate or valve at the juncture of the vertical passage and the receiving-chambers.

16. In an apparatus for separating materials in the granulated or pulverized state, the combination of a vessel or box having its upper part divided into vertical passages or channels by vertical partitions, and having collecting-chutes arranged intermediate the lower end of each pair of adjacent passages, valves or gates at the junctures of the passages and the collecting-chutes, means for actuating all of the gates or valves together, and a feeding device having a discharging-spout arranged

over each of the vertical passages, and means for intermittently actuating the feeding device.

17. In an apparatus for separating materials in the granulated or pulverized state, the combination of a vessel or box having its upper part divided into vertical passages or channels by vertical partitions and having collecting-chutes arranged intermediate the lower end of each pair of adjacent passages, valves or gates at the junctures of the passages and the collecting-chutes, means for actuating all of the gates or valves together, a feeding device having a discharging-spout arranged over each of the vertical passages, means for intermittently actuating the feeding device, and a drip-guard constructed and operated to extend under each of the spouts when they are in their upper position and to be at the side thereof when they are in their lower position.

18. In an apparatus for separating materials in the granulated or pulverized state, the combination of a vessel or box having its upper part divided into vertical passages or channels by vertical partitions, and having collecting-chutes arranged intermediate the lower end of each pair of adjacent passages, valves or gates at the junctures of the passages and the collecting-chutes, means for actuating all of the gates or valves together, a feeding device having a discharging-spout arranged over each of the vertical passages, and means for intermittently actuating the feeding device, and a chamber at the side of the vessel with which all of the collecting-chutes communicate.

19. In an apparatus for separating materials in the granulated or pulverized state, the combination of a vessel or box having its upper part divided into vertical passages or channels by vertical partitions, and having collecting-chutes arranged intermediate the lower end of each pair of adjacent passages, valves or gates at the junctures of the passages and the collecting-chutes, means for actuating all of the gates or valves together, a feeding device having a discharging-spout arranged over each of the vertical passages, means for intermittently actuating the feeding device, a chamber at the side of the vessel with which all of the collecting-chutes communicate, an elevator in this chamber and an elevator in the main part of the vessel.

20. In an apparatus for separating materials

in the granulated or pulverized state, the combination of a vessel or box having its upper part divided into vertical passages or channels by vertical partitions and having collecting-chutes arranged intermediate the lower end of each pair of adjacent passages, valves or gates at the junctures of the passages and the collecting-chutes, gears on the shafts of the gates for connecting them together in pairs, and connected to one of the gears of each pair, a shaft and cam thereon arranged to actuate the gates through the medium of the rod.

21. In an apparatus for separating materials in the granulated or pulverized state, the combination of a vessel or box having its upper part divided into vertical passages or channels by vertical partitions, and having collecting-chutes arranged intermediate the lower end of each pair of adjacent passages, valves or gates at the junctures of the passages and the collecting-chutes, means for actuating all of the gates or valves together, a feeding device having a discharging-spout arranged over each of the vertical passages and supported by connected bell-crank levers, a cam-disk carried by a shaft and having a notch in its periphery, and an adjustable rod connected to one of the bell-crank levers and controlled by the cam-disk.

22. In an apparatus for separating materials in the granulated or pulverized state, the combination of a vessel or box having its upper part divided into vertical passages or channels by vertical partitions and having collecting-chutes arranged intermediate the lower end of each pair of adjacent passages, valves or gates at the junctures of the passages and the collecting-chutes, a hopper located at the top of the vessel having discharging-spouts arranged over the vertical passages and supported by connected bell-crank levers, a cam-disk carried by a shaft and having a notch in its periphery, an adjustable rod connected to one of the bell-crank levers and controlled by the cam-disk, cam-plates adjustably secured to the side of the cam-disk, and a connection between the gates actuated by the cam-plates.

In testimony whereof I have hereunto subscribed my name.

ALFRED SHEDLOCK.

Witnesses:

EDWARD C. DAVIDSON,
J. B. MCCARTHY.