G. C. KIDDER.

ORE SEPARATOR.

APPLICATION FILED DEC. 1, 1910.

1,066,918.

Patented July 8, 1913.

3 SHEETS—SHEET 1.

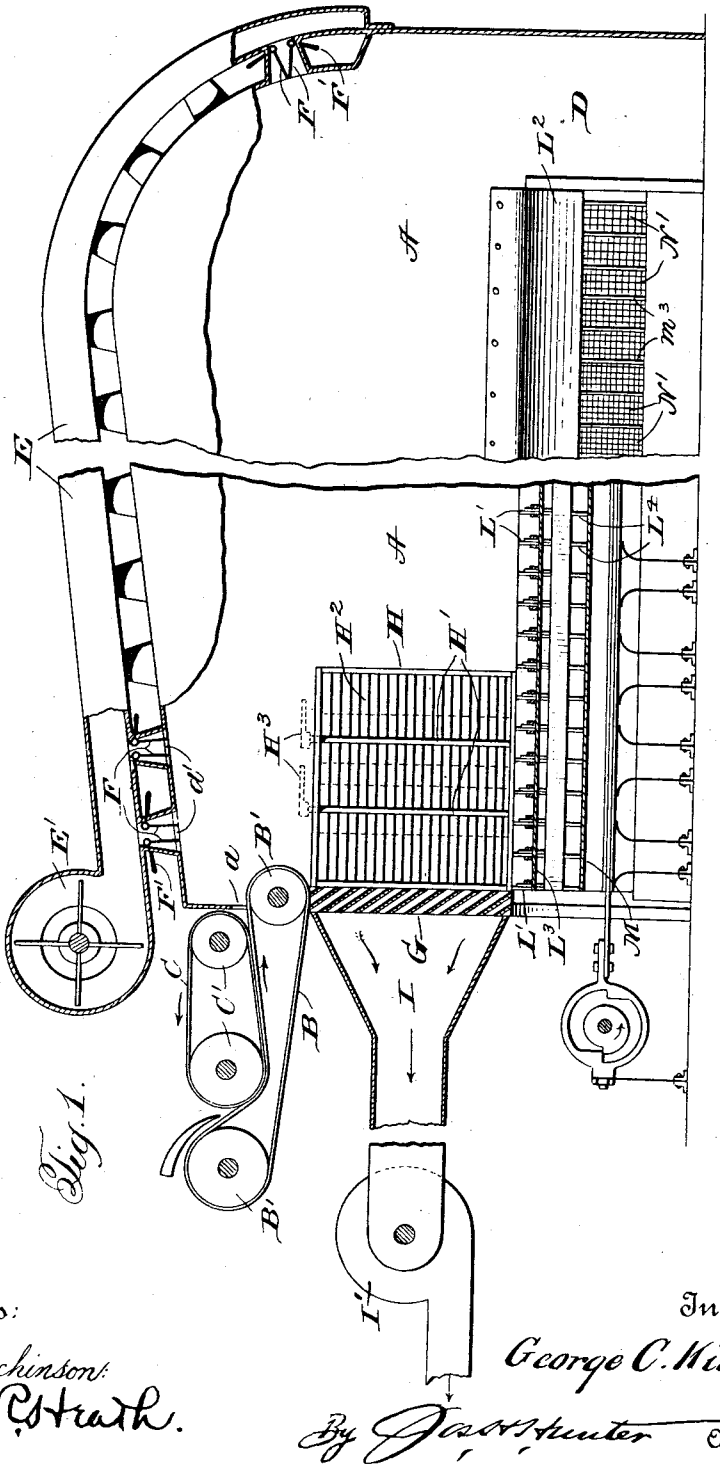


Fig. 1.

Witnesses:

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Thos. C. Strath.

Inventor:

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3 SHEETS—SHEET 2.

Fig. 4.

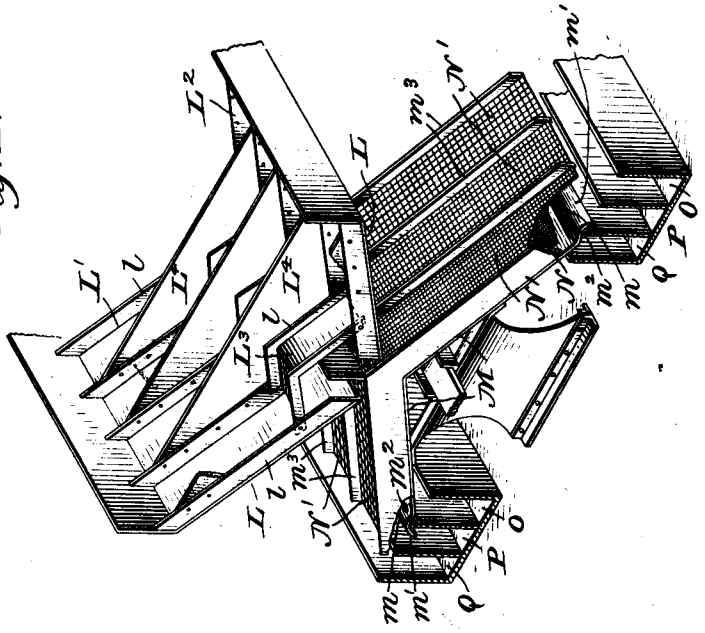
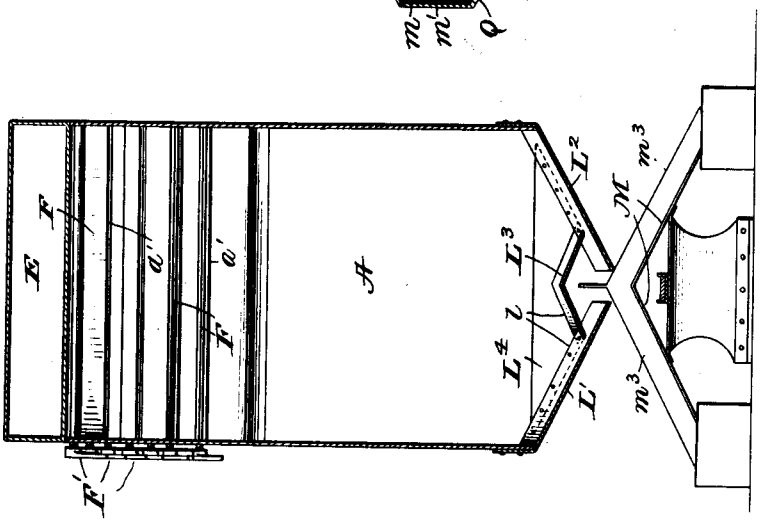


Fig. 2.



Witnesses:

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By Jos. V. Hunter Attorney.

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3 SHEETS—SHEET 3.

Fig. 3.

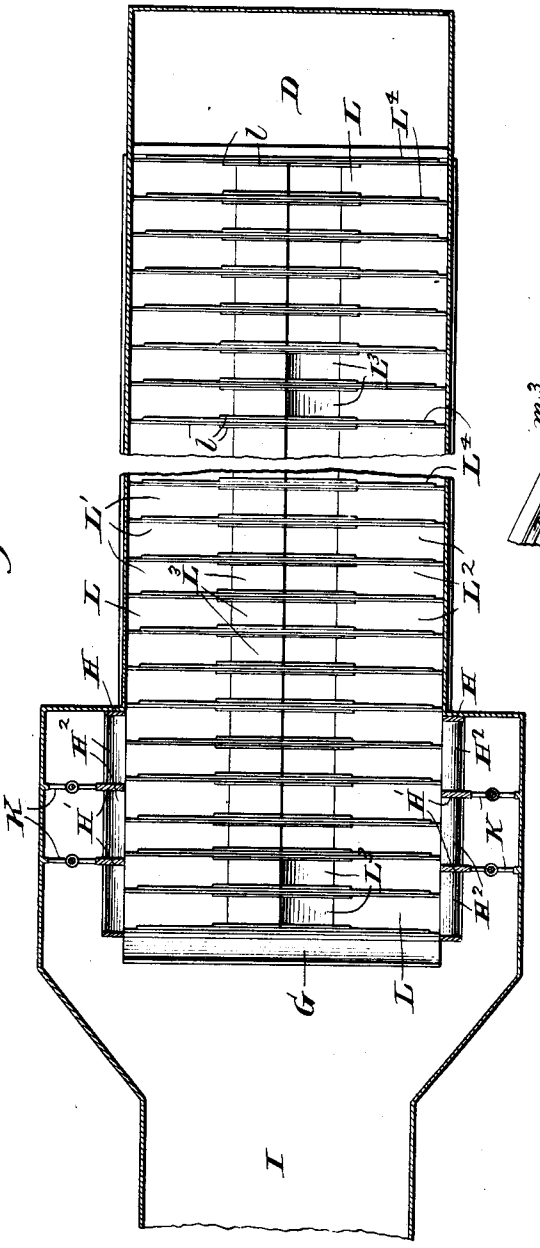
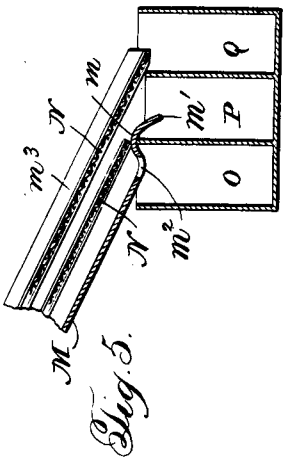


Fig. 5.



Witnesses:

Jas. E. Hutchinson.

Thos. R. Heath.

Inventor:

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UNITED STATES PATENT OFFICE.

GEORGE CHANDLER KIDDER, OF SALT LAKE CITY, UTAH.

ORE-SEPARATOR.

1,066,918. Specification of Letters Patent. Patented July 8, 1913.

Application filed December 1, 1910. Serial No. 595,120.

To all whom it may concern:

Be it known that I, GEORGE C. KIDDER, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Ore-Separators, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to an ore separator and more particularly to an apparatus of this character designed to effect a concentration or separation of dry ores.

The present invention relates more particularly to an ore separator of the type disclosed in my application filed February 3, 1909, Serial No. 475,897, Patent No. 974,395, granted Nov. 1, 1910, in which the material to be treated is projected into a chamber with considerable force and there subjected to atmospheric forces to cause the metallic and non-metallic particles of the same weight to fall on to suitable separating devices, and one of the objects of the present invention is the provision of a machine of this type which is capable of effectually separating large quantities of materials of all grades in a very short time.

A further object of the present invention is the provision of a machine of this character which will effect a more accurate and finer separation of the various grades of metal and gangue according to their respective weights.

Other objects of the invention will be apparent from the detailed description hereinafter when read in connection with the accompanying drawings forming a part hereof, wherein a convenient embodiment of the invention is illustrated and wherein like numerals of reference refer to similar parts in the several views.

Referring now more particularly to the drawings, Figure 1 is a longitudinal section of the improved ore separator, Fig. 2 is a cross section on line 2—2 of Fig. 1, Fig. 3 is a horizontal section of the casing of the separator, Fig. 4 is a fragmentary perspective view of the apron, screen frame, and compartments for receiving the material from the sections of the screen frame; and Fig. 5 is a fragmentary cross section of one edge of the screen frame and the compartments for receiving the material from the sections thereof.

Referring now more particularly to the drawings A designates a chamber which is open at its bottom and in which the separation of the ore is effected, said chamber being provided at its forward end adjacent the top thereof with an inlet opening *a* through which the ore is projected by means hereinafter described. Carried by suitable belt rollers B′ B′ and supported in any suitable manner in front of the casing A is a feeding belt B formed of leather, rubber or other suitable material. The front belt roller B′ is preferably mounted so that it will lie within the inlet opening *a* in the front of the chamber A. Supported on suitable rollers C′ C′ is a second endless belt C which overlies the belt B and is in frictional engagement therewith. The supporting rollers of the belt C may be journaled in any suitable frame positioned at the front portion of the chamber A. Material is fed between the forward portions of the belts B and C and such belts are rotated to project the material into the chamber A at great velocity. Any desired means may be utilized for driving the belts at the desired speed. Positioned at the rear of the chamber A and extending entirely thereacross is a compartment or receptacle D which is adapted to receive any metallic particles which are of sufficient weight to be projected to the extreme end of the chamber.

The top of the chamber is sloped downwardly at the rear portion thereof and said top is provided with a plurality of transversely extending air ports *a′* therein, said ports being preferably located along the entire top at points equi-distant from each other. Positioned upon the top of the chamber A and in communication with each of the air ports *a′* therein is a closed air trunk E and communicating with the forward portion of said trunk is a blast fan E′ which may be of any well known type. Pivotally supported along the front and rear edges of each of the air inlet ports *a′* in the top of the chamber A are depending damper plates F. Each of the damper plates F is provided with an operating handle F′ of any suitable construction which is located outside of the chamber A and by means of which the damper plates may be angularly adjusted to any desired position. From this construction it will be seen that the damper plates of any desired

air port in the top of the chamber may be adjusted to regulate to any desired extent or to entirely cut off the flow of air therethrough from the blast trunk E. It will also be seen that owing to this construction the damper plates at any desired port may be so adjusted as to cause the air from the trunk to pass through such ports and into the casing at any desired angle.

The chamber A is provided below the inlet opening *a* in the front thereof with a slatted front wall G, the slats of said wall extending transversely across the entire front of the casing and being inclined downwardly so that any material which falls thereon will be deflected into the interior of the casing. The sides of the chamber A immediately adjacent the front thereof are cut away to form openings H which are substantially equal in height to the slatted wall at the front of the chamber and are substantially equal in width to the width of the chamber A. Secured within each of the openings H in the side walls of the chamber A are a plurality of vertical posts H′, dividing such openings into sections and in each of the sections thus formed is secured a slatted wall H², the slats of which extend horizontally and are downwardly inclined so that any material falling thereon will be deflected to the interior of the chamber. Secured to the exterior of the chamber A and inclosing the slatted wall G in the front thereof and the openings H H in the sides thereof is a closed air flue I with which a suitable exhaust fan I′ communicates, to obtain a suction through the slatted walls in the front and sides of the chamber.

It is desirable under different conditions, in order to always obtain the proper results with the material being treated, to regulate the suction through the walls of the chamber A and for this purpose a plurality of dampers K are employed, each positioned in the air flue I and the function of which is either to cut off entirely or partially the draft through the slatted sections of the openings H H in the side walls of the chamber A. In practice these dampers are preferably in the form of plates which are pivotally supported to swing upon their vertical axes in the portions of the air flue which overlie the openings H in the side walls of the chamber. In practice, one such damper is pivotally supported in rear of each of the vertical posts H′ and such damper is of a width that when moved to a horizontal position it will completely fill the space between such vertical post and the outer wall of the air flue. Each of the dampers H is provided with an operating handle H³ and any suitable means is provided for holding such operating handle in various positions of adjustment. From this construction it will be apparent that by the adjustment of the dampers H the exhaust through the side walls of the chamber A can be controlled to a nicety.

Secured within the open lower portion of the chamber A and extending for a substantial portion of the full length thereof is an apron L which is adapted to receive the material as it settles in the chamber A and to project the same on to the separating screens to be hereinafter more particularly set forth. The apron L is formed of sections L′ L², the outer edges of which are rigidly secured in any suitable manner to the lower portions of the side walls of the chamber A, said sections extending inwardly from the side walls of said chamber and sloping downwardly. The inner edges of the sections L′ and L² of the apron are positioned adjacent the center of the chamber and the space therebetween is bridged by an inverted V-shaped member L³ which extends the full length of the apron and the outer edges of which are spaced from the sections L′ and L² of the apron. The side sections L′ and L² of the apron and the central section L³ thereof are provided with a plurality of transversely arranged upstanding ribs *l* thereon which are preferably disposed at equal distances apart along the full length of the apron.

L⁴ designates a plurality of partition walls, the outer ends of which are bolted to the upstanding ribs *l* of the said sections L′ and L² of the apron and the under edge of which is shaped to conform to the contour of the central section L³ of the apron and is riveted or otherwise secured to the upstanding flanges thereof.

From this construction it will be seen that the apron is formed with a plurality of transversely arranged compartments into which the material falls and that by reason of the employment of the partition walls L⁴, such compartments are of considerable depth so that the likelihood of any of the material falling into any compartment other than its proper one is materially lessened. Furthermore, the partition plates of the character just described serve to strengthen the entire structure of the apron, which is in the form of a truss-like arrangement suspended from the sides of the chamber.

Positioned directly below the apron L is a screen frame M, which is substantially equal in width and length to the apron L. The screen frame M is of inverted V-shape in cross section, and such screen frame is provided at the apex thereof with an upstanding longitudinal flange which extends upwardly into the space between the free edges of said sections L′ and L² of the apron heretofore described. The outer edges of the sloping sides of the screen frame are

bent upwardly as at m and then downwardly as at m' and such sides are provided adjacent the upwardly bent portions m thereof with openings m^2 therein which are positioned at close intervals along the full length of the screen frame. The sloping sides of the screen frame have secured thereto a plurality of upstanding transverse ribs m^3 which serve to divide the sides of the screen frame into a plurality of transversely arranged compartments. The transverse ribs m^3 are secured on the sides of the screen frame in such a manner that the compartments formed thereby will correspond in number and size to the transverse compartments of the apron L′ heretofore described. Removably secured within the compartments of the screen frame M thus formed are a plurality of screens on to which the material is delivered from the compartments of the apron and which screens serve to separate the metallic from the non-metallic particles of such materials. The screens which are secured in the sections of the screen frame are of varying mesh, those at the rear end of the screen frame being of comparatively coarse mesh and those in front thereof gradually diminishing in mesh, the screens at the front of the chamber being of very small mesh. Theoretically, the material which is delivered on to any particular screen should consist of metallic particles and gangue of such a size that they might be perfectly separated by a screen provided with a mesh just large enough to allow the metallic particles to pass therethrough. In practice, however, there is a small percentage of faults in the distribution and to correct such faults, each of the compartments is provided with two screens, a screen N, which extends from the rib at the center of the screen frame to the outer edge thereof and is spaced from the sloping side of said screen frame, and a screen N′ which is positioned above the screen N and which extends from the rib at the center of the screen frame to a point beyond the edge of the screen frame. The screen N is made smaller in mesh than the screen N′ so that any gangue which might pass through the screen N′ will be caught by said screen.

Positioned at each side of the screen frame and extending longitudinally thereof are three series of compartments O, P and Q. Each of the compartments in the series O is positioned to receive through the openings m^2 in the bottom of each compartment of the screen frame the material which has passed through the screen N in said compartment, while each of the compartments P is adapted to receive the discharge from the top of the screen N in each compartment of the screen frame, and each of the compartments Q is adapted to receive the discharge from the top of the screen N′ positioned in each compartment of the screen frame.

The screens N and N′ may be of any desired construction and type and may be secured in the screen frame in any desired manner. I prefer, however, to form such screens so that they may be secured in and readily removed from the screen frame when desired. Owing to the wide space which is provided at each side of the machine between the apron and the screen frame, it will be apparent that the work which is being performed may at all times be inspected by the operator.

In practice, the screen frame M is preferably supported so that it can be vibrated longitudinally. The means for so supporting the screen frame, forms no part of the present invention and hence has not been illustrated in detail. Any well known screen support and vibrating mechanism may be employed for this purpose.

In operation, the ore to be treated is fed between the belts B and C and is projected into the chamber A in a thin, even layer at a great velocity; the dampers controlling the air ports a in the top of the chamber A and the dampers controlling the exhaust through the openings in the sides of the chamber A are adjusted to obtain the proper blast on the top of the material and the proper degree of exhaust at the front of the chamber according to the character of the material used and the velocity at which it is projected into the chamber. The mass of material which is projected into the chamber consists of metallic and non-metallic particles which will be delivered into the several compartments of the apron and from thence onto the various screen sections of the screen frame. Of the material delivered on a particular screen section the non-metallic particles will of course be much larger than the metallic particles of the same weight and the screen N′ in each compartment of the screen frame is of a size that the greater portion of the metallic portions which are deposited thereon will pass therethrough and on the screen N, while the greater portion of the metallic particles will pass off of the top of the screen N′ and into one of the compartments Q. Of the material which falls onto the screen N by far the greater percentage of any metallic particles which such materials may contain will pass through such screen and onto the bottom of the screen frame from whence it will be discharged through the opening m^2 therein into one of the compartments O. The non-metallic particles which fall onto the screen N will pass into one of the compartments P. As this material may contain some metallic particles, it is preferable to again subject the same to treatment in the second machine.

While a convenient embodiment of the invention is illustrated in the accompanying drawings, it will be understood that many changes may be made to the form and construction therein shown without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:—

1. In an ore separator, a chamber, separating devices in the lower portion of the chamber adapted to receive materials of different weights to separate the metallic from the non-metallic portions thereof, a longitudinally extending blast trunk at the top of said chamber, the rear end of said blast trunk extending downwardly toward the bottom of the chamber, said blast trunk being provided in its underside with a plurality of air ports communicating with the interior of said chamber, and means for projecting ore into said chamber from the front thereof toward the rear thereof above said screen.

2. In an ore separator, a chamber, a screen in the lower portion of said chamber formed of a plurality of sections increasing in mesh from the front to the rear of the chamber, a longitudinally extending blast trunk at the top of said chamber, the rear end of said blast trunk extending downwardly toward the bottom of the chamber, said blast trunk being provided with a plurality of air ports in the underside thereof communicating with the interior of the chamber, means for controlling the flow of air from said blast trunk through said ports, and means for projecting ore into said chamber from the front thereof toward the rear thereof above said screen.

3. In an ore separator, a chamber, a screen at the lower portion of said chamber formed of a plurality of sections increasing in mesh from the front to the rear of the chamber, a longitudinally extending blast trunk at the upper portion of the chamber provided with a plurality of air ports in the underside thereof communicating with the interior of said chamber, means for controlling the flow of air from said trunk through the air ports thereof, means for projecting ore into said chamber from the front thereof toward the rear thereof above said screen, a suction flue communicating with the front end of said chamber below said projecting means, and means for controlling the suction through the front portion of the chamber.

4. In an ore separator, a chamber, separating devices in the lower portion of the chamber adapted to receive materials of different weights and to separate the metallic from the non-metallic portions thereof, a longitudinally extending blast trunk at the upper portion of said chamber provided with a plurality of air ports in the underside thereof communicating with the interior of the chamber, means for controlling the flow of air through said air ports comprising a pair of adjustable depending damper plates pivoted at the front and rear edges of said air ports, and means for projecting ore into said chamber from the front thereof toward the rear thereof above said separating devices.

5. In an ore separator, a chamber, separating devices at the lower portion of said chamber adapted to receive materials of different weights and to separate the metallic from the non-metallic portions thereof, means for projecting ore into said chamber from the front thereof toward the rear thereof above said separating devices, and a suction flue communicating with the front and sides of said chamber below said projecting means.

6. In an ore separator, a chamber, separating devices in the lower portion of said chamber adapted to receive materials of different weights and to separate the metallic from the non-metallic portions thereof, means for projecting ore into said chamber from the front thereof toward the rear thereof above said separating devices, a suction flue communicating with the front and sides of said chamber below said projecting means, and means for controlling the suction through the forward portion of the chamber.

7. In an ore separator, a chamber, a screen at the lower portion of said chamber increasing in mesh from the front to the rear of the chamber, means for projecting ore into said chamber from the front thereof toward the rear thereof above said screen, and a suction flue communicating with the front and sides of said chamber below said projecting means.

8. In an ore separator, a chamber, a screen in the lower portion thereof formed of sections increasing in mesh from the front to the rear of the chamber, means for projecting ore into said chamber from the front thereof toward the rear thereof above said screen, means for subjecting the projecting stream of ore to a downward blast of air during its travel in the chamber, a suction flue communicating with the front and sides of said chamber below the ore projecting means, and means for controlling the suction through the forward portion of the chamber.

9. In an ore separator, a chamber provided with a slatted front wall and with side walls having slatted portions therein adjacent the front wall of the chamber, a suction flue overlying the slatted front wall of the chamber and the slatted portions of the side walls thereof, separating devices at the lower portion of said chamber adapted to receive materials of different weights and

to separate the metallic from the non-metallic portions thereof, and means for projecting ore into said chamber from the front thereof toward the rear thereof above said separating devices.

10. In an ore separator, a chamber provided with a slatted front wall and with side walls having slatted portions therein adjacent the front wall of the chamber, an exhaust flue overlying the slatted front wall of the chamber, and the slatted portions of the side walls thereof, means for controlling the suction through the slatted portions of the side walls of the chamber, separating devices in the lower portion of the chamber adapted to receive materials of different weights and to separate the metallic from the non-metallic portions thereof, and means for projecting ore into said chamber from the front thereof toward the rear thereof above said separating devices.

11. In an ore separator, a chamber provided with openings in the front wall thereof and with openings in the side walls thereof adjacent their connection with the front wall, separating devices at the lower portion of said chamber to receive materials of different weights and to separate the metallic from the non-metallic portions thereof, a suction flue overlying the openings in the front and side walls of the chamber, dampers in the portions of said flue overlying the side walls of the chamber, and means for projecting ore into said chamber from the front thereof toward the rear thereof above said separating devices.

12. In an ore separator, a chamber provided with openings in the front wall thereof and with openings in the side walls thereof adjacent their connection with the front wall, separating devices at the lower portion of said chamber to receive materials of different weights and to separate the metallic from the non-metallic portions thereof, a suction flue overlying the openings in the front and side walls of the chamber, dampers in the portions of said flue overlying the side walls of the chamber, means for projecting ore into said chamber from the front thereof toward the rear thereof above said separating devices, and means for subjecting the projected stream of ore to a downward blast of air during its travel in the chamber.

13. In an ore separator, a chamber, an apron extending longitudinally of said chamber comprising transversely inclined portions extending inwardly from the walls of said chamber, the adjacent edges of which are separated, a screen frame provided with downwardly sloping sides positioned below the opening between the sections of said apron, said screen frame being provided with a plurality of screen sections increasing in mesh from the front to the rear of the chamber, and means for projecting ore into said chamber from the front to the rear thereof above said apron.

14. In an ore separator, a chamber, an apron extending longitudinally of said chamber, comprising transversely inclined portions extending inwardly from the walls of the chamber, and terminating short of the center thereof, said inclined portions being provided with compartments extending transversely thereof, a screen frame provided with downwardly sloping sides positioned below the opening between the sections of said apron, a plurality of screen sections carried by the sides of said screen frame and adapted to receive the discharge from the compartments of the apron sections, said screen increasing in mesh from the front to the rear of the chamber, and means for projecting ore into the chamber from the front to the rear thereof above said apron.

15. In an ore separator, a chamber, an apron extending longitudinally of said chamber, comprising transversely inclined portions extending inwardly from the walls of the chamber, and terminating short of the center thereof, said inclined portions being provided with compartments extending transversely thereof, separating devices adapted to receive the material from the compartments of the machine, and to separate the metallic from the non-metallic particles thereof, and means for projecting ore into said chamber from the front toward the rear thereof above said apron.

16. In an ore separator, a chamber, an apron extending longitudinally of said chamber comprising downwardly inclined sections extending inwardly from the walls of the chamber, and terminating short of the center thereof, and a central section overlying the space between said side sections and provided with downwardly sloping sides the free edges of which are spaced from the side sections of the apron, separating devices adapted to receive the material from the inclined side sections of the apron and to separate the metallic from the non-metallic portions thereof, and means for projecting ore into said chamber from the front toward the rear thereof above said apron.

17. In an ore separator, a chamber, an apron extending longitudinally of said chamber, comprising downwardly inclined side sections extending inwardly from the side walls of the chamber and terminating short of the center thereof and a central section overlying the space between the side sections of the apron and provided with downwardly sloping walls the lower edges of which are spaced from the side sections of the apron, said side sections and central portion being provided with a plurality of transversely disposed compartments therein, and a plurality of separating devices adapt-

ed to receive the material from the compartments in the inclined side sections of the apron and to separate the metallic particles from the non-metallic portions thereof, and means for projecting ore into said chamber from the front thereof toward the rear thereof above said apron.

18. In an ore separator, a chamber, a plurality of compartments extending transversely of said chamber and substantially the full length thereof, a screen positioned to receive the material from said compartments, said screen comprising a plurality of sections, one for each of said compartments, and said sections increasing in mesh from the front to the rear of the chamber, and means for projecting ore into said chamber from the front to the rear thereof above said compartments.

19. In an ore separator, a chamber, an apron extending longitudinally of said chamber comprising transversely inclined portions extending inwardly from the walls of the chamber and terminating short of the center thereof, a plurality of partition plates connecting said inclined portions and extending transversely of the chamber, a screen frame positioned below the opening between the inclined sections of the apron and provided with a plurality of screen sections increasing in mesh from the front to the rear of the chamber, and means for projecting ore into said chamber from the front to the rear thereof above said apron.

20. In an ore separator, a chamber, an apron extending longitudinally of said chamber comprising downwardly inclined side sections extending inwardly from the side walls of the chamber and terminating short of the center thereof and a central section overlying the space between said side sections and provided with downwardly sloping walls, the lower edges of which are spaced from the side sections of the apron, a plurality of partition plates extending transversely of the chamber and rigidly connecting the side and central sections of said apron, a plurality of separating devices underlying said apron and adapted to receive material discharged therefrom and to separate the metallic from the non-metallic particles thereof, and means for projecting ore into said chamber from the front toward the rear thereof above said apron.

21. In an ore separator, a chamber, an apron extending longitudinally of said chamber comprising downwardly inclined side sections extending inwardly from the side walls of the chamber and terminating short of the center thereof, said side sections being provided with a plurality of compartments extending transversely thereof, an angular screen frame provided with downwardly sloping sides positioned below said apron and provided at the apex thereof with an upstanding flange projecting into the opening between the edges of said sections of the apron, a plurality of screen sections carried by the sides of said screen frame, said sections increasing in mesh from the front to the rear of the screen frame, and means for projecting ore into said chamber from the front thereof toward the rear thereof above said apron.

22. In an ore separator, a chamber, an apron extending longitudinally of said chamber comprising downwardly inclined side sections extending inwardly from the walls of the chamber and terminating short of the center thereof, said side sections being provided with a plurality of compartments extending transversely thereof, an angular screen frame provided with downwardly sloping sides positioned below the opening between the side sections of the apron, the sides of said screen frame being provided with transverse compartments therein corresponding in number and size to the compartments in the sides of the apron, and a pair of superposed screens positioned in each compartment in the screen frame, the screens of said screen frame increasing in mesh from the front to the rear thereof, and the lower screen in each compartment of the screen frame being of finer mesh than the upper screen therein, and means for projecting ore into said chamber from the front toward the rear thereof above said apron.

23. In an ore separator, a chamber, a transversely inclined apron member positioned in said chamber and provided with a plurality of upstanding transversely disposed partition plates forming a plurality of compartments extending transversely thereof, an oppositely inclined screen frame positioned below said apron member and a plurality of superposed screens carried by said screen frame increasing in mesh from the front to the rear of the screen frame and the lowermost screen of the screen frame being of finer mesh than the screen thereabove, and means for projecting ore into said chamber from the front toward the rear thereof above said apron.

24. In an ore separator, a chamber, a screen at the lower portion of said chamber formed of a plurality of sections increasing in mesh from the front to the rear of the chamber, a longitudinally extending blast trunk at the upper portion of the chamber provided with a downwardly extending rear portion, said blast trunk being provided along its underside with a plurality of air ports communicating with the interior of said chamber, means for projecting ore into said chamber from the front thereof toward the rear thereof above said screen, and a suction flue communicating with the forward portion of said chamber below said projecting means.

25. In an ore separator, a chamber, separating devices in the lower portion of the chamber adapted to receive materials of different weights and to separate the metallic from the non-metallic portions thereof, a longitudinally extending blast trunk at the top of said chamber provided with a plurality of air ports in the lower portion thereof communicating with the interior of said chamber, means for controlling the direction of flow of air from said blast trunk through said air ports, and means for projecting ore into said chamber from the front thereof toward the rear thereof above said separating devices.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE CHANDLER KIDDER.

Witnesses:
WILLIAM CROME,
C. L. WHITE.