

Sept. 24, 1929.

D. M. CRIST

1,729,095

ELECTROMAGNETIC ORE SEPARATOR

Original Filed Sept. 30, 1924 2 Sheets-Sheet 1

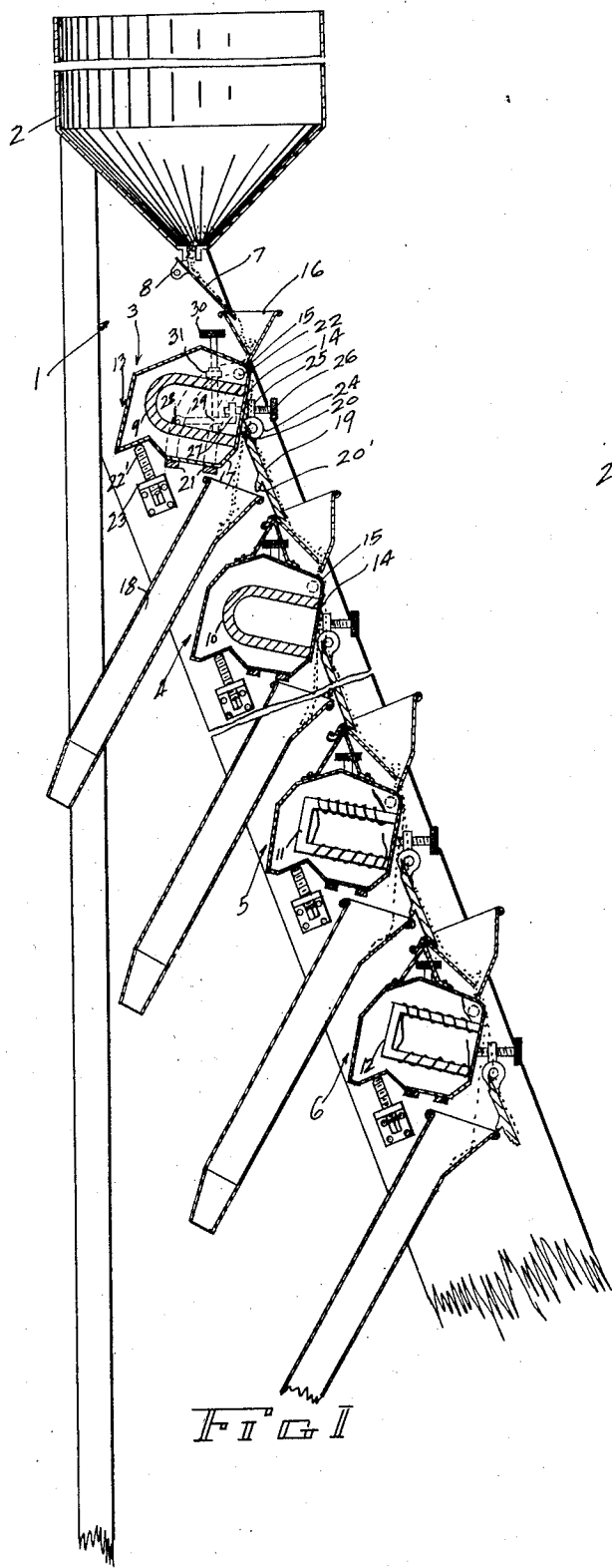


FIG I

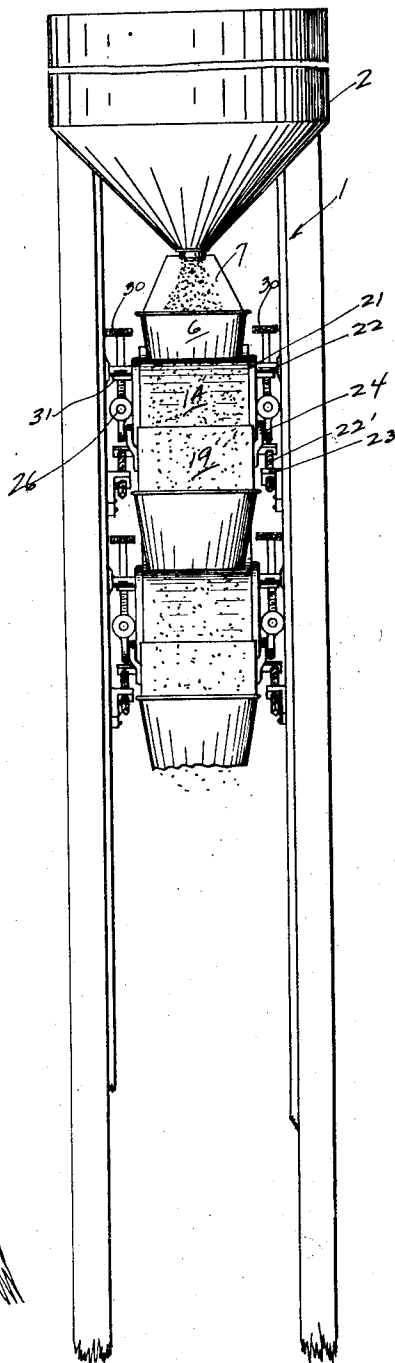


FIG II

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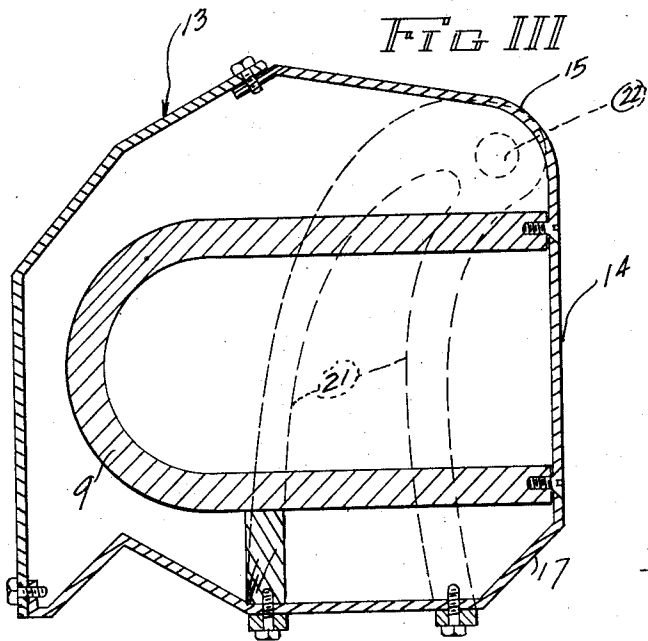
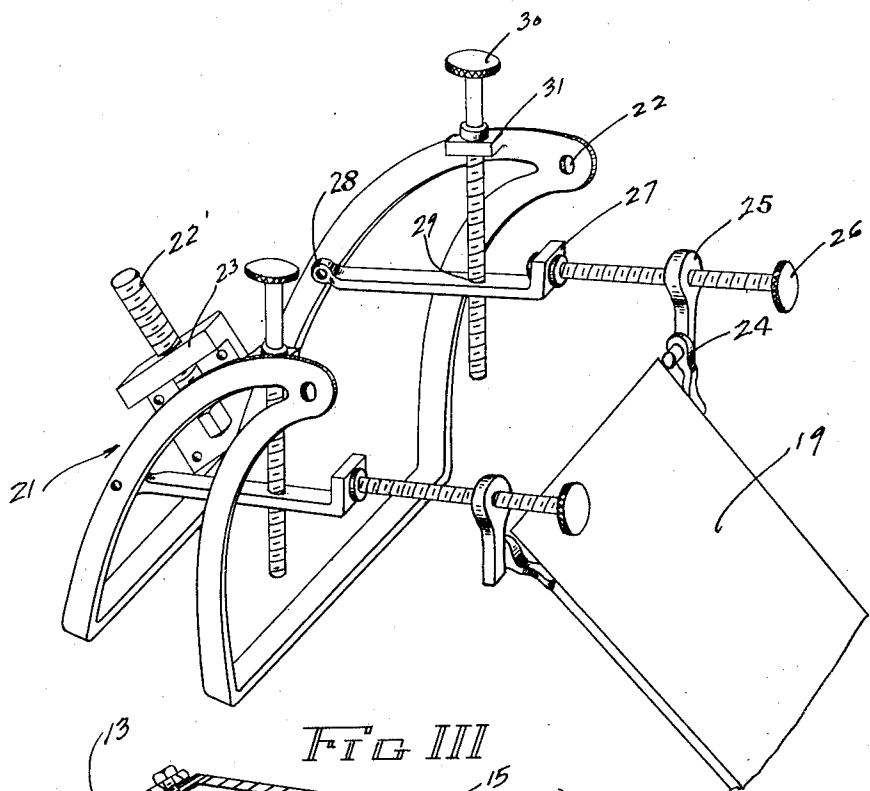


FIG IV

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## UNITED STATES PATENT OFFICE

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## ELECTROMAGNETIC ORE SEPARATOR

Application filed September 30, 1924, Serial No. 740,737. Renewed February 4, 1929.

The main purpose of this invention is to provide for a more positive and thorough separation of magnetic particles of ore of varying magnetic susceptibility, into their  
5 respective classes by causing finely divided ore to gravitate through magnetic fields of different densities in order to deflect the said magnetic particles from their natural paths of gravitation while the ore is in free gravi-  
10 tation. This provides for a more expeditious and more thorough concentration of the several classes of magnetic particles to be separated and also increases the yield of desired magnetic particles as compared to methods  
15 heretofore employed.

One of the objects of the invention is to provide separating apparatus of the character described which apparatus is comparatively  
20 simple as to construction, inexpensive and capable of separating large quantities of ore in a reliable and thorough manner.

Another object of the invention is to provide apparatus of the character described which includes a novel adjustable mounting  
25 for the magnets providing for ready adaptation of the apparatus to the ore and to the kind or character of the separation and classification desired.

A further object is to provide in apparatus  
30 of the character described, deflecting plates that are adjustable in perpendicular and horizontal planes and which serve to deflect the non-magnetic particles from their direct lines of gravitation and to convey such particles  
35 onto the next magnetic and separating unit.

With the above mentioned and other objects in view, the invention consists in the novel construction and combination of parts hereinafter described, illustrated in the ac-  
40 companying drawings, and set forth in the claims hereto appended, it being understood that various changes in the form, proportion, size and minor details of construction within  
45 the scope of the claims may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Referring to the drawings:

Fig. 1 represents a vertical sectional view  
50 of the apparatus of the invention.

Fig. 2 represents a front elevation of the apparatus.

Fig. 3 represents a perspective view of one of the magnetic separating forms. Fig. 4 is a vertical sectional view of one of the mag-  
55 netic units.

The embodiment of the invention herein disclosed comprises essentially a frame 1, supporting a hopper 2, from which finely divided ore discharges so that the ore will  
60 gravitate through the magnetic fields of a plurality of magnetic separator units 3, 4, 5 and 6, arranged one above the other in the frame and in a plane inclined slightly from the vertical. A gate 7 is pivoted as at 8 in  
65 the frame and controls the discharge of ore from the main hopper.

Each of the units 3, 4, 5 and 6 is identical as to construction except that the upper ones designated 3 and 4, are provided with per-  
70 manent magnets 9 and 10, whereas the lower ones 5 and 6, are equipped with electro-magnets 11 and 12, energized from a suitable source of electrical energy not shown. This provides magnetic fields of different magnetic  
75 density through which the ore gravitates.

Other than the different magnets each unit comprises a metallic casing 13 for the magnet, which casing includes a plate 14 disposed in front of the magnet and partly in the path of  
80 the ore and the magnetic lines of force extend through this plate and into the path of gravitation of the ore. The upper end of this plate is rounded as at 15 and turned rearward and upward so as to direct the ore downward in  
85 front of said plate. The face is also inclined downward and rearward from the path of gravitation to facilitate the separation of the ore. Above the plate 14 is a small hopper 16 receiving ore from the gate 7 and discharg-  
90 ing ore onto the upper end 15 of the plate 14. The lower end of the plate 14 is bent inward as at 17 to direct the magnetic particles having been deflected while gravitating through the magnetic field, into a concentrate chute 18  
95 attached to and inclined rearward and downward from the frame. In front of the plate is a diverting blade 19, the upper edge of which is beveled as at 20 on its side opposed to the plate and is spaced therefrom. This  
100

blade diverts the non-magnetic particles and those of the magnetic particles passing through the magnetic field out of their true paths of gravitation into the hopper of the unit next below. A deflecting tongue 20' projects from the rear face of the blade to direct the magnetic particles into the chute.

The casing of each unit is removably supported on a cradle 21 pivoted at its upper end as at 22 to the frame 1. The casing is secured to the cradle by any suitable fastening means, permitting ready detachment of the casing. Screws 22' supported in ears 23 on the frame bear upon the under side of the casing at the rear thereof and provide for adjustment of the casing to change the inclination and position of the face of the plate 14.

The blade 19 is provided on its upper end with upstanding ears 24 pivoted on hangers 25 adjustably supported on thumb screws 26 carried on the outer ends of arms 27 pivoted at their inner ends as at 28 to the cradle. The hangers 25 having screw threaded openings for the screws 26 provide for movement of the blade towards and away from the plate 14 on turning said thumb screws.

The arms 27 have screw threaded openings 29 receiving thumb screws 30 which are supported in lugs 31 on the cradle. On turning these screws, the arms may be lifted and lowered and thus provide for vertical adjustment of the blade. These adjustments of the casing and blade provide for an easy and accurate setting of the plate 14 and blade at the desired effective angles and relative distances apart to suit the particular separation treatment desired or required and insure a more accurate and thorough separation and concentration of the ore.

As the finely divided ore passes through the first magnetic fields of the unit 3, the magnetic particles susceptible to the influence of the magnet are deflected from their true paths of free gravitation and pass downward behind the sharp upper edge of the blade 19 into the concentrate chute. Those of the magnetic particles which are not deflected by the magnetic force pass downward with the non-magnetic particles onto the blade 19 and are diverted out of their true paths by said blade and into the hopper for the next magnetic unit. The next unit 4 repeats the above operation. The magnetic particles having passed through the magnet fields of the permanent magnets in passing through the stronger magnetic fields of the units 5 and 6 containing the electro-magnets, are diverted into the concentrate chutes as hereinbefore explained. Thus, when the ore passes through the last magnetic field practically all of the desirable magnetic particles have been taken off in classes and a thorough concentration of the ore sought is had in this way.

I claim:

1. A magnetic ore separator comprising a

plurality of magnets arranged one above the other, a plurality of plates disposed in front of said magnets, means for discharging ore so that it will gravitate freely in natural paths successively through the magnetic fields of said magnets in front of said plates, diverting plates interposed between said magnets and being angularly disposed with relation to the natural paths of gravitation of the ore, hoppers into which ore is discharged from off said diverting plates, which hoppers are disposed above and are adapted to discharge ore in front of said first named plates and means for changing the angularity of said diverting plates.

2. A magnetic ore separator comprising a plurality of magnets arranged one above the other, a plurality of plates disposed in front of and carried by said magnets, means for discharging ore so that it will gravitate freely in natural paths successively through the magnetic fields of said magnets in front of said plates, diverting plates interposed between said magnets and being angularly disposed with relation to the natural paths of gravitation of the ore, hoppers into which ore is discharged from off said diverting plates, which hoppers are disposed above and are adapted to discharge ore in front of said first named plates, said first named plates being angularly related to the natural paths of gravitation of the ore and means for changing the angularity of said first named plates.

3. A magnetic ore separator comprising a plurality of magnets arranged one above the other, a plurality of plates disposed in front of said magnets, means for discharging ore so that it will gravitate freely in natural paths successively through the magnetic fields of said magnets in front of said plates, diverting plates interposed between said magnets and being angularly disposed with relation to the natural paths of gravitation of the ore, hoppers into which ore is discharged from off said diverting plates, which hoppers are disposed above and are adapted to discharge ore in front of said first named plates, said first named plates being angularly related to the natural paths of gravitation of the ore, means for changing the angularity of said first named plates and means for changing the angularity of said diverting plates.

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