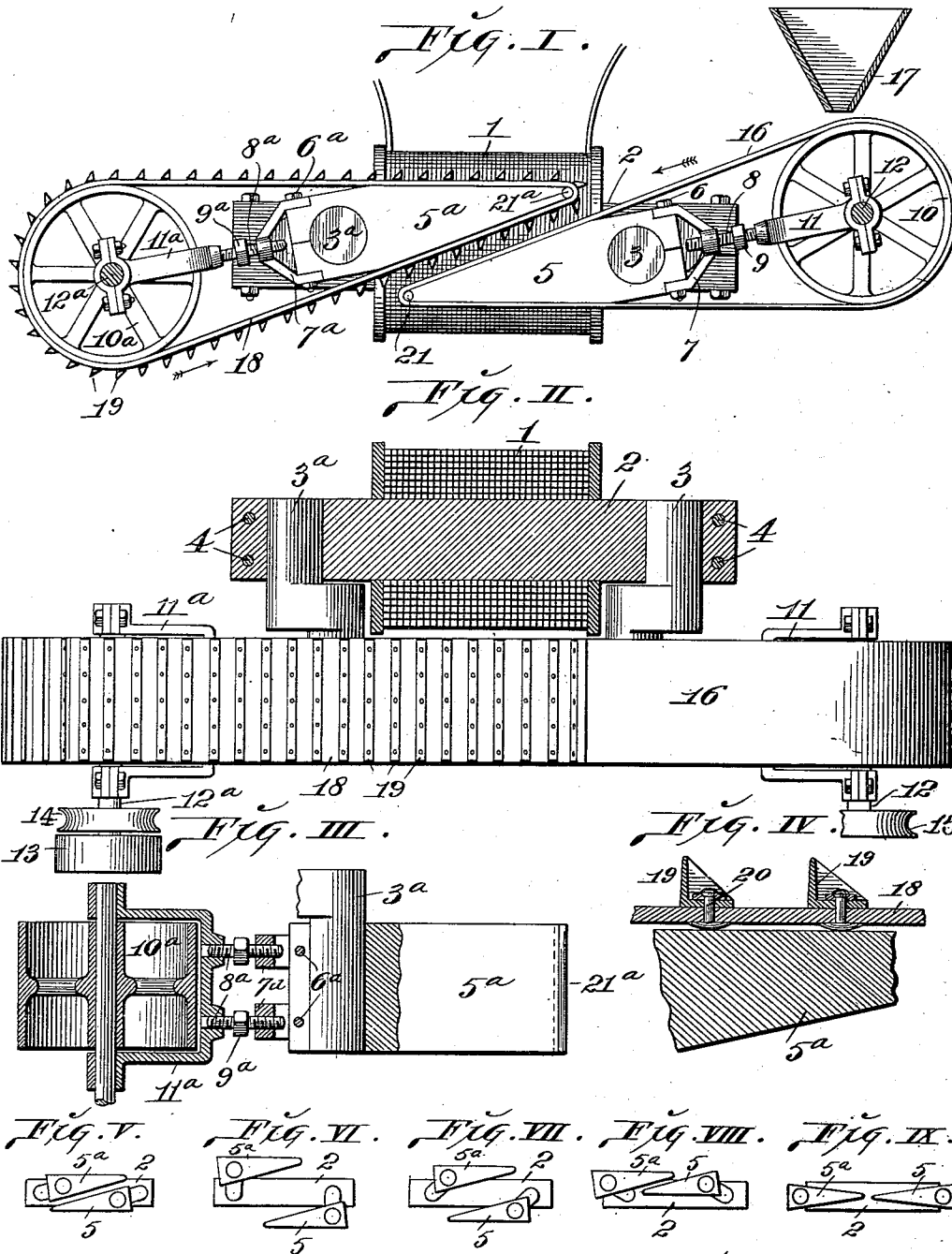


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ELECTROMAGNETIC ORE SEPARATOR.
APPLICATION FILED DEC. 13, 1902.

NO MODEL.



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ELECTROMAGNETIC ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 751,150, dated February 2, 1904.

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To all whom it may concern:

Be it known that I, ALEXANDER DEAN, a citizen of the United States, residing in Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Electromagnetic Ore-Separators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an electromagnetic ore-separator for separating such metals as are subject to magnetic attraction from non-magnetizable metals or gangue found therein. The separator is designed for use in handling all kinds of magnetizable materials, but is more particularly of value in the treatment of ores in the separation of which a very high potency in the magnetic field is necessary.

The invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a side elevation of my separator. Fig. II is a top or plan view with the core and coil illustrated in horizontal longitudinal section. Fig. III is a view, partly in horizontal section and partly in plan, of one of the magnetic pole members and the drum and supports by which the pole member is carried. Fig. IV is a vertical section taken longitudinally through fragments of the negative-pole member and the belt associated therewith. Figs. V to IX are diagrammatical views showing various positions into which the pole members may be shifted relative to each other for varying magnetic action.

1 designates a magnetic coil that may have suitable connections to an electrical generator, and 2 is a core extending through the coil and having its ends projecting beyond the ends of the coil. The coil and core may be supported in any desirable manner. The ends of the core are split horizontally and are provided with transverse bores which receive cranks 3 and 3^a, that may be held as tightly as desired in the core by binding-bolts 4, which pass vertically through the split ends of the core.

The cranks 3 and 3^a are capable of rotation in the core 2. Mounted on the outwardly-extending arm of the crank 3 is a positive-pole member 5, and mounted on the outwardly-extending arm of the crank 3^a is a negative-pole member 5^a. The pole members are both of wedge shape and are placed so that their points project in opposite directions, as seen in Fig. I, and they are adjustable with relation to each other through the medium of the crank-arms on which they are mounted, the object in view being to arrange them for a close, open, or long magnetic field or a short intense magnetic field or any condition between the extremes mentioned. By making the pole members of wedge shape, as stated, I am enabled to obtain a greater intensity in the magnetic lines of force, owing to the concentration of such lines at the opposing ends of the members, and thereby acquire a greater efficiency due to such concentration. The outer ends of the pole members are split horizontally, and they are held to the crank-arms on which they are mounted by binding-bolts 6 and 6^a, which pass through the members.

7 and 7^a are strips fixed to the pole members and having situated therein right and left threaded adjustment-rods 8 and 8^a, that bear nuts 9 and 9^a.

10 and 10^a are drums that are carried by the pole members through the medium of yokes 11 and 11^a, in which the adjustment-screws 8 and 8^a are mounted. Passing through the yokes are shafts 12 and 12^a, to which the drums are fixed. On the shaft 12^a is a pulley 13, to which a belt leading from a suitable source of supply may be applied to rotate the drum 10^a, and alongside of said pulley is a second pulley 14, that is adapted to receive a transmission-belt leading to a pulley 15 on the shaft 12 for the purpose of driving the drum 10. The transmission-belt is arranged to drive the drums 10 and 10^a toward each other and may be maintained in a taut condition by a suitable belt-tightener.

16 designates a plain endless apron arranged on the drum 10 and extending around the tapered end of the positive-pole member 5,

which it traverses in the direction indicated by the arrow, Fig. I, in the rotation of said drum.

17 is a hopper through which the material to be treated is fed onto the apron 16.

18 is an endless apron mounted on the drum 10^a and extending around the tapered end of the pole member 5^a, which it traverses in the direction indicated by the arrow, Fig. 1. Fixed to and extending transversely of the apron 18 at intervals is a series of magnetizable bars 19, preferably of soft iron. These bars are preferably of angle bucket shape, as seen in Fig. IV, and they are secured to the apron by rivets 20, the heads of which are placed on the inside of the apron, as seen in Fig. IV, to furnish good contact between the pole member 5^a and the bars 19.

21 and 21^a designate antifriction-rollers seated in recesses at the points of the pole members 5 and 5^a and on which the aprons 16 and 18 travel, the said rollers being introduced at the points named to provide for ease of travel of the aprons 16 and 18 as they pass the points of the pole members and serve to prevent wear of the aprons as they pass said points.

In the practical use of my separator the magnetic coil 1 having been connected to a suitable electrical generator the aprons 16 and 18 are set into motion to traverse the pole members to which they are applied. The material to be operated upon is then introduced through the hopper 17 and falls onto the apron 16, by which it is carried forwardly toward the apron 18. As the material reaches the apron 18 the magnetism in the transverse bars 19, carried by the apron 18 and created therein from the negative-pole member, attracts the particles of metal subject to magnetic attraction to said bars and causes them to adhere thereto. The particles are therefore carried with the apron 18 in the direction of its travel—that is, upwardly and outwardly—and as the apron passes over the drum 10^a the attracted particles fall therefrom. The substance not subject to magnetic attraction continues the inward travel with the apron 16, and passing over the point of the positive pole member drops from the apron. I prefer to use bars 19 of angle form, as shown, inasmuch as their use furnishes projecting flanges that not only serve as temporary magnets subsidiary to the pole member the apron 18 traverses, but in addition thereto the said flanges serve as buckets on which the magnetically-attracted metal particles are carried as the apron passes the point of the pole member, thereby preventing the fall of the attracted material again onto the delivery-apron 16. Furthermore, the flanges presented by the angle-bars provide continuous thin edges extending across the apron 18, by which the

entire adjacent surface of the delivery-apron is traversed to attract all of the metallic particles subject to attraction carried thereby.

By mounting the pole members 5 and 5^a on the cranks 3 and 3^a I provide for their adjustment relative to each other, so that their opposing faces may be placed in any position between one in which their sides are presented close to each other and one in which their points are presented. When their sides are presented to each other, as shown diagrammatically in Fig. V, the full magnetic carrying capacity of the core 2, to which the pole members are connected, is secured, and the greatest quantity or volume of magnetic action is obtained, thereby causing the greatest efficiency by magnetic separation in the use of the apparatus.

Figs. VI, VII, and VIII illustrate varying positions into which the pole members may be shifted to secure less degrees of volume of action in the magnetic field, according to requirements, to suit exigencies in which less volume of action is desired or a more open or more close field with less volume is of advantage. By placing the pole members as seen in Fig. IX, with their points directly facing, the lines of magnetic force are concentrated in the thin ends of the members and the action is intensified owing to such concentration, thereby giving greater power at the juncture of the pole members, as a result of which the particles of metal that are the least susceptible to magnetic attraction are drawn to the magnetic bars traveling on the negative-pole member.

By having the pole members connected to the shafts of the drums 10 and 10^a through the medium of strips and yokes and the adjustment means situated between them it will be seen that I am enabled to move the pole-pieces and adjust them at any angle or position without interfering with the tension of the aprons traveling on the pole-pieces and drums, inasmuch as all of the parts mentioned are carried by the cranks that support the pole members.

I claim as my invention—

1. The combination with a pair of adjustable pole members, of belts for the pole members, drums for the belts adjustable with the poles, and adjustable connections between the poles and the drums.

2. In an electromagnetic ore-separator, the combination of a magnet-coil, a core, cranks rotatively seated in said core and having outwardly-extending arms, tapering pole members mounted on said crank-arms, and means arranged to traverse one of said pole members and adapted to receive material subject to magnetic attraction passed between said pole members, substantially as set forth.

3. In an electromagnetic ore-separator, the combination of a magnet-coil, a core, cranks

rotatively seated in said core and having outwardly-extending arms, tapering pole members mounted on said crank-arms, a delivery-apron arranged to traverse one of said pole members, and an apron arranged to traverse the other of said pole members, said last-named apron being provided with means

whereby material conveyed by said delivery-apron and subject to magnetic attraction is attracted thereto, substantially as set forth.

ALEXANDER DEAN.

In presence of—

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