

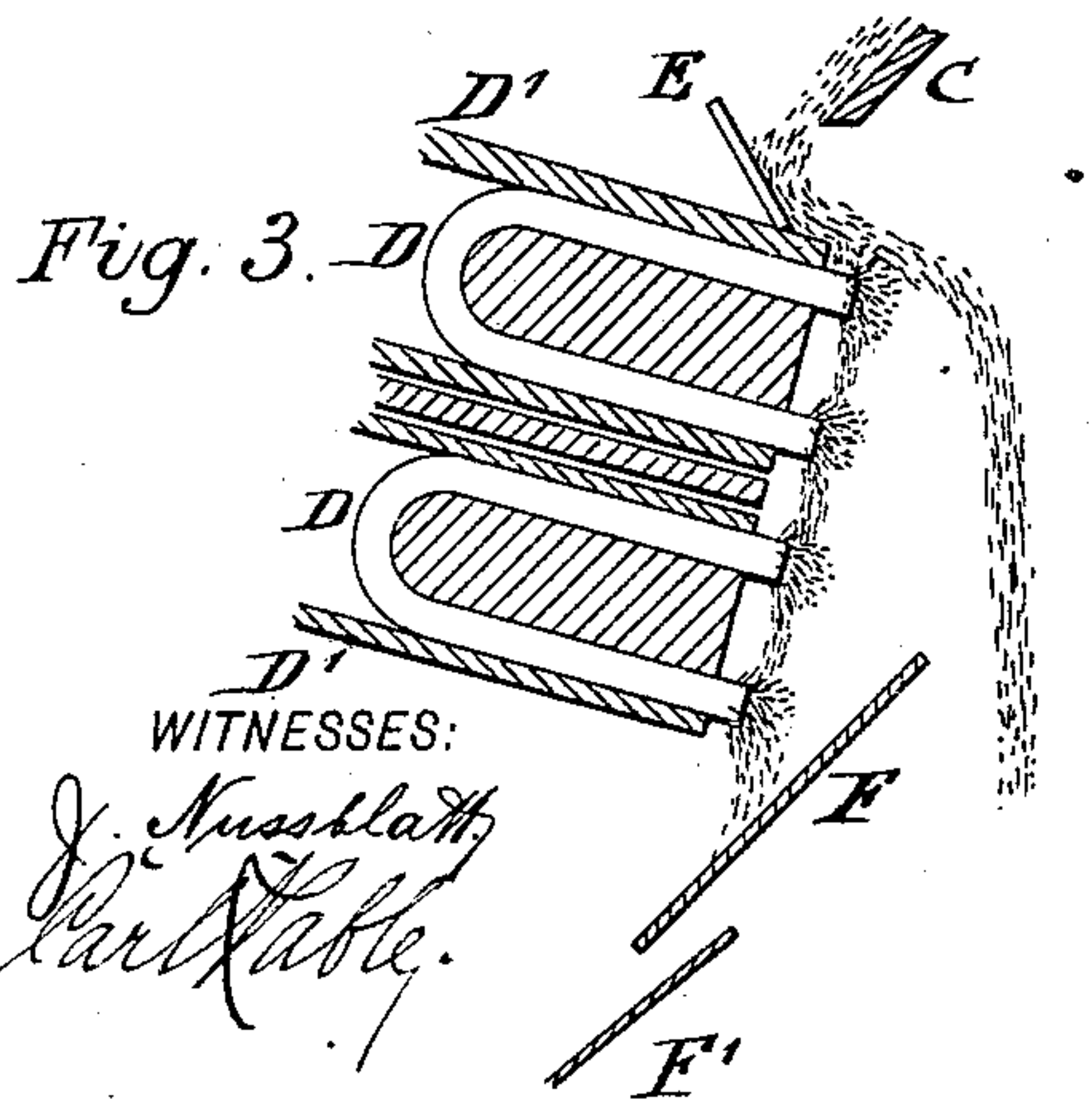
2 Sheets—Sheet 1.

No. 538,320.

Patented Apr. 30, 1895.

Fig. 1.

Fig. 2.



WITNESSES:

J. Nussblatt
Car. Table.

Fig. 4. *D'* *E* *C*

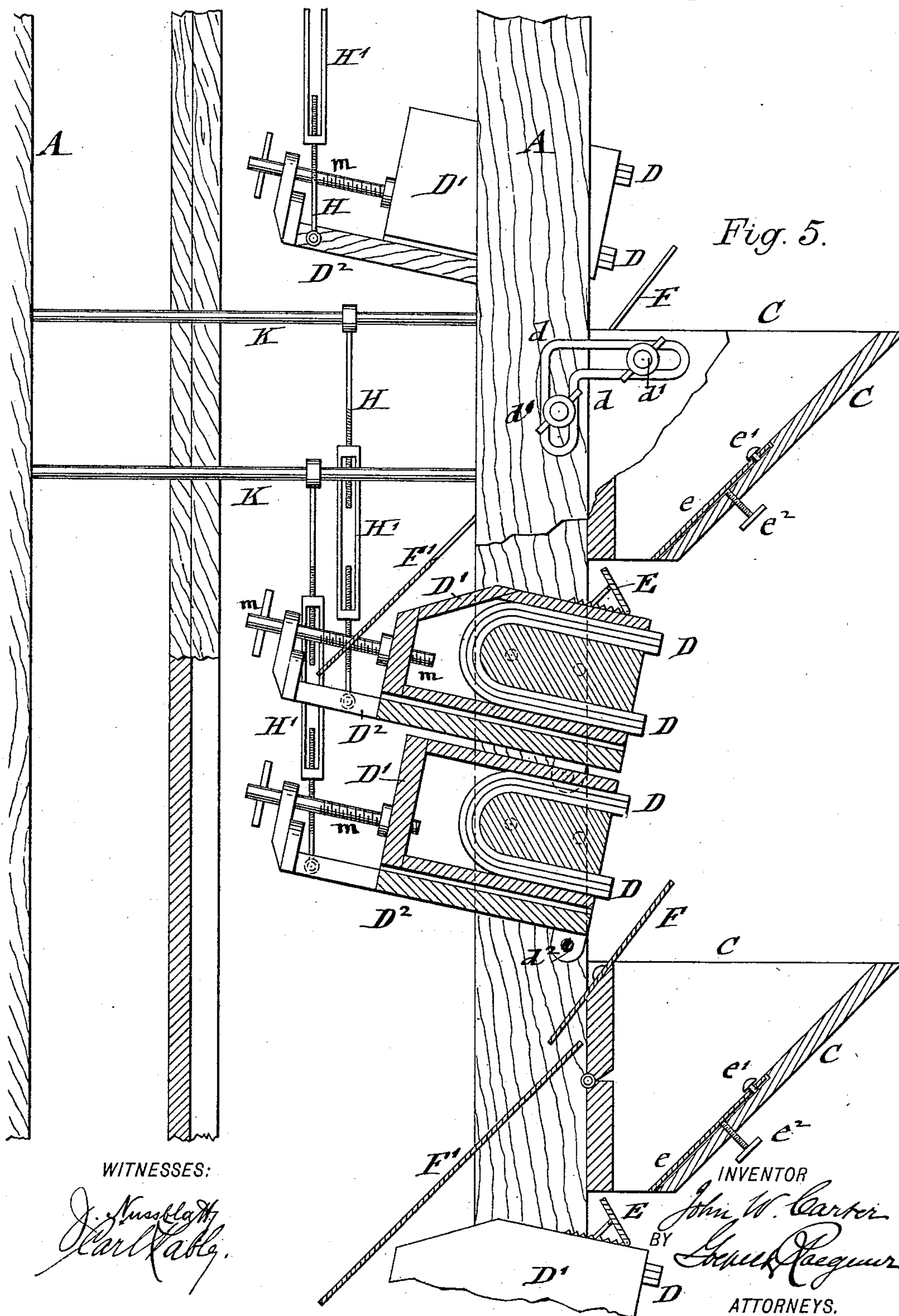
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2 Sheets—Sheet 2.

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Patented Apr. 30, 1895.



UNITED STATES PATENT OFFICE.

JOHN W. CARTER, OF BROOKLYN, NEW YORK.

MAGNETIC ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 538,320, dated April 30, 1895.

Application filed December 30, 1893. Serial No. 495,211. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. CARTER, a citizen of the United States, residing in Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Magnetic Ore-Separators, of which the following is a specification.

This invention has reference to certain improvements in that class of machines which are known as magnetic ore-separators in which a number of permanent magnets are arranged in gangs one below the other, and over which the ground ore is passed by gravity so that the magnetic particles of ore are separated from the non-magnetic particles in a quick and reliable manner.

The invention consists of an ore-separator in which a series of permanent magnets is arranged below the supply-hopper in such a manner that the lower pole-ends are receding below the upper pole-ends, which latter are in the path of the falling material, that is conducted from the hopper over a magnetic deflecting-plate that is arranged above and at a short distance back of the upper pole-ends of the magnets, so that the magnetic ore-particles are separated from the non-magnetic particles in their passage over the deflecting-plate and upper pole-ends, and gradually conducted to the lower pole-ends, while the non-magnetic particles are dropped by gravity and collected in a separate receptacle from the magnetic particles.

The invention consists further of certain details of invention which will be fully described and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a side elevation of my improved magnetic ore-separator, showing the same arranged with three gangs of stationary magnets, one below the other. Fig. 2 is a front elevation of the same. Figs. 3 and 4 are detail vertical sections, drawn on a larger scale, showing two different arrangements of the stationary magnets; and Fig. 5 is a side elevation partly in vertical section of one gang of magnets and its supply-hopper drawn on a still larger scale.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents the frame of my improved ore-separating ma-

chine, on the top of which is arranged a supply-hopper B into which ground ore is placed. From the supply-hopper B the ore passes into a second hopper C that is arranged vertically below the supply-hopper B. The hopper C is attached by means of slotted angle-bars d and screws d' to the supporting-frame A, the angle-bars being attached to the side walls of the hopper C and the side posts of the frame A, as shown clearly in Figs. 1 and 5. Below the hopper C are arranged two series or rows of permanent magnets D which together form a gang. The magnets D are supported in boxes D' , of wood or other non-magnetic material which are guided in exterior frames D^2 , that are connected by pivots d^2 at their front ends to the posts of the supporting-frame. The rear ends of the supporting frames D^2 are supported by hanger-rods H, which are provided with turn-buckles H' , said hanger-rods being suspended by means of eyes at their upper ends from horizontal cross-rods K of the supporting-frame A. By means of the turn-buckles, the suspending rods H can be lengthened or shortened, so as to give to the magnet-holding frames D^2 and to the rows of permanent magnets in the same, the desired degree of inclination. The boxes D' in which the magnets are located, are connected with the rear parts of the frames D^2 by means of screws m , so that the boxes can be adjusted longitudinally in the frames D^2 , said boxes being guided in ways or other suitable manner on said frames. By the adjustment of the adjustable frames and boxes, one series or row of magnets D can be so arranged relatively to the other that their pole-ends are arranged in an inclined plane, so that the upper pole-ends of one row of magnets extend beyond the lower pole-ends of the same; in other words, that the lower pole-ends are located in vertical planes to the rear of the upper pole-ends, as shown in Fig. 3, or the pole-ends of the upper series of magnets may be arranged to project over the pole-ends of the lower series of magnets so that the latter are located in vertical planes successively to the rear of those above, as shown in Fig. 4.

On the top of the upper magnet-holding box D' of each gang of permanent magnets is arranged an inclined magnetic deflecting-plate E, which is located near the front edge of the

box and adapted to be adjusted on the same in any approved manner. Below the lower series of magnets of each gang is arranged a chute F, the upper edge of which is vertically below the edge of the upper pole-ends of the upper row of magnets, so that the magnetic ore-particles that are dropped from the pole-ends are collected and conducted over a second chute F' to a suitable collecting receptacle. At the inside of the inclined front wall of the hopper C is arranged a deflecting-plate *e* which is retained by a headed pin *e'* at its upper end and adapted to be adjusted by means of a set-screw *e''*, that passes through the inclined front wall of the hopper C, so that the inclination of the deflecting-plate can be adjusted and thereby the stream of ground ore thrown from the hopper to a greater or less distance according to the relative position of the deflecting-plate E from the upper pole-ends of the magnets.

The parts so far described constitute one gang, and are repeated in each gang, of which a plurality may be arranged one below the other, all being supported by the frame A, as shown clearly in Figs. 1 and 2.

The operation of my magnetic ore-separator is as follows: The ground ore to be separated is conducted from the supply-hopper B into the uppermost hopper C and from the same onto the deflecting-plate E, which is of magnetic material and to some extent under the magnetic influence of the upper series of magnets. From the deflecting-plate E, the ground ore passes over the edge of the supporting-box D' on to the upper pole-ends of the upper series of magnets. While the mass of ground ore passes over the deflecting-plate E, the magnetic ore particles are brought within the influence of the magnets and are slightly retarded in their motion, while the non-magnetic particles continue in their motion. The influence of the pole-ends on the magnetic particles and consequently the retardation of the latter increases as they approach the upper pole-ends of the upper series of magnets, while the non-magnetic particles, being not subject to magnetic attraction, are thrown forward with considerable velocity, so as to fall beyond the chute F and drop into the hopper C of the second gang of magnets. The magnetic ore-particles accumulate on the upper pole-ends of the upper series of magnets, pass gradually from the same to the lower pole-ends of the upper series and from the same to the upper pole-ends of the lower series of magnets and then to the lower pole-ends of the same. The magnetic particles accumulate gradually to such an extent as to form a continuous web or fleece-like body, which gradually permits the outermost particles to become loose and move down by friction over the web or fleece until they are dropped on the chute F and passed over the same into the collecting receptacle. The particles taken up by the hopper C containing still a small quantity of magnetic particles, they

are passed successively in the same manner over the pole-ends of the lower gangs until the entire separation of the magnetic particles from the non-magnetic is accomplished. In Figs. 3 and 4 the motion of the magnetic ore-particles from pole-end to pole-end is represented, the magnetic ore-particles being attracted around the pole-ends until a sufficient quantity is accumulated and the magnetic influence of the pole-end overcome so that they slide downward toward the next lower pole-end where they again accumulate filling up the space between the pole-ends and passing on to the next pole-ends, and so on, until they are dropped onto the chute and conducted off.

The action of the pole-ends of the magnets of the lower gang on the magnetic particles that are delivered by the hopper of the second, third, &c., gang, is the same as in the first gang, all the magnets being charged, so to say, with an armature of accumulated ore-particles whereby the remanent magnetism of the same is retained and the very effective separation of the ore from the gangue produced without any change in the trajectory of the falling material which continues to drop according to the law of gravity.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with a supply-hopper, of a series of permanent magnets, the pole-ends of which are located below the hopper, and an adjustable deflecting-plate located above and at a short distance back of the pole-ends of said magnets and in the path of the falling material, substantially as set forth.

2. In a magnetic ore-separator, the combination of a supply-hopper, a series of magnets having the extreme attractive or active surfaces of their uppermost poles directly in the path of discharge of the ore-particles and the attractive or active surfaces of the poles beneath out of said path but directly in the path of that portion of the magnetic material that has been separated by said uppermost poles, and an inclined magnetic deflecting-plate located below the mouth of the hopper and arranged above but out of contact with the attractive or active surfaces of said uppermost poles, substantially as set forth.

3. In a magnetic ore-separator, the combination of a supply-hopper for the ore-particles, two series of magnets placed one beneath the other and having the extreme attractive or active surfaces of the poles of the upper series of magnets directly in the path of discharge of the ore-particles from the supply-hopper so as to be in direct contact with the ore-particles to be treated, and having the attractive or active surfaces of the poles of the lower series of magnets at some distance back from and out of the path of the ore-particles to be separated, but directly in the path of and in direct contact with that portion of the magnetic material that has been separated by the poles of the upper series, and an inclined

magnetic deflecting-plate located below the mouth of the hopper and arranged above and out of contact with the poles of the upper series of magnets, substantially as set forth.

- 5 4. In a magnetic ore-separator, the combination, with a supply-hopper, of a series of permanent magnets located below the hopper, a box for supporting said magnets, a pivoted frame for guiding said box, means for
10 adjusting the box on said frame, and means

for adjusting the inclination of said frame, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOHN W. CARTER.

Witnesses:

PAUL GOEPEL,
K. R. BRENNAN.