

(No Model.)

2 Sheets—Sheet 1.

G. W. L. CARTER.

MAGNETIC ORE SEPARATING MACHINE.

No. 292,096.

Patented Jan. 15, 1884.

Fig. 1.

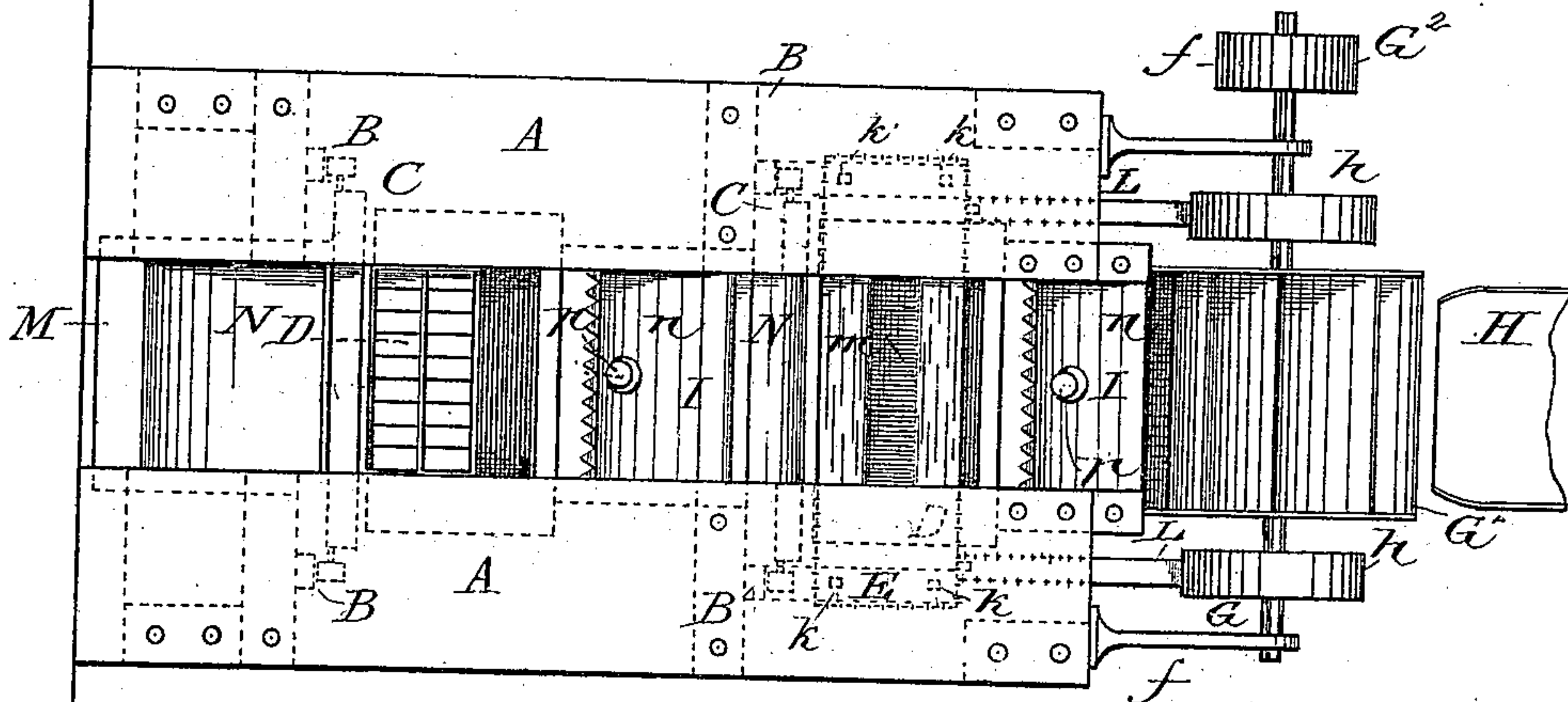
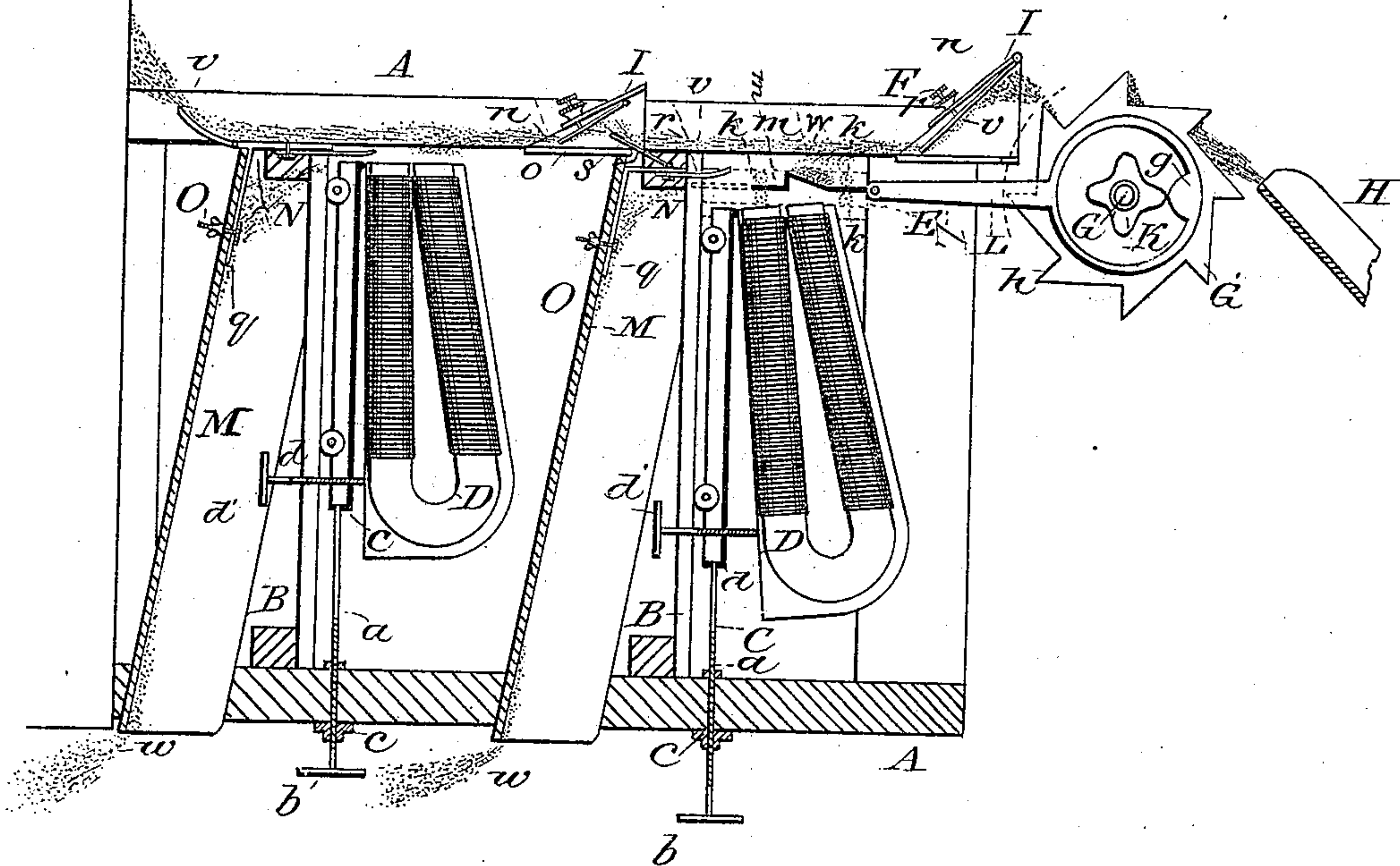


Fig. 2.



WITNESSES

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(No Model.)

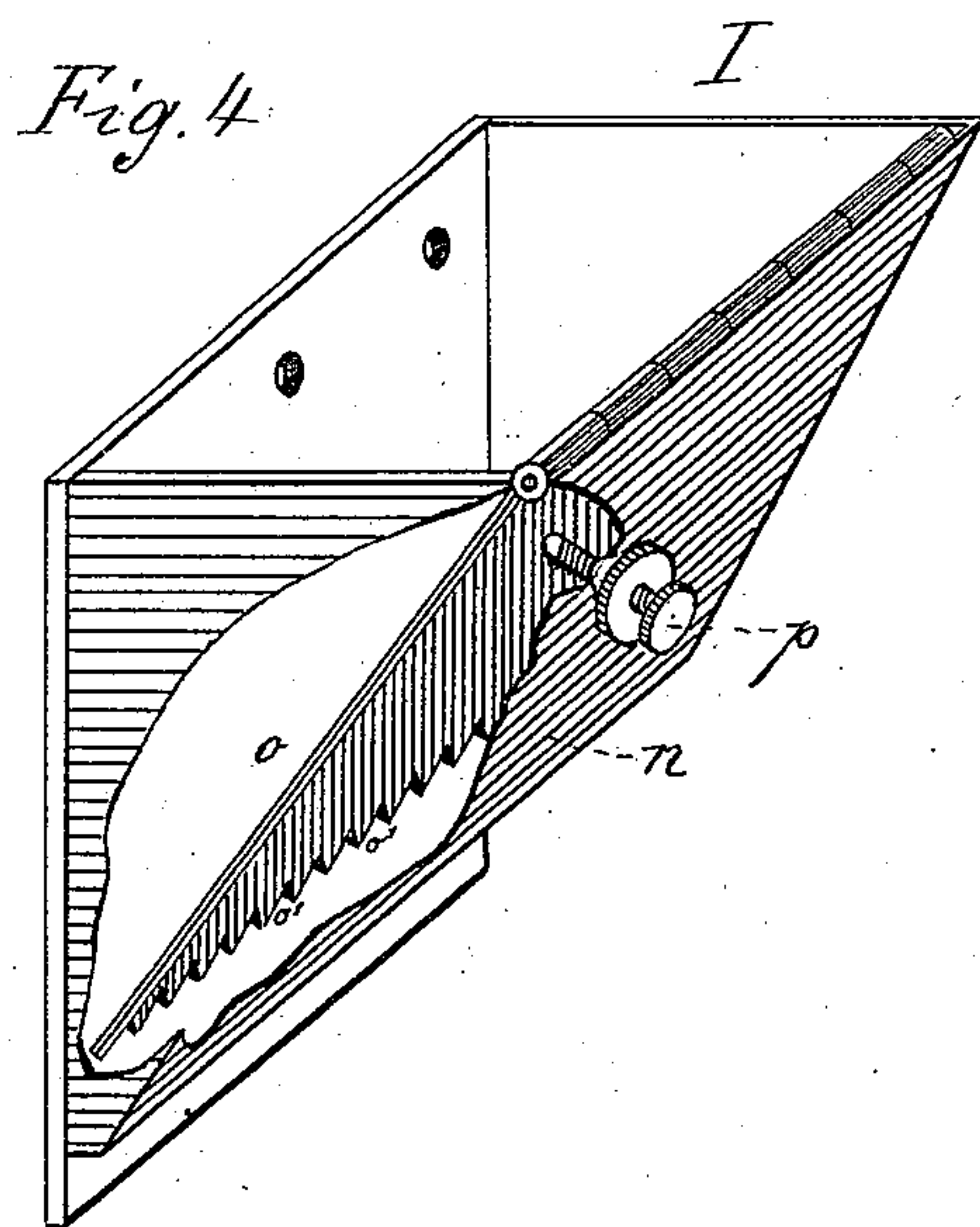
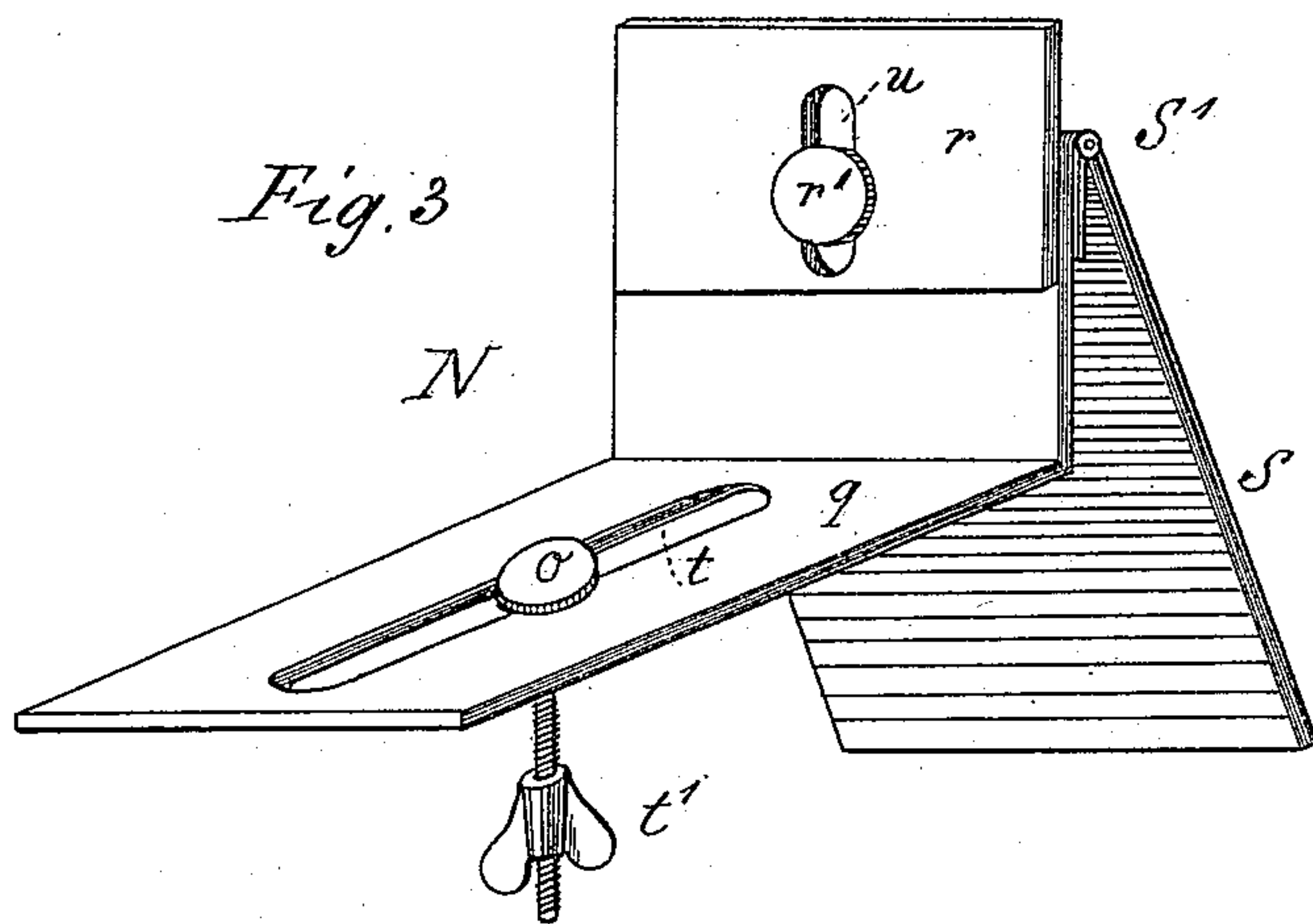
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UNITED STATES PATENT OFFICE.

GEORGE W. L. CARTER, OF NEW YORK, N. Y.

MAGNETIC ORE-SEPARATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 292,096, dated January 15, 1884.

Application filed April 1, 1882. Renewed March 5, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. L. CARTER, of the city, county, and State of New York, have invented a new and useful Improvement in Magnetic Ore-Separating Machines, of which the following is a specification.

This invention relates to that class of magnetic machines or devices that are designed for separating the magnetic particles of ore from the non-magnetic particles thereof, the ore being first reduced to the condition of sand or powder.

The invention consists of a device composed of one or more simple or compound magnets or groups of magnets mounted on a suitable frame and made adjustable by screws or other devices, so that their faces may be presented at any desired angle to and distance from the falling stream of ore to be treated; of a non-magnetic shield or septum of novel design, for preventing the adherence of the magnetic particles of the ore to the faces of the magnets, arranged between the faces of the magnets and the stream of falling ore, and adapted to be moved vertically and intermittently up and down; of an adjustable hopper designed for regulating the breadth and thickness of the stream of falling ore and for directing it past the magnet-faces; of one or more adjustable plates fixed below the magnets, and designed for directing the magnetic and non-magnetic particles of the ore in contrary directions, and of other novel mechanisms for facilitating the operation of the device, all of which will be hereinafter set forth and claimed.

Figure 1 is a front elevation of the device. Fig. 2 is a sectional side elevation of the same. Fig. 3 is an enlarged perspective view of the adjustable division-plate. Fig. 4 is an enlarged perspective view, with parts removed, of an adjustable hopper.

Similar letters of reference indicate corresponding parts.

In the drawings, A represents the rectangular frame of the machine, constructed, preferably, of wood, and having fixed within it one or more pairs of horizontal rails, B, which support the adjustable cars C, upon which the magnets D, which may be permanent or electro-magnets, are mounted. These cars C are designed to be moved forward or rearward at will by means of attached screws a, that are

turned by hand-wheels b and project rearward through nuts c, that are secured on the back of the frame A, whereby the magnets D may be adjusted close to or at a distance from the septum or shield E, for the purpose of attracting the magnetic particles of ore with more or less force, as may be desired. Screws d, turned by hand-wheels d', and passing up through the cars C against the lower sides of the magnets D, are designed for elevating or depressing the rear ends of said magnets D, and thereby presenting their faces at any desired angles to the septum E and falling stream of ore, (indicated at F,) for the purpose of facilitating the separation of the magnetic from the non-magnetic particles of ore; for if the faces of these magnets be angularly presented, with their lower portions retired, the magnetic particles of the ore, if the septum E were inclined at the same angle, as may well be, would be inclined in their descent from the plane of the magnetic field to diverge farther from the falling stream of the non-magnetic particles.

A horizontal shaft, G, is supported in standards f, that are fixed on top of the frame A, and on this shaft G is secured a longitudinally-grooved drum, G', that is designed to be reversed by power applied to the pulley G², or by the weight of falling ore. This drum G' receives in its grooves the ore delivered from a chute or hopper, H, and discharges it into the upper hopper I. On said shaft G, at either end of the drum or wheel G', is secured a cam, K, and encircling these cams K, with their interior eccentric projections, g, resting thereon, are the straps h of the connecting-rods L, to the lower ends of which is pivoted the septum or shield E, that is designed to be moved up and down in front of the magnets D, to prevent the contact of the magnetic portions of the ore with the magnets, said septum E being guided and held at its edges between rollers k k, that are fixed on the frame A. The septum E is designed to be of non-magnetic metal or other substance, and to have formed across its outer face a re-entering angle or depression, m, opening downward, for a purpose hereinafter set forth.

In the drawings are shown two adjustable hoppers, I I, fixed in the frame A, each just above and in front of its corresponding magnet or group of magnets, D. Each hopper I

has for its inclined face two plates, *n o*, respectively, the plate *n* forming the fixed front of the hopper, and being of less depth than the inner plate, *o*, which is hinged to it at the top, thereby leaving a suitable space in the hopper-bottom for the discharge of the ore. The plate *o* is adjustable, may be raised or lowered to increase or diminish the opening in the hopper-bottom by means of a set-screw, *p*, passed through the plate *n*, and has its lower edge serrated, as shown at *o'*, for the purpose of causing a more even flow of the ore from the said hopper.

Beneath each magnet or group of magnets *D* is fixed in the frame *A* a chute, *M*, inclining rearward and downward, for the reception and delivery of the magnetic particles of the ore that may be separated from the gangue.

On each chute *M*, at the front and highest point thereof, is fixed a division or separating plate, *N*, at points immediately below the faces of their respective magnets or magnet-groups. Each division-plate *N* is composed of three plates of metal, *q r s*, respectively. The plate *q* is bent at nearly a right angle, and has a slot, *t*, formed in its lower or horizontal portion, and is adjustably secured in position on a chute, *M*, so as to be moved nearer to or farther from the stream of falling ore, by a clamp or set-screw, *O*, that passes down through the slot *t* and through the chute *M*, and has a thumb-nut, *t'*, on its lower end, as shown in Fig. 3. The plate *r* has a vertical slot, *u*, and is adjustably held to the vertical portion of the plate *q* by means of a set-screw or clamp, *r'*, that passes through said slot *u*, as shown, whereby the plate *r* may be made to approach to or recede from the lower part of the faces of the magnets *D*, for the purpose of dividing or separating the falling streams of magnetic and non-magnetic particles of ore at a higher or lower point of elevation. The plate *s* is secured to the top of the upright portion of the plate *q* and on the back thereof by means of a hinge, *s'*, and extends downward sufficiently, and at a suitable angle, to rest upon the upper edge of the back of a hopper, *I*, beneath it. The magnets or magnet groups *D*, septum *E*, hoppers *I*, and division-plates *N*, with their adjuncts or co-operating parts, may be duplicated in this device as often as may be desirable for effective work.

In operating this ore-separator the ore, sand, or powder fed from the chute *H* upon the revolving drum or wheel *G'* is thereby delivered into the upper hopper *I*, whence it falls in a wide stream (whose thickness is regulated by the adjustment of the plate *o*) in front of the septum *E*, against or close to the rear face of which the magnets *D* are suitably adjusted. The septum *E* at the same time is moved by the cam *K* vertically up and down several times at each revolution of the shaft *G*, before the faces of the magnets *D*, with a stroke or throw of sufficient extent to carry the septum depression *m* from about the center of the magnetic field to a point below the said field and back

again. As the ore falls from the upper hopper *I*, the non-magnetic portion, containing, perhaps, some magnetic particles, gravitates straight downward into the lower hopper *I*, whence it passes down in front of a second magnet or group of magnets, *D*, as shown, before which there may be another septum, *E*, connected with the upper one, for a further or complete separation of the magnetic ore particles; and, finally, the non-magnetic ore particles discharge from off the lower plate, *v*, into some suitable receptacle. In the meanwhile the magnetic particles of the ore are attracted by the magnet *D* to the outer face of the septum *E*, and at first to that portion thereof that is above the depression *m*, as indicated in Fig. 2, wherein the non-magnetic portion of the ore is indicated at *v* and the magnetic portion at *w*. As the septum or armature *E* is moved upward the ore particles adhering thereto above the depression *m* are drawn down by the magnetic attraction, so that they will accumulate in the said depression *m*, and on the downward motion of the septum *E* the magnetic ore particles are retained in the depression *m*, which prevents them from moving upward again into or opposite the magnetic field until they are carried by the motion of said septum or armature below the magnetic field and its influence, when they fall by gravity inside of the plate *r* of the division-plate *N* into the chute *M*, whence they are discharged into a suitable receptacle.

In lieu of the movable septum *E*, a fixed septum may be placed over the faces of the magnets, to prevent the contact therewith and adherence thereto of the magnetic particles of ore, and some convenient device may be applied for intermittently removing said particles from such septum.

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

1. The combination, with a magnet or magnets and a hopper arranged to deliver the material in a stream past said magnet or magnets, of a septum or shield separated from the magnet or magnets and arranged between the same and the path of the falling material, and at one side of said path, so that the non-magnetic material will fall clear of the septum or shield, while the magnetic particles, being attracted, will diverge and come against said septum or shield, substantially as described.

2. The combination, with a magnet or magnets and a hopper arranged to deliver the material in a stream past said magnet or magnets, of a reciprocating shield or septum arranged between the magnetic poles and the path of said stream, so that the non-magnetic material is carried past the septum or shield, while the magnetic particles are attracted to and collected on it, substantially as described.

3. The combination, with the magnet or magnets, of a reciprocating septum or shield provided with an offset or recess, substantially as described, for collecting and discharging the magnetic particles, as set forth.

4. The combination, with a hopper and a magnet or magnets arranged below and at one side of the hopper-outlet, not directly beneath the same, of means, substantially as described, for
5 adjusting the angle of the magnet or magnets with respect to the stream of material falling from the hopper, as set forth.

5. The combination, with the magnet or magnets of a magnetic separating-machine,
10 and a hopper arranged to deliver the stream of material in front of said magnet or magnets, of means, substantially as described, for adjusting the angle of the magnet or magnets to the falling stream, substantially as described.

15 6. A magnetic ore-separator constructed substantially as herein shown and described, containing the following elements: adjustable magnets, adjustable hoppers, and adjustable division or ore-separating plates, said magnets
20 being arranged below and at one side of the hopper-outlets, not directly beneath the same,

and the said plates below the magnets between the poles thereof and the direct path of the falling material, as set forth.

7. In a magnetic ore-separator, the combination, with the adjustable magnets D, of the
25 car C and adjusting-screws *a d*, substantially as and for the purpose described.

8. In a magnetic ore-separator, as a means
30 for dividing or separating the falling streams of the magnetic from the non-magnetic ore particles, the combination, with the magnets and their support, of a division-plate, N, constructed, substantially as herein shown and described, of rectangular slotted plate *q*, vertical
35 slotted plate *r*, set-screw *r'*, and hinged plate *s*, arranged and operated as set forth.

GEORGE W. L. CARTER.

Witnesses:

HENRY STEWART, Jr.,
JACOB J. STORER.