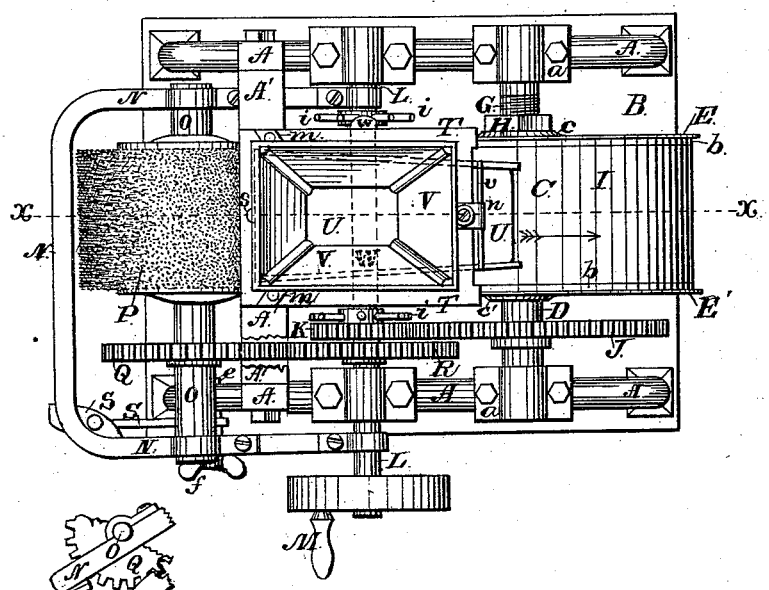
B. FITTS.

Magnetic Metal-Separator.

No. 208,163. Patented Sept. 17, 1878.

Fig. 1.



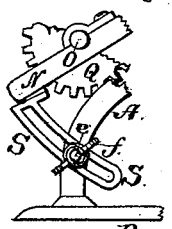


Fig. 4.

Fig. 2.

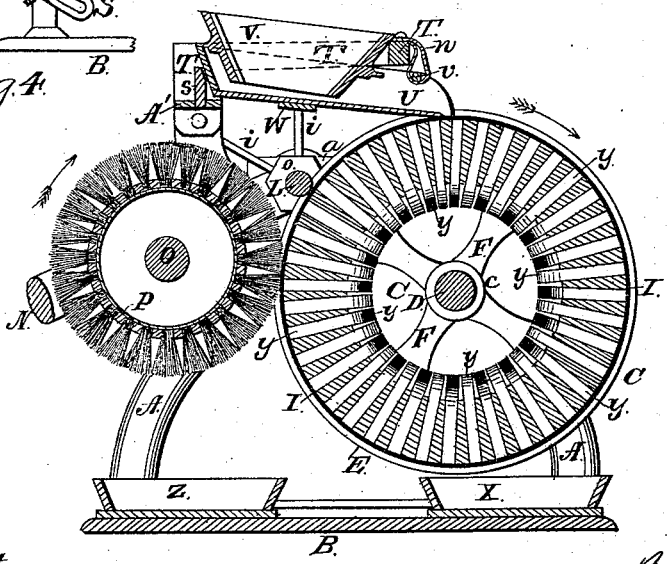
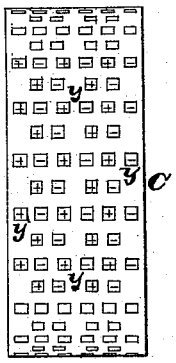


Fig. 3.



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UNITED STATES PATENT OFFICE.

BENAIAH FITTS, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN MAGNETIC METAL-SEPARATORS.

Specification forming part of Letters Patent No. **208,163**, dated September 17, 1878; application filed May 27, 1878.

To all whom it may concern:

Be it known that I, BENAIAH FITTS, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Magnetic Metal-Separators; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification, in which—

Figure 1 represents a plan view of a machine embodying my improvements, and Fig. 2 a vertical section taken through line *x x* in Fig. 1. Fig. 3 is a face elevation of the magnet-wheel with the covering-ring removed. Fig. 4 represents a detail view, on a reduced scale, of a portion of the brush-adjusting devices.

My invention relates, first, to a new and improved mode of constructing the magnet; and consists in arranging the magnets in proper position in radial lines, and then securing them together by cement, the ends of the magnets reaching through to the face of the cylinder.

It also consists in combining a rotating stripping-brush, adjustable or otherwise, with a cylinder formed of one or more series of permanent magnets covered with a smooth ring, for a purpose to be hereinafter described.

It further consists in combining an automatically-reciprocating hopper or feed-chute with a cylinder formed of permanent magnets, and provided with a smooth ring for the purpose of feeding the material to be separated evenly over the cylinder or ring.

In the drawings, A represents a frame of suitable construction, mounted upon the floor or a bed-plate, B, and which carries the operative parts of the machine. C represents the magnet-wheel, mounted upon a shaft, D, which has its bearings *a* in the frame A. This magnet-wheel consists of a cylinder formed of permanent magnets *y*, arranged in a radial line, as shown in section in Fig. 2. When properly arranged, and so that they do not touch each other in any part, a thin cement is then poured around them and allowed to harden, they for this purpose being inclosed in a suitable matrix or mold. In forming this magnet-ring the magnets may consist either of straight magnet-bars or of the ordinary horseshoe-magnet variety. If made of the horseshoe-shaped variety, they are arranged so that their ends shall protrude through the cement to the face of the outer periphery of the cylinder, as shown in Fig. 3. As a rule, two or more rows of these magnets will be arranged around the periphery of the wheel, in which case the positive and negative poles will be arranged alternately and in zigzag lines, as represented in Fig. 3. Where the magnets consist of straight bars they will be arranged in a similar manner—that is to say, the positive end of one adjoining the negative end of the next, and so on alternately and successively. In this condition the ring C, after its surface has been smoothed evenly over, but leaving the ends of the magnets exposed, is ready to be mounted in its frame, which consists of two annular disks, E E′, each secured to a set of arms, F, and mounted on the shaft D. These disks, on their inside and at or near their periphery, carry internally-projecting flanges *b*, and which fit over the edge of the periphery of the cylinder C.

Upon the shaft D is formed a screw, G, on which works a binding-nut, H, which bears against the hub *c* of the spider-frame or arms F of one, E, of the disks E E′, whereby the cylinder C is firmly clamped between these disks, the hub *c′* of the other disk, E′, for this purpose being made to abut firmly against a shoulder formed on the shaft D at its outer side.

Thus constructed the magnet-cylinder would be ready for operation; but as in this condition the magnets would attract the iron so firmly that it would be very difficult to remove it to make it ready for a new charge by the use of an ordinary stripping-brush, I prefer to cover it with a thin strip or ring, I, of metal, such as brass, or of other suitable material, but prefer the brass ring, as such presents a smooth surface to the action of the brush and will last for a long time. This ring may be secured in any suitable manner, or clamped, if desired, underneath the flanges *b* of the disks E E′.

Power is applied to the magnet-cylinder C

through a gear, J, keyed fast to its shaft, and which meshes with a small pinion, K, on the main driving-shaft L, and which carries a crank-handle, M, or pulley, through which motion is imparted to the apparatus either from hand-power or other prime motor.

To the main shaft L is hinged a swinging frame, N, and which carries a shaft, O, in suitable bearings. On this shaft O is secured a rotary brush, P, as also a pinion, Q, which meshes with another pinion, R, keyed fast to the main shaft L, and through which rotary motion is imparted to brush P.

At one end and under side of the swinging brush-frame N is secured a curved slotted arm, S. (See Figs. 1 and 4.) The curve of the slot is formed from a radius-line from the center of the driving-shaft L. Into this slot projects a screw-bolt, *e*, on the end of which is arranged a thumb-clamp screw-nut, *f*. Bolt *e*, for this purpose, is passed through one of the legs A of the main frame.

By this arrangement the brush-frame N can be adjusted with respect to the magnet-cylinder C I as to be either entirely free from or in contact with the latter, as may be desired, and for a purpose to be hereinafter referred to.

The two side frames A are connected together at top by a cross-beam, A′, and thus connected form the main frame. On the upper side of cross-beam A′ is formed or otherwise secured a frame, T, for the support of the chute U and feed-hopper V. The latter is simply arranged or placed on its top, it, for this purpose, being provided with ribs or flanges on its sides, which project over and rest upon the top of frame T.

Chute U is swung from frame T, its rear end for this purpose being suspended by two straps, *m*, one at each side, from frame T, and its front end by one strap, *n*, and which, for this purpose, at its lower end, is formed into a loop, which passes around a cross-bar, *v*, secured to the upper edges of the sides of the chute, and thereby supports its front end, as shown in Fig. 2. The chute thus suspended is capable of receiving a jerking back-and-forth movement from side to side. This motion it is desirable to impart to the chute, as well to distribute the material to be separated evenly over the surface of the magnet-wheel as to insure its discharge from the chute. To this end a bar, W, is rigidly secured to the under side of the chute U. This bar is made longer than the width of the chute, so that its ends shall project beyond its sides. The ends are then rounded or inclined. Against each of these ends a series of rotating arms, *i*, play. Each series of these arms *i* are mounted in a hub, *o*, and the hub on the driving-shaft L, there being one hub and one series of arms on each side of the chute, as shown in Fig. 1. The one set of arms is so arranged on shaft L with respect to the other set that one arm of each will alternately strike the opposite end of the bar W, and thus impart a sidewise back-and-forth movement to the chute. To prevent too much back end play, a stop-pin, *s*, is secured to the upper side of the cross-beam A′ immediately in the rear of the chute.

Thus constructed, the operation is as follows: The material to be separated is placed in the hopper, whence, through suitable devices, if desired, it can be fed to the chute in regulated quantities, or simply allowed to pass down to the chute through a suitably-sized opening, and, motion having been imparted to the apparatus through the main shaft L, the material is then fed to the magnet-cylinder C, either with or without covering-ring I; but the latter is preferred. This feeding is effected by the action of the two series of arms *i* upon the ends of the bar W of the chute U. As the feeding goes on the cylinder C and brush P are made to rotate in the direction of their respective arrows. The magnets in cylinder C attract the iron, and cause it to adhere thereto, but exert no influence upon the mineral matter of the ore or the copper or brass filings with which the iron may be mixed. Consequently, as wheel C revolves, the mineral or brass chips or filings drop off by their gravity, when in position so to do, and fall into the trough or vessel X arranged below the cylinder at that side, while the iron is carried around and is swept off by the brush P on the other side of the cylinder into the trough or vessel Z arranged for its reception.

By means of the slotted arm S and thumb-screw, the brush is raised entirely free from contact with the cylinder, as when the machine is not intended to be used, the object of which is to allow the cylinder C to remain charged with the iron, in order to retain the power of the magnets. When it is intended to use the machine, the brush is then lowered to the proper position for stripping the iron from the cylinder.

On the bed-plate of the frame, or on the floor, should none be used, if desired, guide-rails may be arranged for keeping the troughs X and Z in place. Ordinarily for this purpose the bottom of the troughs will project beyond their sides, forming tongues, which take into a groove formed in the guide-rails. This allows the troughs to be drawn out as far as may be necessary to receive the material as it falls from the magnet-cylinder, and be pushed back again out of the way when not in use, the troughs being supported when drawn out by the tongues on their sides bearing against the portion of the rails which form the upper side of the grooves.

The machine is intended for separating iron ores from the earthy or mineral matters with which they are combined, the ore for this purpose being first reduced to a powder. It is, however, mainly intended for separating brass and copper filings from the iron filings with which they generally get mixed in machine-shops. But the machine may be used for any other analogous purpose to which it can be usefully applied.

Having described my invention, what I claim

as new, and desire to secure by Letters Patent, is—

1. A magnet-cylinder, C, composed of one or more series of permanent magnets, Y, held together by cement, in the manner substantially as set forth.

2. The mode of securing the magnets together to form a cylinder by means of a cement composition, as set forth.

3. The adjustable stripping-brush P, as arranged and operated, for the purposes set forth.

4. The combination of the reciprocating feed-chute U, bar W, double series of actuating-arms *i*, and driving-shaft L with a rotating magnet-cylinder, C, substantially as and the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

BENAIAH FITTS.

Witnesses:
D. G. STUART,
P. HANNAY.