(No Model.)

2 Sheets—Sheet 1.

W. H. WILLIAMS.

MAGNETIC SEPARATOR.

No. 528,054. Patented Oct. 23, 1894.

Fig. 1.

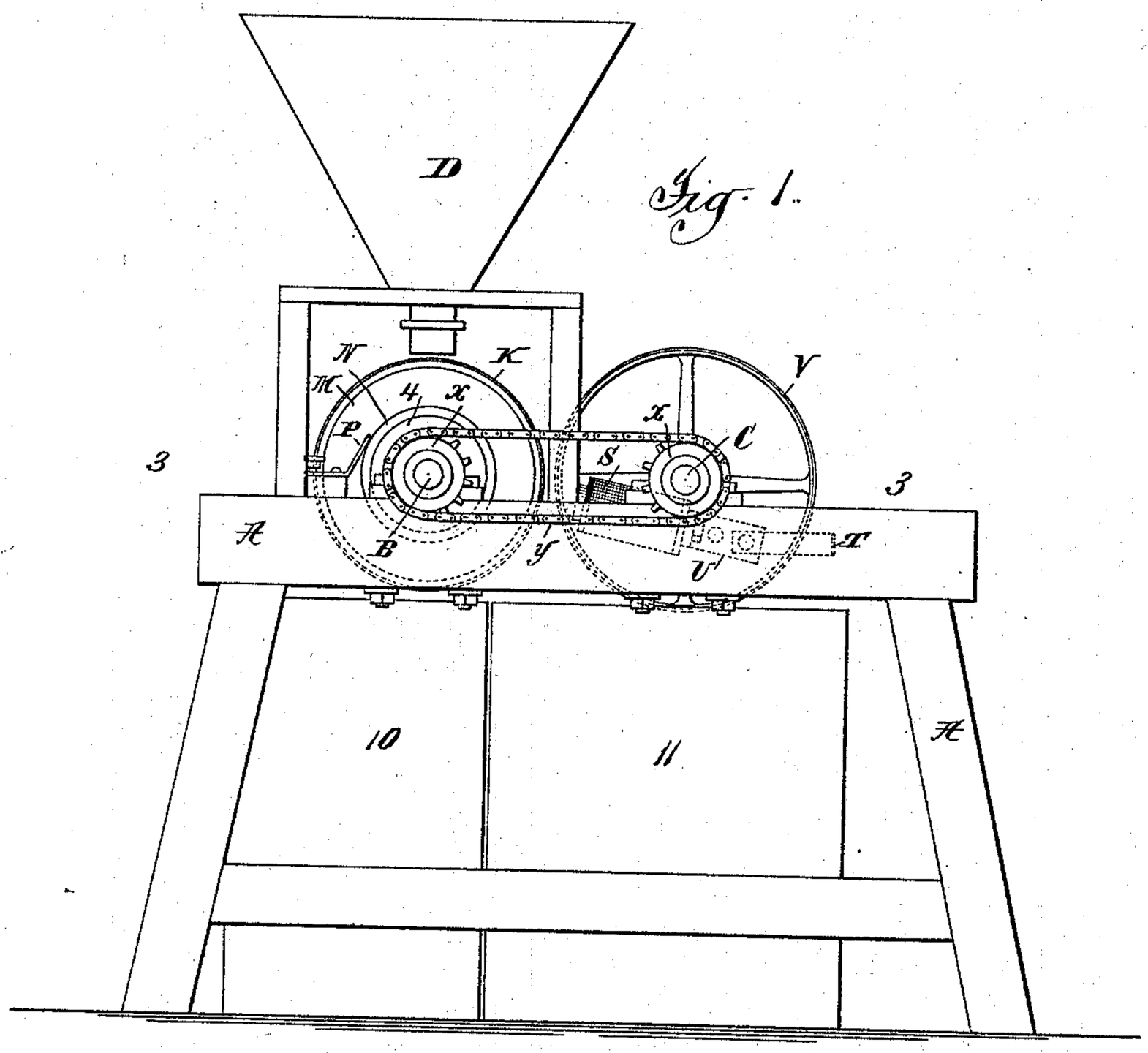
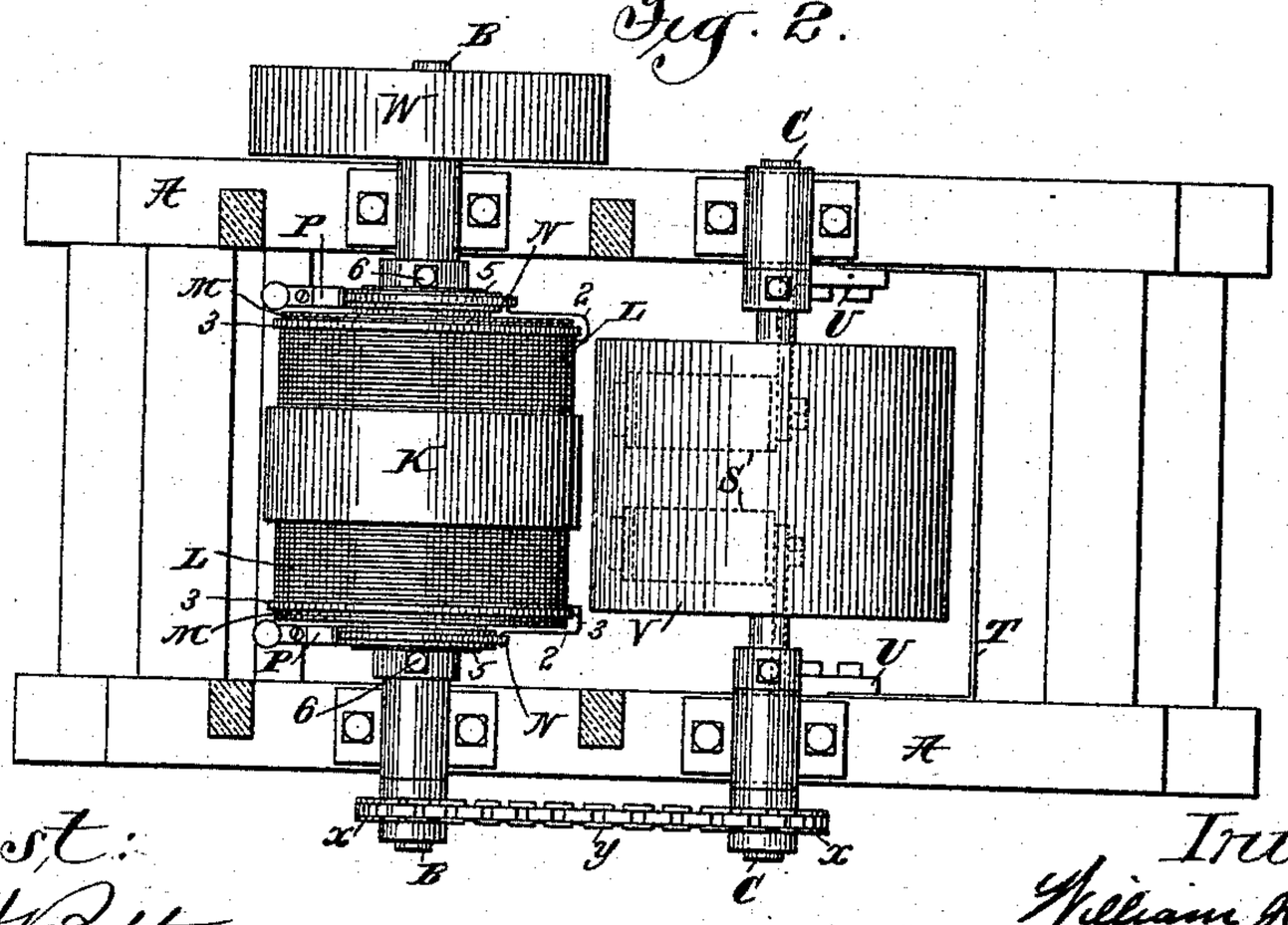


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

W. H. WILLIAMS.

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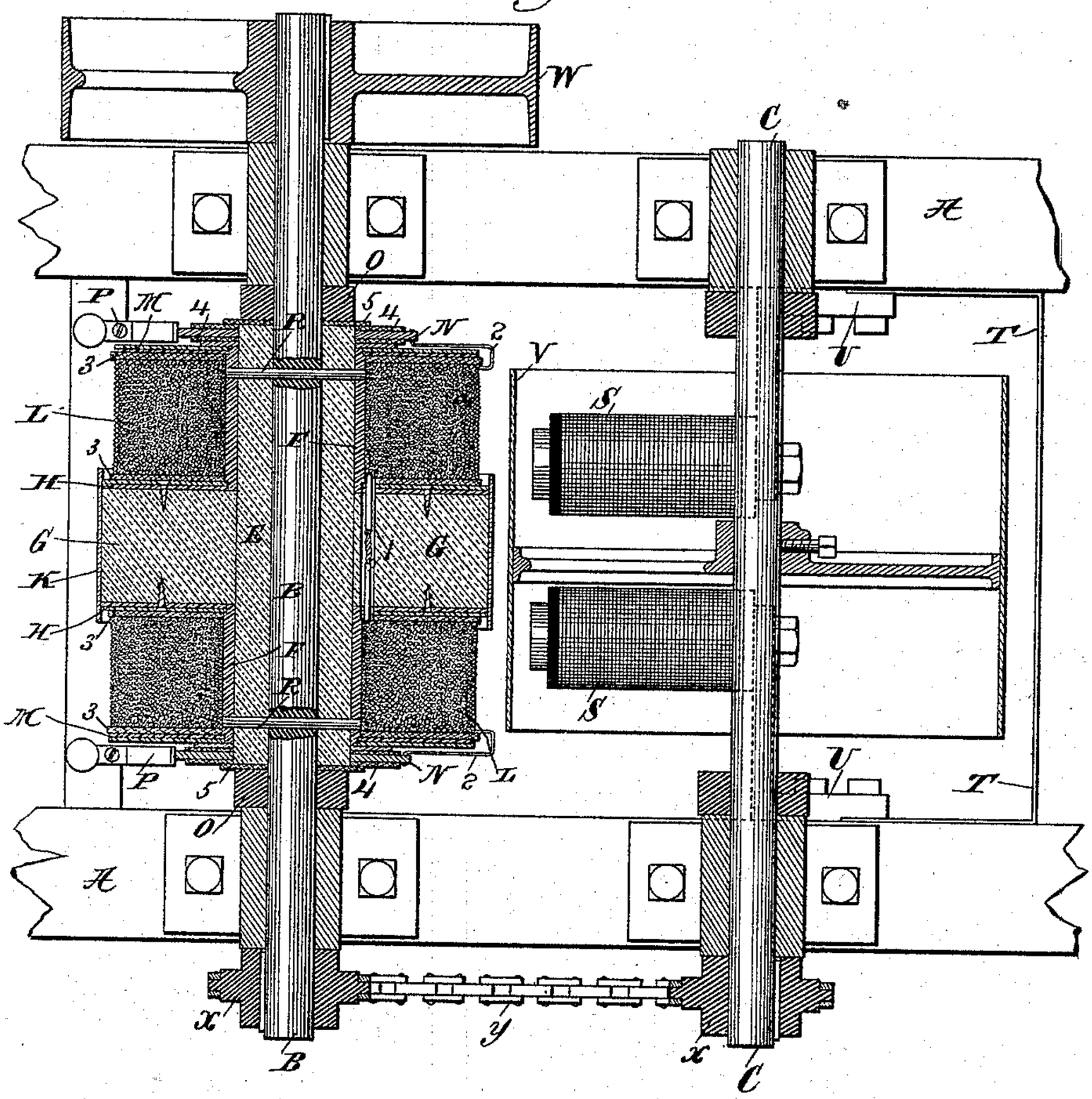
Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM H. WILLIAMS, OF NEWARK, NEW JERSEY.

MAGNETIC SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 528,054, dated October 23, 1894.

Application filed January 29, 1892. Serial No. 419,684. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. WILLIAMS, a citizen of the United States, residing at Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Magnetic Separators, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to that class of machines known as magnetic separators, in which magnetic force is applied to effect the separation of magnetic from non-magnetic material mixed therewith, its object being to provide a simple, convenient and cheap machine of this class which shall be more efficient than those heretofore in use.

In my application, Serial No. 397,707, dated June 27, 1891, I have described a magnetic separator providing a continuous revolving magnetic separating field and having a non-magnetic separating drum therein, said field being formed by an electric magnet having its helices placed end to end with the poles adjacent, and rotating on an axis central to the cores, the outer ends of the cores being yoked together to form the magnet and establish the poles at the inner adjacent ends of the helices, by means of a bar connecting the outer ends of the poles, preferably inside the magnetic field and separating drum.

One object of the present invention is to improve the general construction of this machine, and to provide an improved machine of this class.

A further object of the invention is to provide improved means for removing separated magnetic material from the separating drum of a magnetic separator. I attain this object by the use of an electro magnet placed with its poles adjacent to the separating drum, and a drum consisting of a thin plate of non-magnetic material revolving between the electro magnet and the separating drum, so that as the two drums pass each other the magnetic force in the brush drum is sufficient to attract the separated magnetic material from the separating drum to the brush drum and carry it onward, until as the brush drum passes out of the magnetic field the magnetic material is released and deposited as desired. While this part of my invention is of general application in magnetic separating machines, it has been devised in connection with my improved machine operating on the principle of my application above referred to, and will be illustrated and described as thus applied.

For a full understanding of my invention, a detailed description of a construction embodying my invention in its preferred form will now be given, reference being had to the accompanying drawings forming a part of this specification, in which—

Figure 1 is a side elevation of my improved machine in its preferred form. Fig. 2 is a plan view of the same with the feeding hopper removed, and Fig. 3 is a horizontal section taken centrally through the separating and brush drums, on line 3—3 of Fig. 1.

Referring to said drawings, A is the frame of the machine; B, a shaft mounted therein on which the separating drum is carried; C, a shaft carrying the brush drum, and D the hopper through which the material to be acted upon is fed to the separating drum.

The shaft B is of iron or other suitable magnetic material, so as to form a part of the yoke of the magnet, and upon this shaft is mounted a cylinder E of non-magnetic material, preferably wood, as shown, forming a body on which the cores and helices are carried and upon this body E are secured cylinders of iron or other suitable magnetic material F which form the cores of the magnet. A space is left between the inner ends of the cores F, and these cores are separated by a block G of non-magnetic material, preferably wood.

The cores F are provided at their inner ends with disks or flanges H which are of magnetic material, and may be formed integral with the cores F or consist of independent disks mounted thereon. The separating drum is formed of a band K, preferably of thin brass, extending about and carried by the block G and disks H. It will be understood also that this band may be omitted and the edge of the block G be depended upon to form the drum, but the band will preferably be used as providing a smooth, uniform, and durable surface.

Upon the cores F, the coils L, L forming the helices are wound, the initial wires 1 of these helices being united through the disk and

block H, G, as shown in Fig. 3, the wires being insulated from the disks H in any suitable manner. The helices L are held in place by the disks H at the inner ends of the cores F, and by the heads M at the outer ends of the same, the helices being insulated from the disks and heads by fiber disks or washers 3. The helices L, starting with the initial wires at the inner ends of the cores, are wound in opposite directions, so that the poles of the magnet are formed at the disks H. The winding is the same as though a single bar were wound continuously so as to form north and south poles at its opposite sides, and this bar divided transversely and the original ends yoked together so that the inner ends formed by the division become new poles, the winding thus being in opposite directions starting from the inner ends as the cores are brought end to end as in the construction shown.

For the purpose of supplying the current through the helices L, L to form the electro magnet, the following construction is provided: The terminal wires 2 of the helices connect with brass rings N which are mounted upon the wooden cylinder E outside the heads M and insulated from the heads by fibre washers 4 on each side, these rings being insulated by washers 5 from the collars O by which the wooden cylinder E and all the parts carried thereby forming the electro magnet are held in position upon the shaft, these collars being preferably secured upon the shaft by set screws 6, as shown, so that the parts may readily be removed. Connection is made with these brass rings N by the brushes P connected with the current wires in the usual manner, and making continuous contact with the rings N as the latter rotate with the cores F. The yoke by which the outer ends of the cores F are connected so as to establish the poles at the disks or flanges H is formed in the construction shown by the metal shaft B and by pins R which extend through the shaft B, cylinder E and cores F so as to form a connection between the cores through the shaft. The yoke is thus formed by a very simple construction and lies wholly within the magnetic field, so as not to interfere with the action of the drum during the rotation of the latter.

With this separating drum construction, any suitable means may be used for removing the separated magnetic material from the band K forming the outer surface of the drum, but I prefer the following construction which forms a part of my invention: A strong electro magnet S is mounted upon the frame A with its poles toward and adjacent to the drum. This magnet may be constructed and mounted in any suitable manner. As shown, it consists of two helices of a common construction which are yoked together by a plate or rod T connecting with the metal frame U on which the helices are mounted. A drum V of any suitable non-magnetic material, preferably of brass, surrounds the magnet and rotates with its periphery between the poles of the magnet and the separating drum and close to both, so that as the drum V passes through the magnetic field formed by the electro magnet S, the attraction will be sufficient to remove the separated magnetic material from the drum. The helices of the electro magnet S are connected in circuit in the usual manner.

The separating and brushing drums may be rotated by any suitable means. As shown, the shaft B is provided with a pulley W by which it is driven from any suitable source of power, and the two shafts B, C, are driven in unison by sprocket wheels X and chain Y connecting the same.

The operation of the machine will be understood from a brief description: The material to be separated is received upon the separating drum from the hopper D mounted above the same, and, as the drum and cores are rotated, the magnetic force of the magnetic field formed between the disks H acting through the band K of non-magnetic material is sufficient to attract to the band and hold thereon the magnetic material, while the non-magnetic material passes off the edge of the drum into the receptacle 10. As the drum continues its rotation, it carries the magnetic material with it past the receptacle 10 until it reaches the point opposite the electro magnet S, when the action of the magnetic field formed thereby acting through the drum V of non-magnetic material operates to attract the separated magnetic material from the separating drum to the brushing drum V, by which it is then carried downward until as the drum V passes out of the magnetic field formed by the magnet S the separated magnetic material is released and falls into the receptacle 11.

It will be understood that modifications may be made in the construction shown without departing from my invention, and that I am not to be limited to the specific construction of any of the devices shown.

What I claim is—

1. The combination of two cores and helices mounted on a shaft of magnetic material end to end with their poles adjacent, and connections between the cores and the shaft, whereby the shaft forms a part of the yoke, substantially as described.

2. The combination of two cores and helices arranged end to end with their poles adjacent, and a yoke joining the cores and central thereto, substantially as described.

3. The combination of two cylindrical cores and helices arranged end to end with their poles adjacent, and a yoke joining the cores and lying inside the cores, substantially as described.

4. The combination with shaft B, of body E and block G of wood or similar non-mag-

netic material, cylindrical cores F on said body having disks H separated by block G, and helices L on said cores, substantially as described.

5. The combination with shaft B, of body E and block G of wood or similar non-magnetic material, cylindrical cores F on said body having disks H separated by block G, and helices L on said cores, and band K of brass or other suitable non-magnetic material carried by said block and forming a separating drum, substantially as described.

6. The combination with shaft B, of body E and block G of wood or similar non-magnetic material, cylindrical cores F on said body having disks H, separated by block G, and helices L on said cores, rings N on said body to which the terminal wires are connected, and brushes P, substantially as described.

7. The combination with a magnetic separating drum, of a stationary electro-magnet forming a magnetic field adjacent to the drum, and a rotating brush drum inclosing said magnet, substantially as decribed.

8. The combination with a separating drum rotating in a continuous magnetic field, of a brush drum rotating in a non-continuous magnetic field, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM H. WILLIAMS.

Witnesses:
J. J. KENNEDY,
C. J. SAWYER.