(No Model.) 2 Sheets—Sheet 1.

W. H. WILLIAMS.

MAGNETIC SEPARATING MACHINE.

No. 528,053. Patented Oct. 23, 1894.

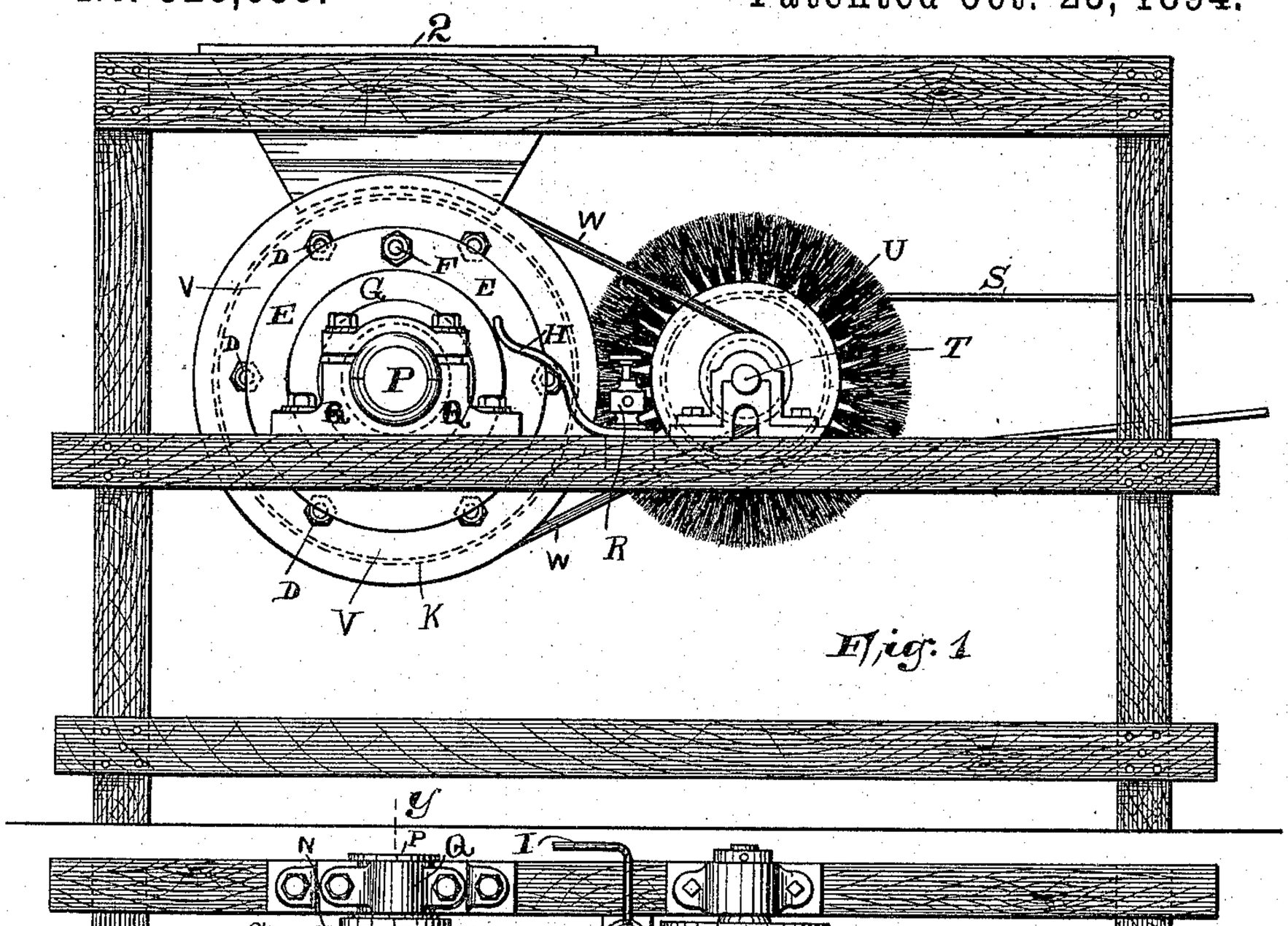

Fig. 1.

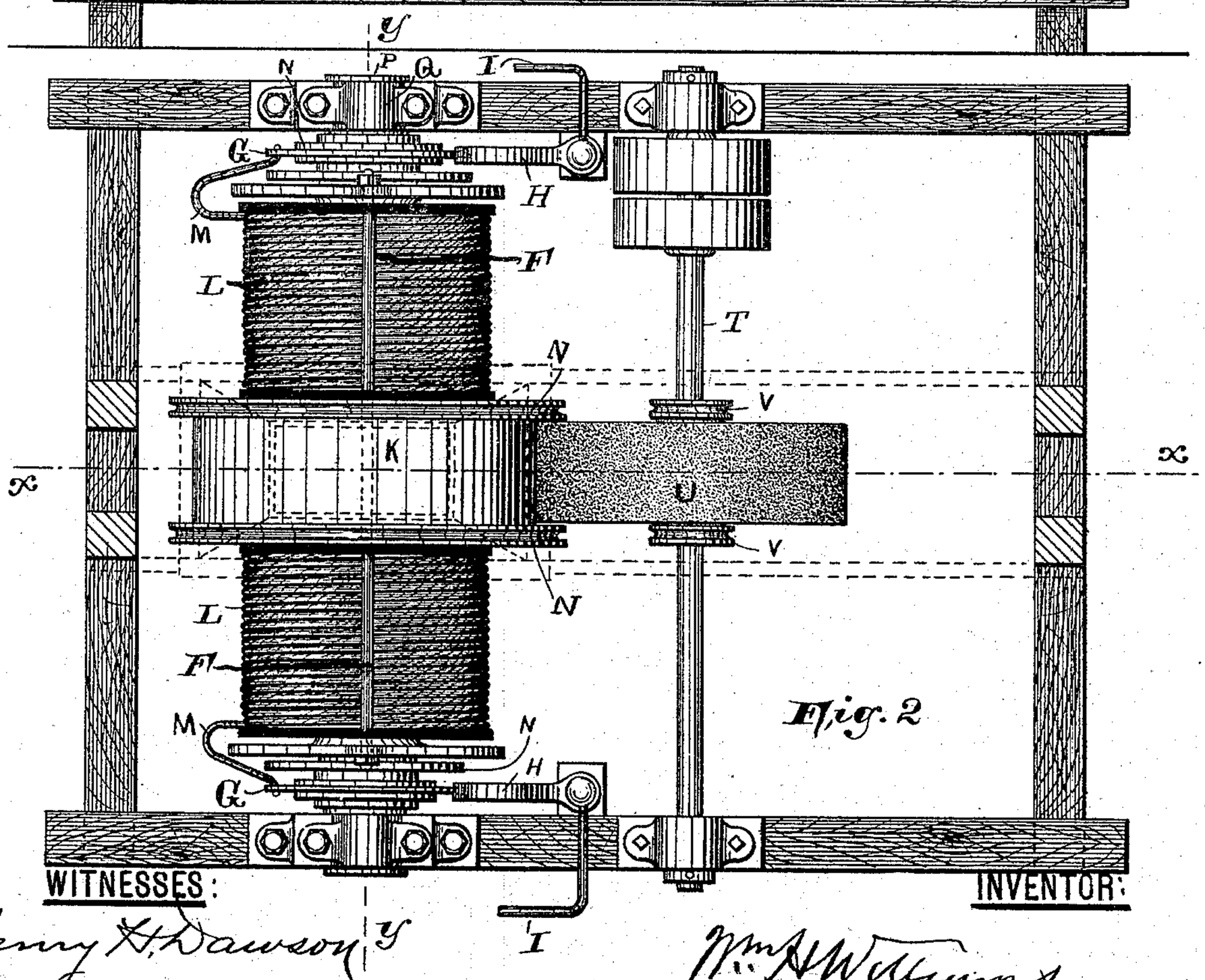

Fig. 2.

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INVENTOR:

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(No Model.) 2 Sheets—Sheet 2.

W. H. WILLIAMS.

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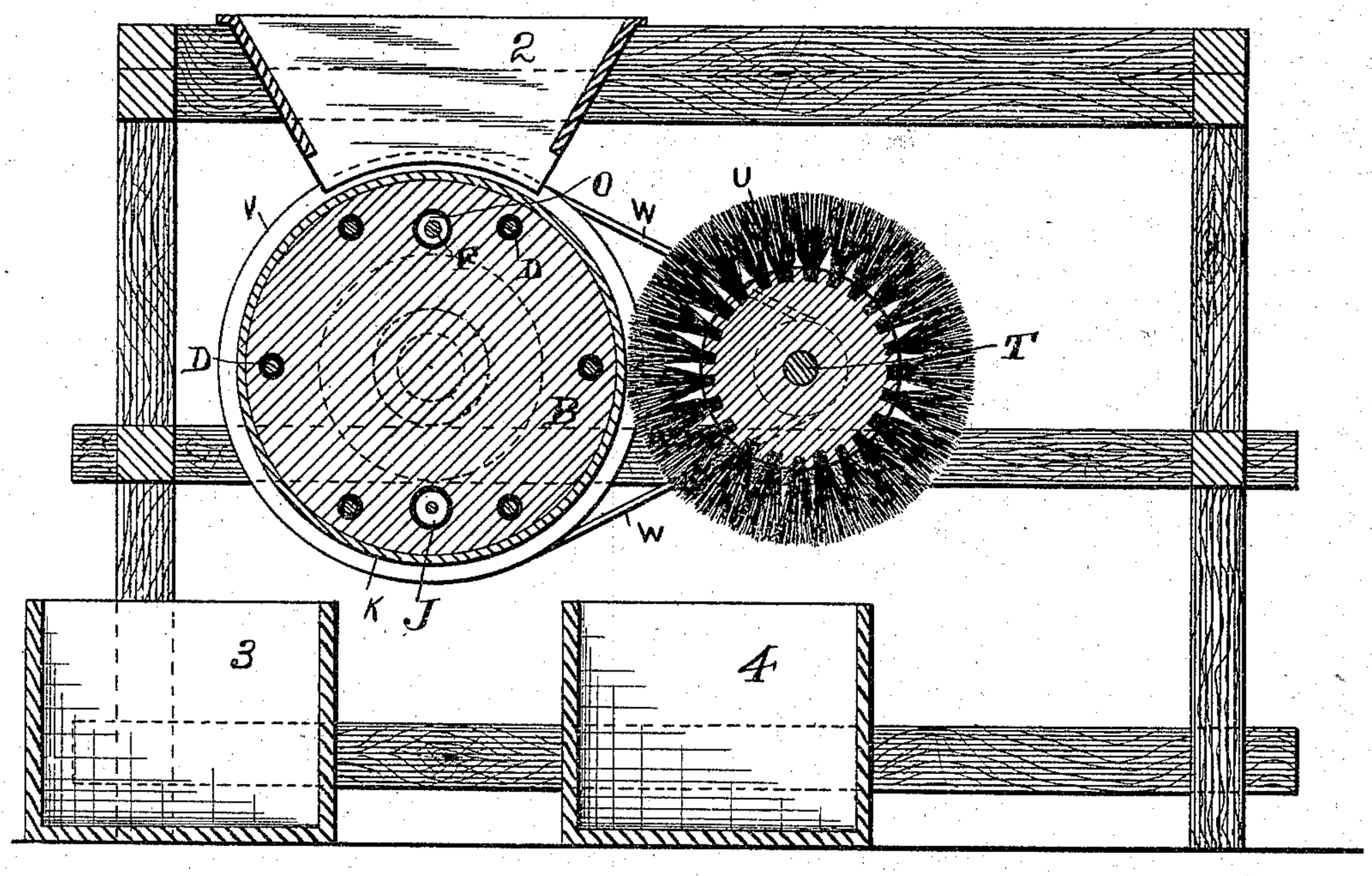

Fig. 3

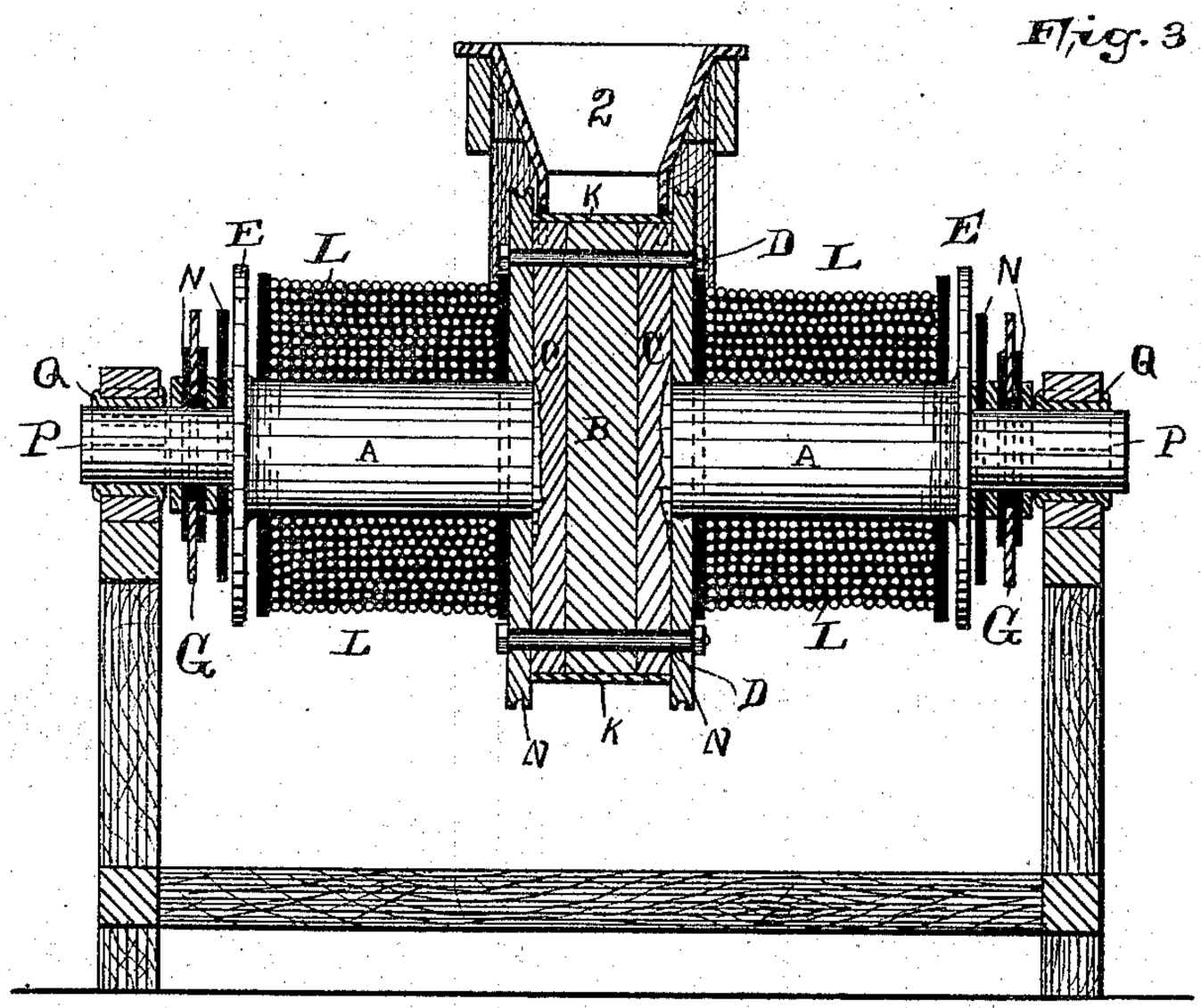

Fig. 4

WITNESSES:

Henry H. Dawson

J. K. Howell

INVENTOR;

Wm H Williams

UNITED STATES PATENT OFFICE.

WILLIAM H. WILLIAMS, OF NEWARK, NEW JERSEY.

MAGNETIC SEPARATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 528,053, dated October 23, 1894.

Application filed June 27, 1891. Serial No. 397,707. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. WILLIAMS, a citizen of the United States, residing in the city of Newark, county of Essex, and State of New Jersey, have invented a new and useful Magnetic Separating-Machine, of which the following is a specification.

The invention relates to that class of machines known as magnetic separators, in which magnetic force is applied in treating magnetic material combined with non-magnetic material so as to separate or concentrate the magnetic material contained therein, its object being to provide an improved machine of this class which shall be more efficient than those heretofore in use.

In my improved separator I employ a pair of magneto-electric poles arranged opposite each other and at any convenient distance apart with a non-magnetic conveyer moving in the magnetic fields between said poles, so that the magnetic material carried by said conveyer is subject to attractions in opposite directions by the opposed poles so as to be attracted toward one pole or the other, according as the non-magnetic material may lie in the path of attraction toward one pole or the other, this conveyer being of such form as to prevent the magnetic material being drawn over the edges, which result may conveniently be secured by flanges on the conveyer or between which the conveyer moves. In the preferred construction an electro-magnet is rotated on an axis centrally to the cores, the poles of the magnets being opposed, and at a convenient distance from each other, and the conveyer is preferably a drum formed by a band of non-magnetic material placed between the cores and secured thereto so as to be carried thereby, a very simple construction being thus provided with which any suitable means may be used for removing the separated magnetic material from the drum.

My invention therefore consists broadly in the combination of a pair of magneto electric poles arranged pole to pole at any convenient distance apart, and a non-magnetic conveyer moving within the magnetic field between said poles as an intercepting device for collecting magnetic matter, and further in specific constructions of the same in which the magnetic field revolves with the separating drum, and in various specific constructions and combinations of devices, all of which will be fully described in the following specification and specifically pointed out in the claims.

For a full understanding of my invention I have shown in the accompanying drawings a simple construction of apparatus in which my invention is embodied, and which forms one of the preferred forms of my improved machine, and a full description of the same 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 the machine. Fig. 2 is a plan of the same with the hopper removed. Fig. 3 is a vertical section of the complete machine on line *x* of Fig. 2. Fig. 4 is a vertical section on line *y* of Fig. 2.

Referring to the said drawings, A are the cores of the electro-magnet which are preferably extended outward, as shown, to form journals P supported in bearings Q in the side frames of the machine, the cores being reduced in size to form the journals, as shown, or not as desired. For the purpose of forming a large magnetic field and separating drum, these cores are provided upon their inner ends with flanges or disks C which may be of any suitable magnetic material, such as iron. Between these flanges or disks C is interposed a disk of non-magnetic material B, such as brass, wood or glass, and the flanges C and disk B are bolted together securely so as to form a single rigid construction by means of bolts D, said bolts being of non-magnetic material or of iron properly insulated, to prevent magnetic connection between the flanges or disks C. In the construction shown, these bolts also secure together so as to form a rigid part of the construction, pulleys Z outside the disks C, by which the cores A and parts carried thereby are rotated.

The separating drum is formed by a band K preferably of thin brass, but it will be understood that this band may be of paper or other suitable non-magnetic material. It will be understood also that this band may be omitted and the non-magnetic disk B be depended upon to form the drum, but the band will preferably be used as providing a smooth

uniform surface which may readily be replaced when worn.

Upon the cores A on opposite sides of the flanges or disks C, the coils L, L forming the helices are wound, the initial wires of these helices being united through a hole J in the pulleys Z, disks C, and non-magnetic disk B, as shown in Figs. 3 and 4, this hole being preferably formed of a rubber tube so as to insulate the initial wires within the flanges C, although it will be understood that they may be insulated in any other suitable manner.

The helices L starting with the initial wires at the inner ends of the cores are wound in opposite directions, that is, so that the poles of the magnet are formed at the flanges or disks C. The winding is the same as though a single bar were wound continuously so as to form north and south poles at opposite ends, 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 from the initial points 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 M, M of the helices connect with brass rings G which are mounted upon the extended ends P of cores A by ring centers N of fiber so as to be insulated from the cores, and the brushes H connected with the wires I from the electric current supply make continuous contact with the disks G as they rotate with the cores A. The outer ends of the cores A may be joined to form the magnet and establish the poles at C, C in any suitable manner, but the yoke will preferably be inside the drum and magnetic field so as not to interfere with the action of the separator on the material as the yoke rotates with the magnet. In the construction shown, the ends are joined as follows: The iron cores A carry iron lugs E, which are shown in the present case as disks extending about the cores, although it will be understood that a simple arm may be used, these lugs being preferably formed as a part of the iron cores A, as shown. Fiber brushes U are interposed between the lugs E and the disk G so as to avoid any possibility of electrical contact between the disks G, and lugs E. These lugs E, E are connected by the yoke formed by an iron rod or bar F which passes outside the helices L and through a hole O in the disks B, C, and pulleys D, this bar being insulated from the flanges by forming the hole of a rubber tube or in any other suitable manner. By this yoke F the two arms of the electro-magnet formed by the cores A, A and helices L, L are connected and the poles established at C, C. Where a hollow core is not otherwise objectionable, the rod or bar F may be passed through inside the core and make contact with the exterior or journal ends of the latter in any suitable manner, but any other suitable construction and arrangement of this yoke may be used.

The parts may be operated in any suitable manner and any suitable means may be used for the purpose of removing the separated magnetic material from the drum. In the construction shown, a brush U is used for the purpose of removing the separated material, this brush being mounted so as to rotate in contact with the band K of the drum. The brush U is mounted upon a shaft T which is driven by a belt S or other suitable means and the cores A are driven from the brush shaft T by belts W connecting the pulleys V on opposite sides of the brush with the pulleys Z on the cores A previously referred to, two pulleys and belts being preferably used where the drum and brush are mounted centrally, as shown, so as to secure a uniform movement and prevent sidewise strain upon the drum shaft.

The operation of the machine will be understood from a brief description.

The material to be separated is received upon the drum from a hopper 2 mounted above the same and as the drum and cores are rotated, the magnetic force of the magnetic field formed by the disks C, C 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 hopper 3. As the drum rotates, it carries the magnetic material with it past the hopper 3 until it reaches the brush T, which operates to remove the material from the drum when it falls into the hopper 4.

What I claim is—

1. In an electro-magnetic separator, the combination of a pair of magneto electric poles arranged pole to pole, and a non-magnetic conveyer moving within the magnetic field between said poles, substantially as described.

2. In an electro-magnetic separator, the combination with a pair of magneto electric poles arranged pole to pole, of a non-magnetic drum rotating within the magnetic field between said poles, substantially as described.

3. In an electro-magnetic separator, the combination with a pair of magneto-electric poles arranged pole to pole, of a non-magnetic drum rotating within the magnetic field between said poles, and flanges at the edges of said drum, substantially as described.

4. In a magnetic separator, the combination with a pair of magneto-electric poles arranged pole to pole and revolving about their magnetic axis, of a non-magnetic drum revolving concentrically with said poles, and flanges at the edges of said drum, substantially as described.

5. In a magnetic separator, the combination with an electro magnet having its helices placed end to end with the poles opposed, of a non-magnetic separating drum revolv-

ing in the magnetic field, substantially as described.

6. In a magnetic separator, the combination with an electro magnet having its helices placed end to end with the poles opposed and separated by non-magnetic material, of a non-magnetic separating drum revolving within the magnetic field between the poles, substantially as described.

7. In a magnetic separator, the combination with a rotating electro magnet having its helices placed end to end with their poles opposed and rotating about the magnetic axis of the poles, of a drum of non-magnetic material rotating with the magnet and forming a separating drum within the magnetic field between the poles, substantially as described.

8. The combination with an electro magnet having its helices placed end to end with their poles opposed, and its cores extending outward to form journals, of a drum of non-magnetic material carried by said cores and forming a separating drum within the magnetic field between the poles, and means for rotating said magnet and drum about the magnetic axis of the poles, substantially as described.

9. The combination with two cores and helices arranged end to end with their poles opposed, of a non-magnetic separating drum within the magnetic field between the poles, and a yoke connecting the outer ends of the cores, substantially as described.

10. The combination with two cores and helices arranged end to end with their poles opposed, of a non-magnetic separating drum within the magnetic field between the poles, and a yoke connecting the outer ends of the cores and passing inside the drum, substantially as described.

11. The combination with two cores and helices arranged end to end with their poles opposed, of the disks C, C on the cores, non-magnetic material carried by and separating the disks, a band of non-magnetic material carried by the disks and forming a drum within the magnetic field, and a yoke inside the drum connecting the outer ends of the cores substantially as described.

12. The combination with two cores and helices, of disks C, C carried by the cores and forming the poles, the initial wires of the helices being connected through but insulated from said disks C, C and a yoke connecting the outer ends of the cores, substantially as described.

13. The combination of cores A, A mounted to rotate on an axis central thereto, a non-magnetic conveyer within the magnetic field between said cores, helices L, L on said cores having their initial wires connected together, means for securing said cores together end to end but out of contact with each other, and a yoke connecting the outer ends of the cores, substantially as described.

14. An electro magnet having the faces or polar areas of the two arms opposed and secured to rotate on an axis central to the core, and a non-magnetic drum rotating within the magnetic field between said poles, substantially as described.

Dated June 25, 1891, Newark, New Jersey.

WM. H. WILLIAMS.

Witnesses:

HENRY H. DAWSON,

F. K. HOWELL.