

(No Model.)

3 Sheets—Sheet 1.

W. H. WILLIAMS.
MAGNETIC SEPARATOR.

No. 528,055.

Patented Oct. 23, 1894.

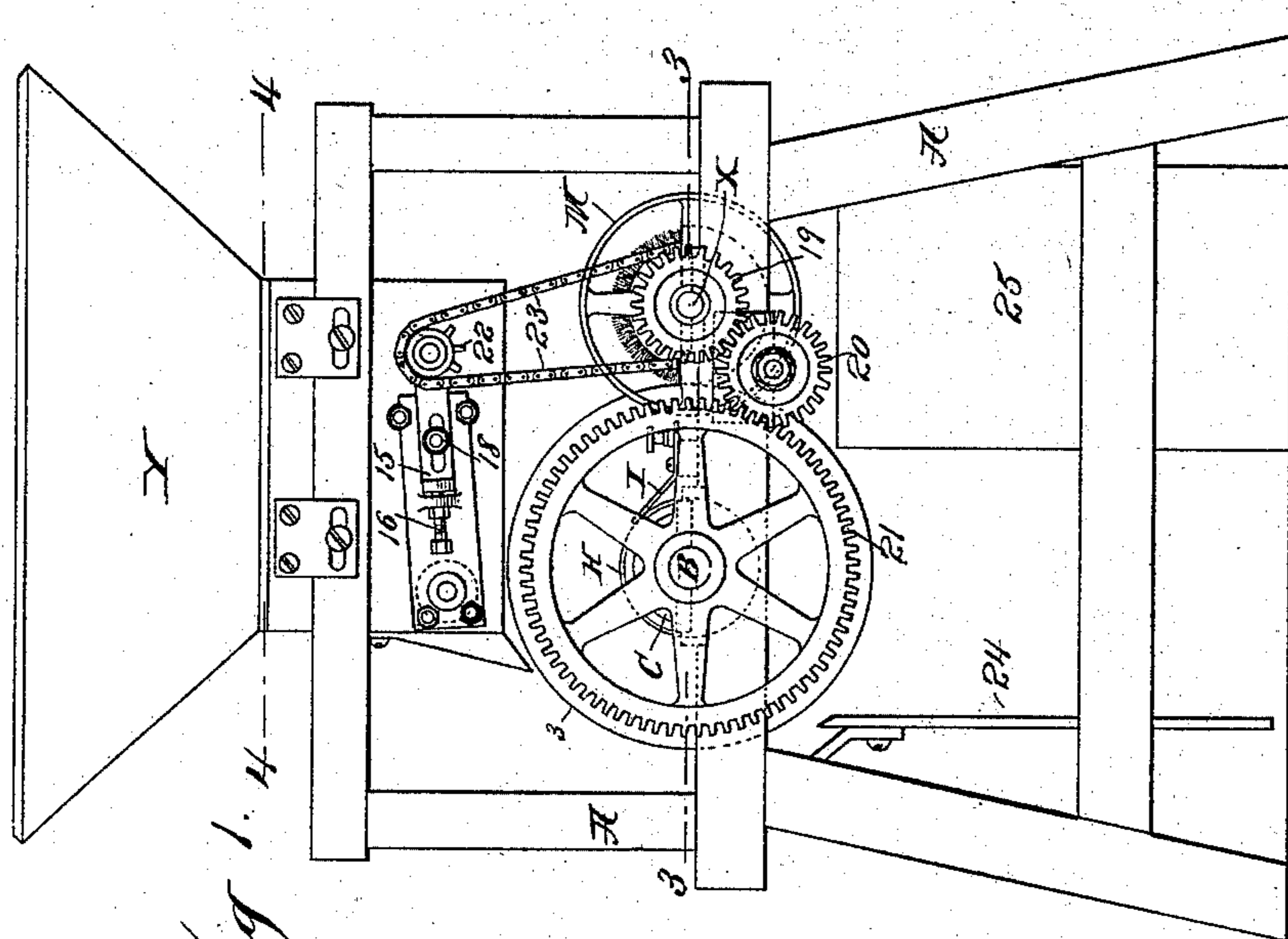


Fig. 1.

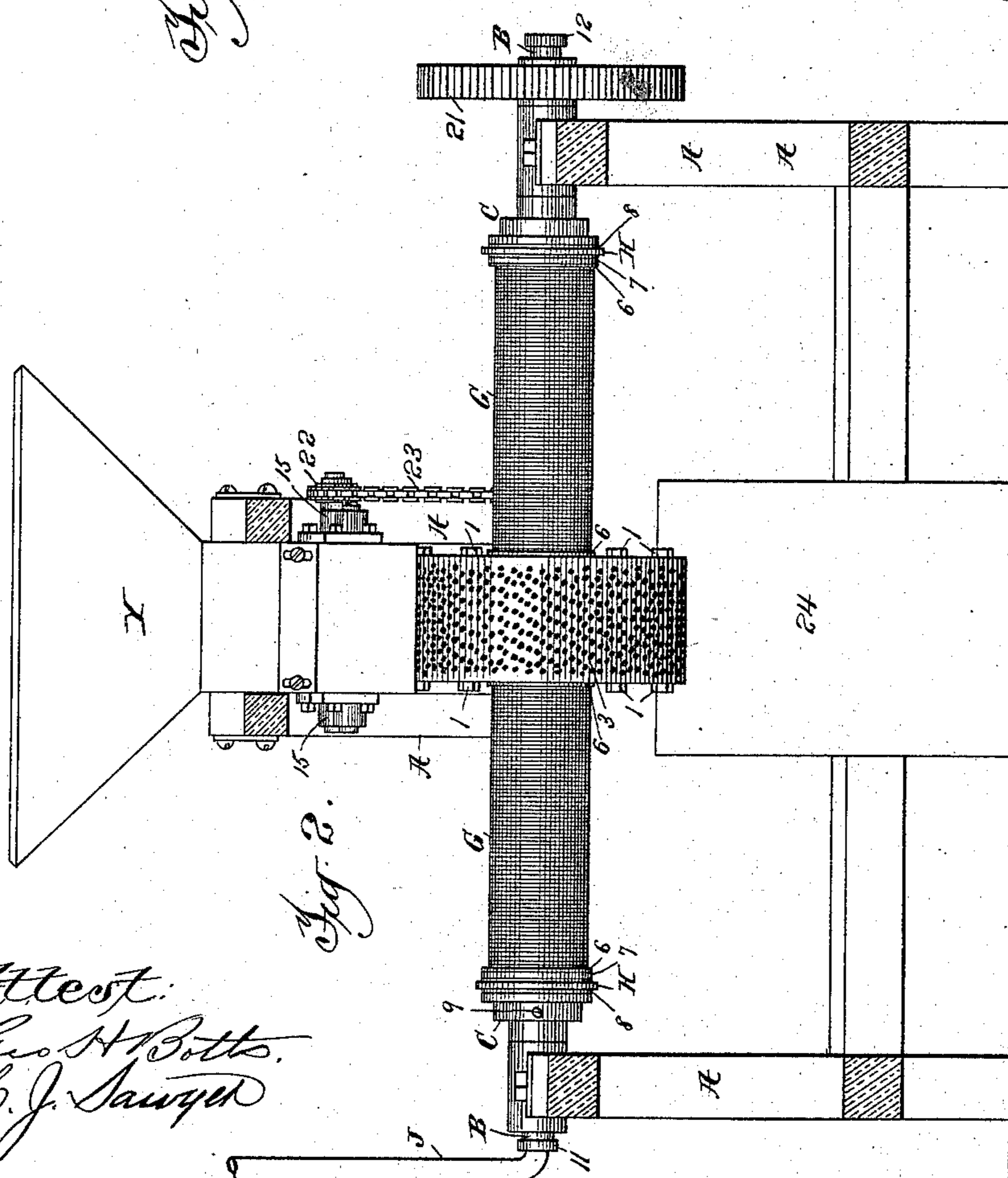


Fig. 2.

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(No Model.)

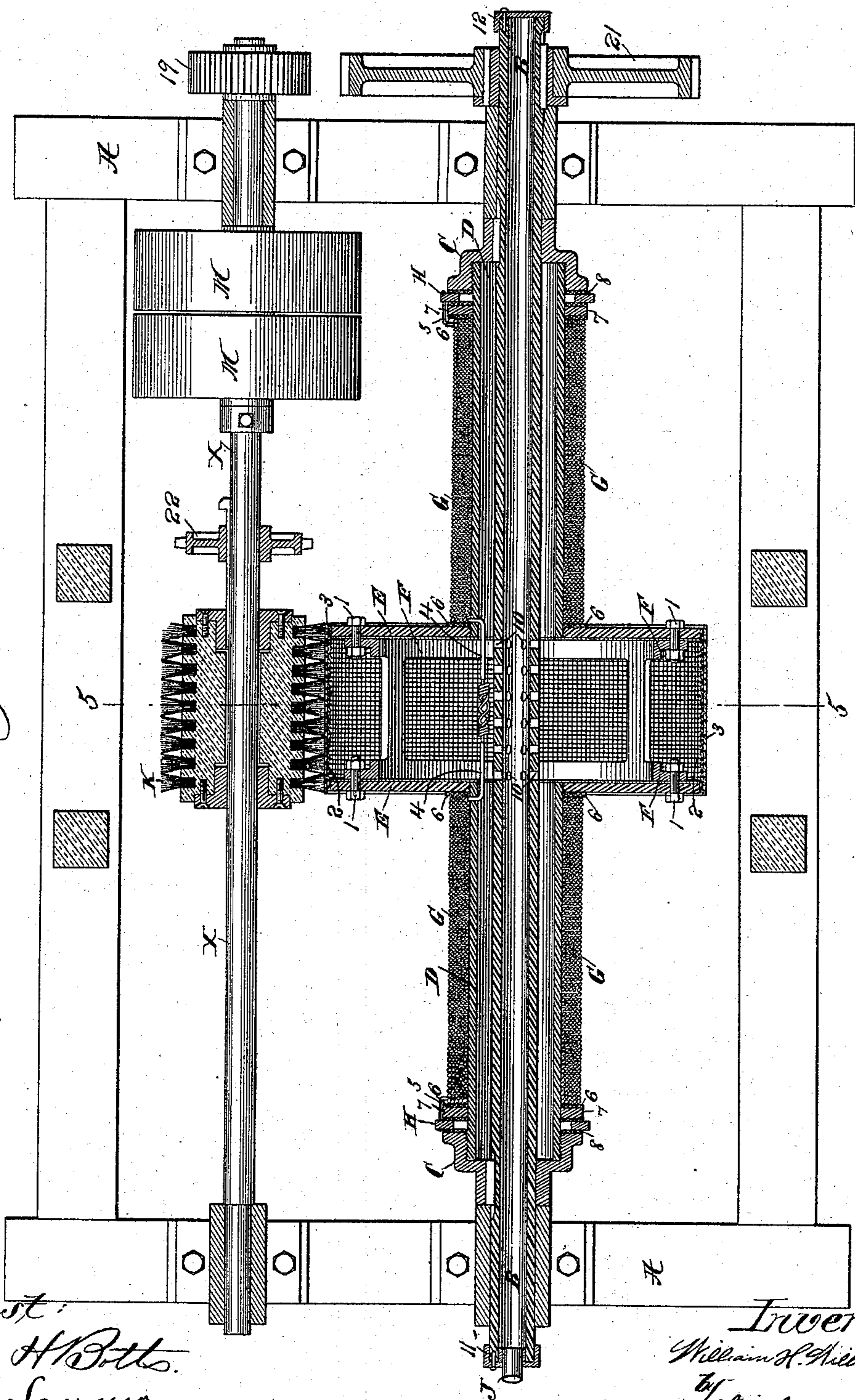
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Fig. 3.



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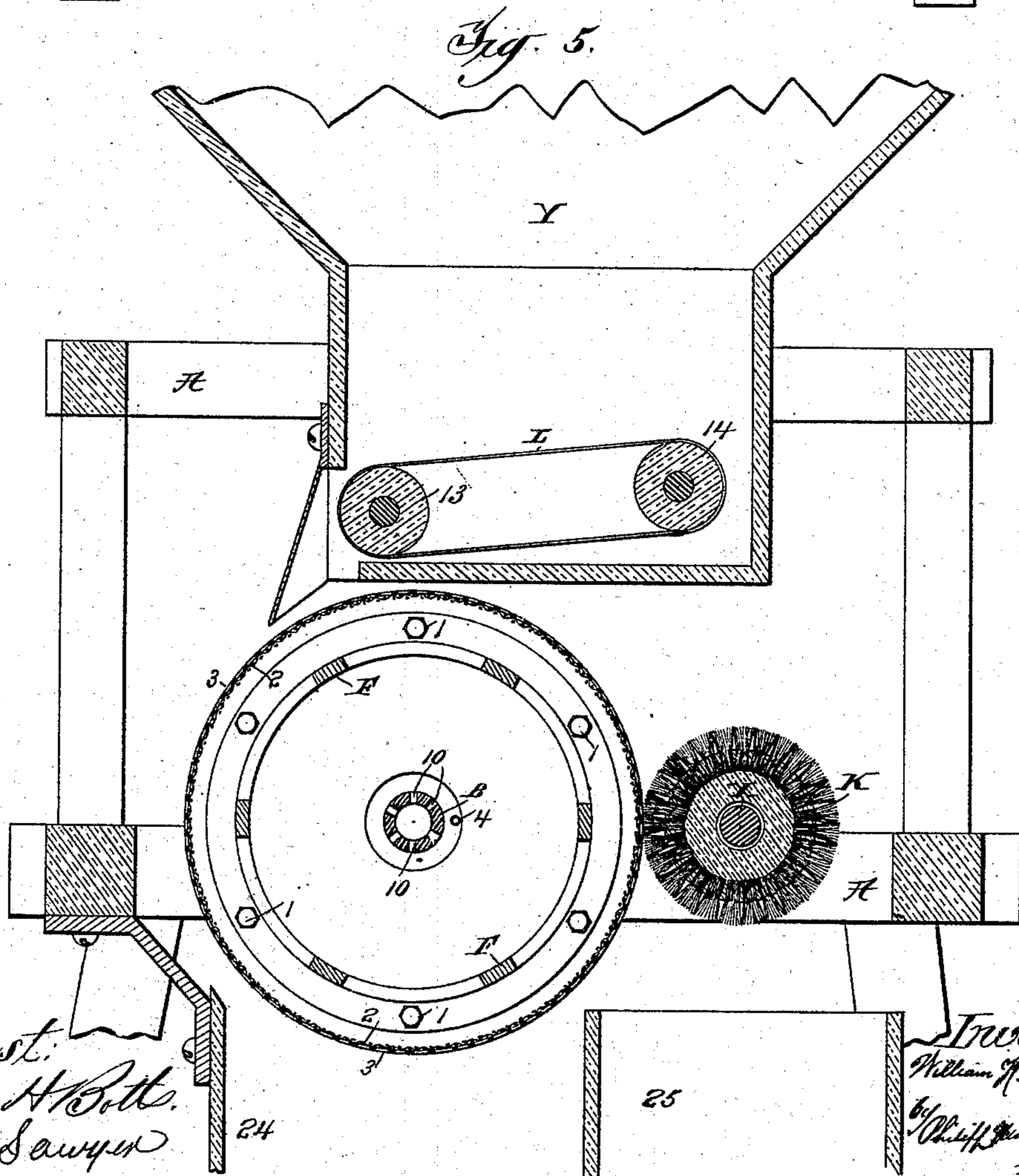
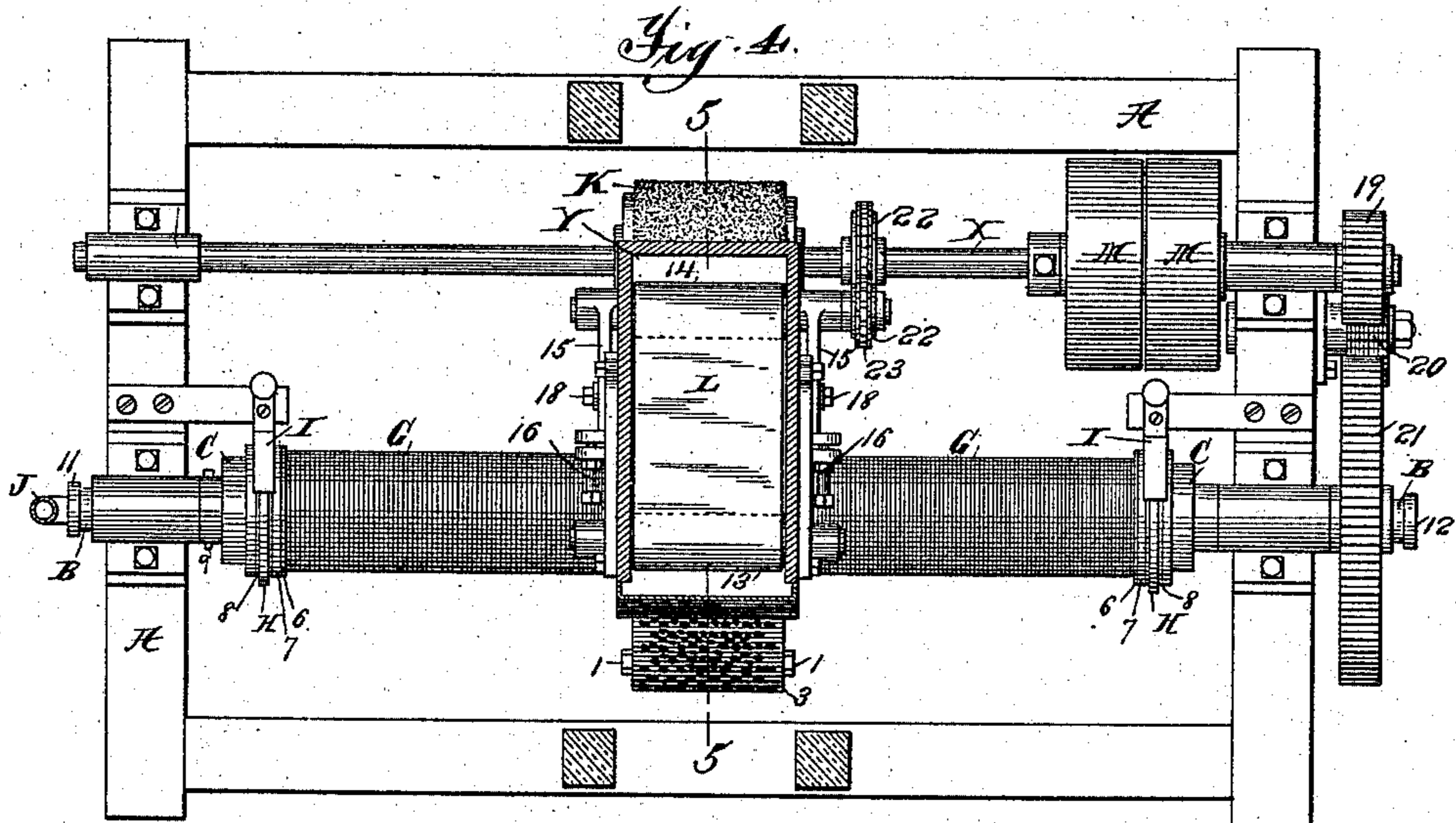
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3 Sheets—Sheet 3.

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C. J. Sawyer

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UNITED STATES PATENT OFFICE.

WILLIAM H. WILLIAMS, OF NEWARK, NEW JERSEY.

MAGNETIC SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 528,055, dated October 23, 1894.

Application filed January 29, 1892. Serial No. 419,685. (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.

10 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 machine of this class which shall be more efficient than those heretofore in use.

15 In my application, Serial No. 397,707, filed 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 of an electro magnet having its helices placed end to end with the poles adjacent and rotating on an axis central to the
20 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.

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

25 In magnetic separators previously in use it has been found that the non-magnetic material is liable to be held upon the separating drum by adhesion to the magnetic material so as to be carried about the drum therewith, an imperfect action of the separator thus being caused.

Another object of the invention is to avoid this difficulty, and I attain this object by making the separating drum hollow and forming the periphery of perforated metal or gauze, and by the use of an air blast operating from the interior of the drum so as to blow off and remove any non-magnetic particles, while the magnetic particles are held to the drum against the blast by magnetic force.

30 It is evident that this invention may be applied to magnetic separators of other general constructions than that of my application above referred to, but the invention has

been devised in connection with improvements upon such a separator, and will be described and shown in connection therewith. 55

My invention, therefore, consists broadly in an electro magnetic separator having a hollow perforated separating drum with an air blast working from the interior, and in various constructions and combinations of parts in a magnetic separator, all of which will be more particularly described in the following specification and pointed out in the claims. 60

For a full understanding of my invention a detailed description of the same will now be given, reference being had to the accompanying drawings forming a part of this specification, in which I have shown my invention as embodied in a machine of the preferred construction, and in which— 65 70

Figure 1 is an end view of the machine. Fig. 2 is a side elevation of the same looking to the right in Fig. 1, with a portion of the frame removed. Fig. 3 is a horizontal section on the line 3—3 of Fig. 1. Fig. 4 is a horizontal section on the line 4 of Fig. 1. Fig. 5 is a detail section on the line 5—5 of Figs. 3 and 4 on an enlarged scale. 75

Referring to said drawings, A is the frame of the machine; B, the shaft by which the electro magnet and separating drum are carried; X, the brush shaft, and Y the hopper from which the material to be acted upon is fed to the separating drum. The shaft B is hollow and consists of a cylinder which is of iron or other suitable magnetic material as this forms a portion of the yoke of the electro magnet, this cylinder being mounted in bearings in the frame so as to rotate therein. 80 85 90

Upon the shaft B inside the side frames are mounted two sleeves of metal C screw threaded upon the inside into which are screwed cylinders D of iron or other suitable magnetic material, these cylinders forming the cores of the magnet and being of somewhat larger diameter than the shaft B so as to be out of contact therewith, and leave an air space between the cores and shaft. These cores D are provided at their inner ends with flanges or disks E preferably of considerable size so as to form a large drum, these disks being of iron or other suitable magnetic material, and being formed on the cores D or 100

consisting of independent disks secured thereto. Between the disks E is a frame F of brass or other suitable non-magnetic material to which the flanges or disks are secured, preferably by brass bolts 1, as shown, so as to form a single rigid construction.

The disks E form the poles of the magnet and the space between them forms the magnetic field. To form a perforated separating drum within the magnetic field I may use only a perforated brass plate, but I preferably form the construction, as shown, of an inner cylinder formed of fine mesh brass gauze 2 and a perforated brass plate 3 outside the same, this being secured to the disks E in any suitable manner so as to be carried thereby.

On opposite sides and outside the disks E the coils G forming the helices are wound their initial wires 4 being passed through the cores D and connected inside the hollow drum, these wires being insulated from the cores D where they pass through the same in any suitable manner. Fiber disks 6 are provided at opposite ends of the helices G by which the helices are insulated from the flanges on the inner side and from metal washers 7 at their outer ends by which the helices are held in position.

The helices G starting with the initial wires at disks E are wound in opposite directions, that is, so that the poles of the magnet are formed at the disks E. The winding is the same as though a single bar had been 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 became new poles, the winding thus being in opposite directions starting at the inner ends as the coils are brought end to end, as in the construction shown.

For the purpose of supplying the current through the helices G to form the electro magnet, the following construction is provided:— The terminal wires 5 of the helices connect with brass rings H which are mounted upon the cores D so as to be out of contact therewith, and are held between and insulated from the washer 7 and sleeve C by fiber washers 8, as shown in Fig. 3. These brass rings H make contact with the brushes I to which the wires from the electrical supply are connected, as usual, a continuous contact between the brushes I and the rings H being thus formed during the rotation of the cores. The yoke by which the outer ends of the cores D are connected so as to form the electro magnet and establish the poles at the disks E is formed by the screw sleeves C at each end and the shaft B to which they are connected.

For the purpose of securing an air blast operating from within the perforated separating drum, the shaft B is provided with a series of perforations 10 extending about the shaft, as shown in Figs. 3 and 5, and a pipe

J connects with one end of the shaft B which is open to receive the pipe, this pipe being loose within the cap 11 on the end of the shaft, so that the shaft and parts carried thereby may rotate independently of the pipe J. The other end of the shaft B is closed by a small cap 12.

With the separating drum thus constructed any suitable means may be used for removing the separated magnetic material. As shown, I use a common brush K which is mounted upon the shaft X and rotates in contact with the separating drum, as usual.

The material to be treated may be fed from the hopper D to the drum in any suitable manner but I prefer to use the construction shown, by which the material is fed gradually and at a uniform rate of speed. In this preferred construction, the material within the hopper rests upon a feeding belt L and is advanced thereby through the outlet of the hopper onto the surface of the drum, this belt L being carried by rolls 13, 14 which are mounted in the side frames of the hopper. One of the rolls is preferably adjustably mounted so as to take up any slack in the belt, being shown as carried by brackets 15 adjustable by set screws 16 and held in position by bolt 18 passing through a slot in the bracket. The parts of the machine may be driven in any suitable manner.

As shown, the shaft X is provided with pulleys M by which the shafts are driven and is geared to the shaft B by gear 19 on shaft X, intermediate 20, and gear 21 on shaft B so as to secure the proper direction of movement of the latter. The belt L is driven from shaft X by sprocket wheels 22 and chain 23 connecting the shaft and roll 14.

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

The material to be separated is received upon the separating drum by the action of the feeding belt L and as the drum and cores are rotated the magnetic force of the magnetic field formed by the disks E acting through the perforated band 3 of non-magnetic material is sufficient to attract to the band and hold thereon the magnetic material, while the non-magnetic material is blown off or loosened by the air blast received from pipe J through shaft B and drops from the drum outside the guard 24. As the drum rotates, the magnetic material adhering thereto is carried forward until it reaches the brush K when it is removed by the brush as usual in magnetic separators of other constructions and falls into the receptacle 25.

It will be seen that my construction provides a very simple magnetic separator of great separating power, and it will be found that the use of the air blast to assist in carrying off the non-magnetic material produces a very efficient machine.

It will be understood that my invention is not to be limited to the specific construction shown, but that modifications may be made

therein without departing from my invention.

What I claim is—

1. The combination with a hollow perforated magnetic separating drum, of connections for producing an air blast from the interior of said drum outward through the perforated separating wall of the drum, substantially as described.

2. The combination with a hollow magnetic separating drum having an inner covering of wire gauze and an outer perforated metallic plate, of connections for producing an air blast from the interior of said drum outward through the wire gauze and metallic plate, substantially as described.

3. The combination with a hollow perforated magnetic separating drum, of a hollow perforated shaft on which the drum is mounted and with which it rotates, and connections for supplying an air blast to the interior of said drum through said shaft, substantially as described.

4. The combination with two cores and helices arranged end to end with their poles adjacent, of a perforated non magnetic separating drum mounted between said poles, and connections for supplying an air blast to the interior of said drum, substantially as described.

5. The combination with two rotating cores and helices arranged end to end with their poles adjacent, of a perforated non magnetic separating drum carried by and mounted be-

tween said cores, and connections for supplying an air blast for the interior of said drum, substantially as described.

6. The combination with hollow perforated shaft B, of cylindrical cores D mounted thereon with a space between the cores and said shaft, coils G on said cores, disks E on the adjacent ends of said cores forming the poles, and a perforated non magnetic separating drum carried by and mounted between said disks, substantially as described.

7. The combination with shaft B, of sleeves C carried by said shaft, cylindrical cores D mounted in said sleeves, coils G on said cores, disks E on the adjacent ends of said cores forming the poles and a non magnetic separating drum carried by and mounted between said disks, substantially as described.

8. The combination with hollow perforated shaft B, of sleeves C carried by said shaft, cylindrical cores D mounted in said sleeves, coils G on said cores, disks E on the adjacent ends of said cores forming the poles, a perforated non-magnetic separating drum carried by and mounted between said disks, and pipe J connecting with said shaft B for supplying an air blast, substantially as described.

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

WILLIAM H. WILLIAMS.

Witnesses:

T. F. KEHOE,
C. J. SAWYER.