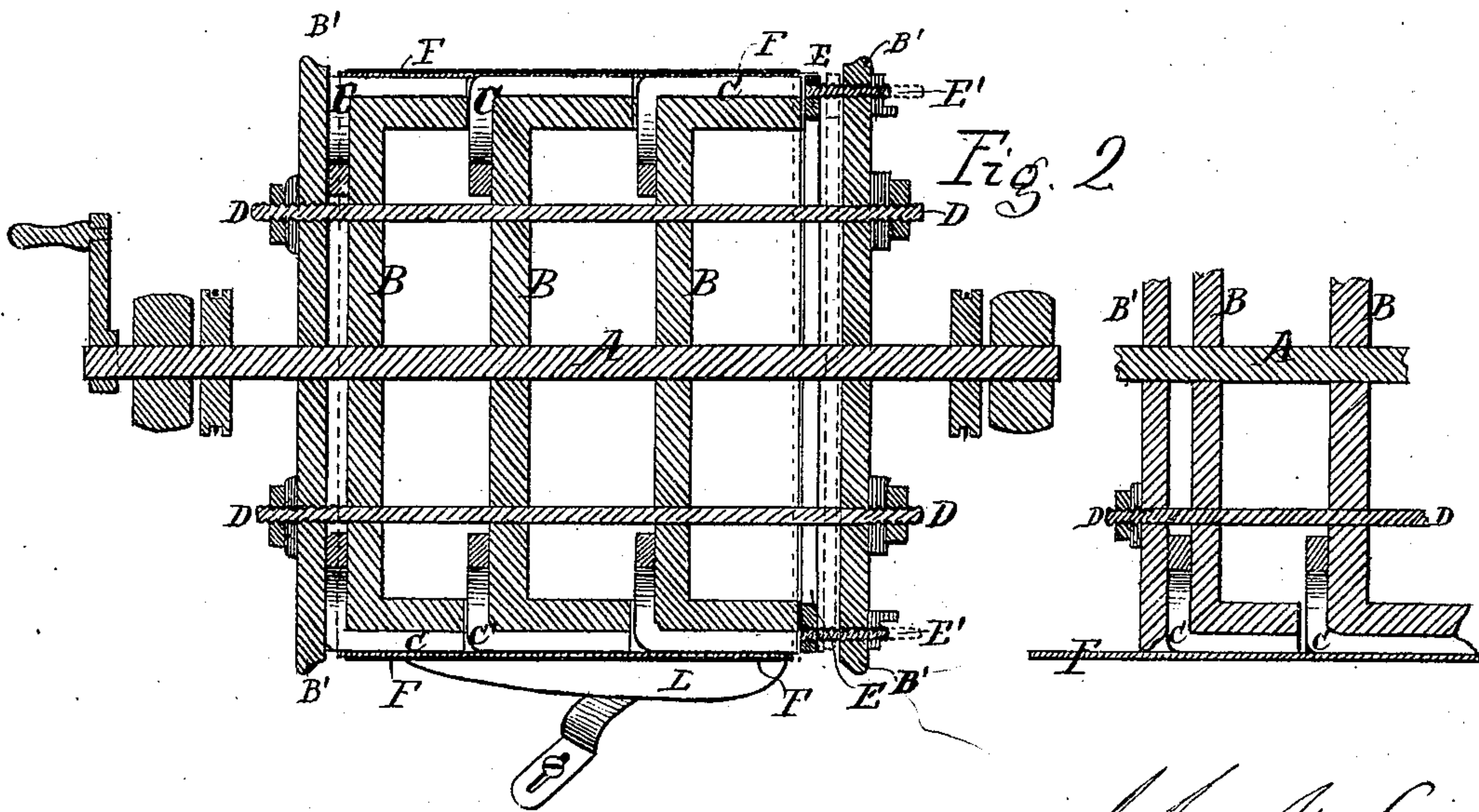
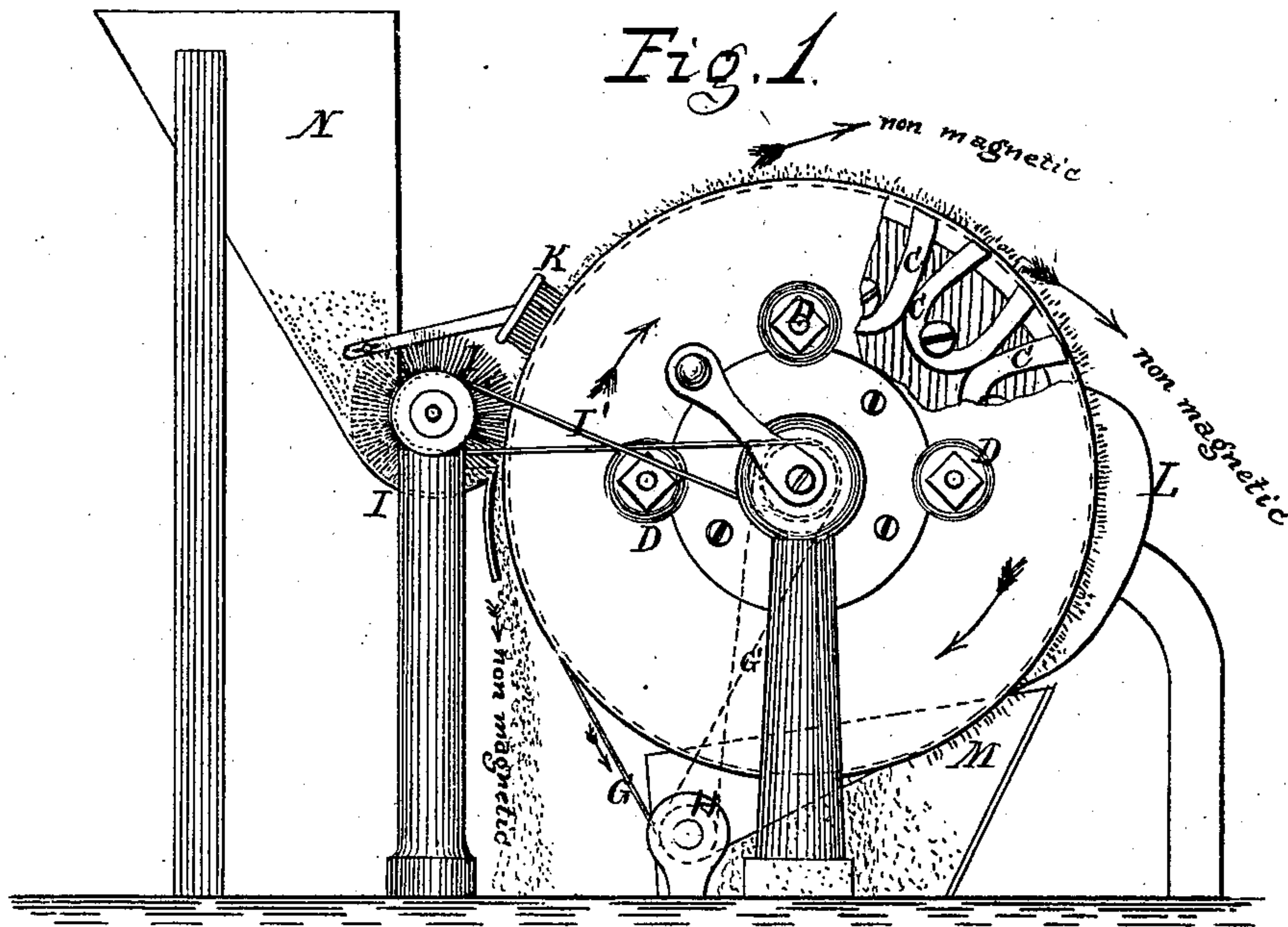


J. Y. SMITH.

Ore-Separators by use of Magnets.

No. 148,517.

Patented March 10, 1874.



Attest

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UNITED STATES PATENT OFFICE.

JOHN Y. SMITH, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN ORE-SEPARATORS BY USE OF MAGNETS.

Specification forming part of Letters Patent No. **148,517**, dated March 10, 1874; application filed February 18, 1871.

To all whom it may concern:

Be it known that I, JOHN Y. SMITH, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improved Magnetic Separator for separating particles of iron and magnetic iron ore from non-magnetic impurities; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 is a side elevation of the machine, and Fig. 2 is a horizontal section of the cylinder.

The same letters are used in both figures in the indication of the same parts.

My improvements relate to that class of machines in which, by the action of a series of magnets, either electro or permanent, magnetic particles are separated from other particles which are non-magnetic. I have shown, in the annexed drawings, two modes of effecting the separation—one in which an endless belt is employed, passing around a magnet-cylinder, and around a drum or roller, which belt carries away the magnetic particles beyond the influence of the magnets, the main principle of which is set forth in Letters Patent heretofore issued to me. In the other case shown, the magnets arranged around a cylinder are curved by a non-magnetic band of sheet metal, or other material giving a smooth surface, and the magnetic particles are removed by a scraper or brush, the magnets having been, in whole or in part, deprived of their magnetism. In either case, if permanent magnets are employed, I propose to construct the magnet-cylinder in the following manner:

A is the shaft, to which the power is applied in any convenient manner. On the shaft I place a series of wooden disks, B, of a uniform diameter. The magnets are bent, as shown in Fig. 2, they being, in the case illustrated, the ordinary horseshoe-magnets. When all the magnets are placed on the cylinder they are to be held by means of the heads B, and rods, with screws and nuts D, by means of which the loops of the magnets will be compressed between the disks B, and, their points being brought into actual contact with the

next magnet in front of them in series, a row of magnets will be made to form a single compound magnet. Care must be taken, however, that a space shall be left between the ends of the outer magnet, whose poles are exposed, and one of the heads B'. In this space is placed an annular keeper, E, made of soft iron, which may be moved by means of the screw-bolts E', passing through the head, so as to be brought into contact with the exposed poles of the magnets, thereby connecting said poles; or it may be withdrawn, so as to increase the force of the magnets to their full united strength; or they may be regulated to a less intensity, when desired; or, by drawing the keeper against one side only, the magnets on that side might be weakened, while the opposite ones retain their full strength. This keeper may be carried with the cylinder or independently supported, which would be desirable when it was important to have the greatest intensity of the magnets on the side where they receive the ore, and lightest on the opposite side, where it is to be removed from the cylinder. The cylinder should then be covered by a sheet of smooth metal, or other substance, to give a smooth surface to the cylinder, as shown at F in Fig. 2. If the endless belt is used, as shown at G, it is carried under the drum or cylinder H, placed at such a distance from the magnet-cylinder that the particles carried on the cylinder shall be withdrawn from the influence of the magnets, the ore falling into a hopper, M. In most cases it will be found desirable to run the roller H at different speed from that which would be imparted to it by the belt G. This may be effected by a belt, G', carried around the pulleys placed on the shaft A, and on the roller H, the construction or tension of which must be sufficient to retard or increase the speed of the belt G, by causing it to slip on the cylinder, for the purpose of bringing the poles of the magnets alternately under the ore on the belt G, thereby causing it to roll over in the manner explained in Letters Patent heretofore issued to me.

Instead of the endless belt G, the smooth surface F may be used to receive the ore. In this case I would use electro-magnets so connected with the battery that they may be cut

off when the ore has been carried to a point where it is desired to discharge it; or the keeper may be set against the poles of magnets on that side, when permanent magnets are employed, as heretofore explained.

A brush or scraper, L, may be attached to bear against the cylinder on the demagnetized side thereof, in which case the casing F should be extended at one end of the cylinder beyond the magnets, as the particles held on the cylinder may be slid from the influence of the magnets onto such non-magnetized portion much more easily than they can be brushed from the surface while held by the residual magnetism. The cylinder may be run at such speed that the non-magnetic particles may be thrown from its surface by centrifugal action, while the magnetic particles are held by a magnetic force greater than the centrifugal force. The ore is fed from the hopper by means of a brush of bristles, I, placed in the mouth of the hopper, and thus evenly distributed upon the surface of the cylinder or belt. Combs K may also be attached to agitate the ore on the surface of the cylinder or belt, and suitable bins may be placed in proper position to receive the magnetic and non-magnetic particles as they fall from different parts of the machine.

I have heretofore taken out Letters Patent covering the use of the belt G, passing round the magnet-cylinder and drum or roller H, and also for giving to the said belt a speed different from that of the magnet-cylinder. All that I claim herein as being new in this part of the machine is the particular mode of effecting this difference of speed by means of the auxiliary belt G', and the mode of attaching the magnets by means of the disks B.

I have also set forth in a former patent a keeper for the purpose of connecting the poles of the compound magnets, and I therefore limit my claim to the use of the annular adjustable keeper set forth. I am also aware that brushes have been proposed to be used as a means of removing the magnetic particles

from the magnetic cylinders; but the use which I claim as being new for the brush is as a feeder to supply ore from the hopper to cylinder. I am also aware that machines have been proposed to be used with a continuous smooth surface; but in all such machines permanent magnets have been used, or proposed to be used, without making any provision for decreasing the magnetic intensity of the magnets at a point where such removal is attempted; nor has any machine been known in which the smooth surface has been extended beyond the range of the magnetic action, for the purpose set forth.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In combination with a magnet-cylinder, drum or roller H, and belt G, an auxiliary belt, G', and pulleys for controlling the relative speed of the belt and cylinder, substantially in the manner and for the purpose set forth.

2. The mode of attaching the magnets to form the cylinder by means of the disks B and rods D, substantially as set forth.

3. In combination with the magnets C, the annular and adjustable keeper E, substantially as set forth.

4. In combination with the hopper and magnets, the brush I, when arranged to feed the ore or other fine particles from the hopper.

5. In combination with the magnet-cylinder, the combs K, arranged to operate substantially as set forth.

6. In combination with the magnets, the non-magnetic surface, extending at the end of the cylinder beyond the influence of the magnetic force, and means for sliding the magnetic particles on such surface.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN Y. SMITH.

Witnesses:

R. MASON,

B. EDW. J. ELLS.