No. 762,751. PATENTED JUNE 14, 1904.

C. Q. PAYNE.

SEPARATING CYLINDER FOR MAGNETIC SEPARATORS.

APPLICATION FILED AUG. 17, 1901.

NO MODEL.

Fig. 1.

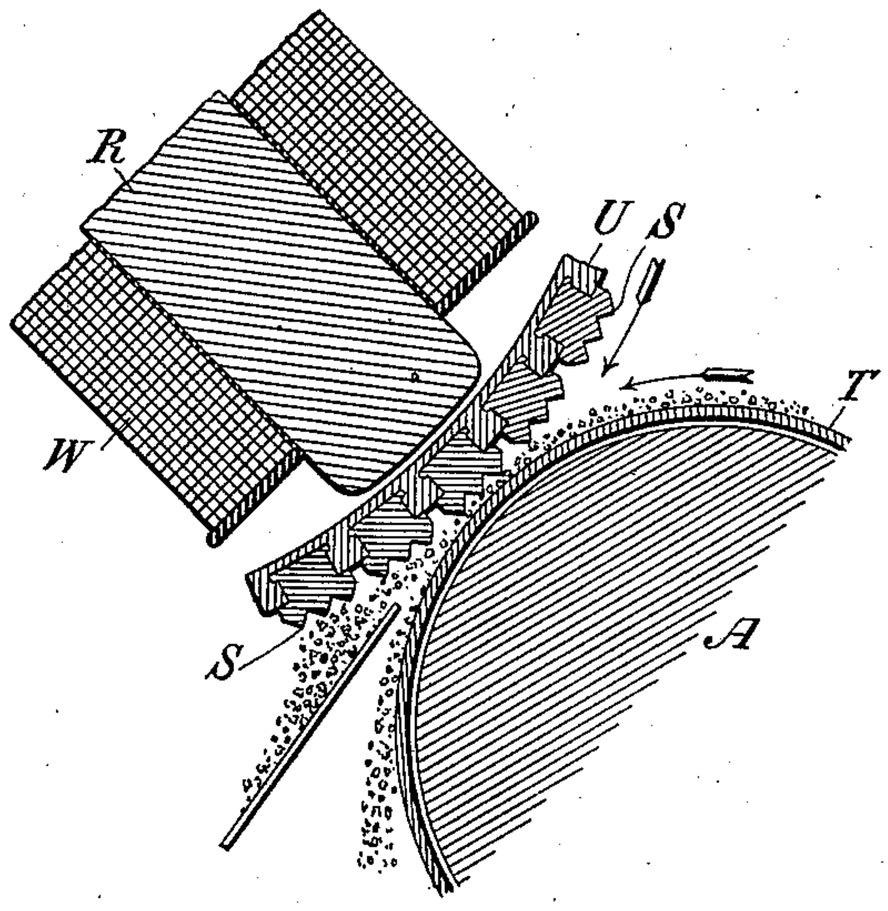


Fig. 2.

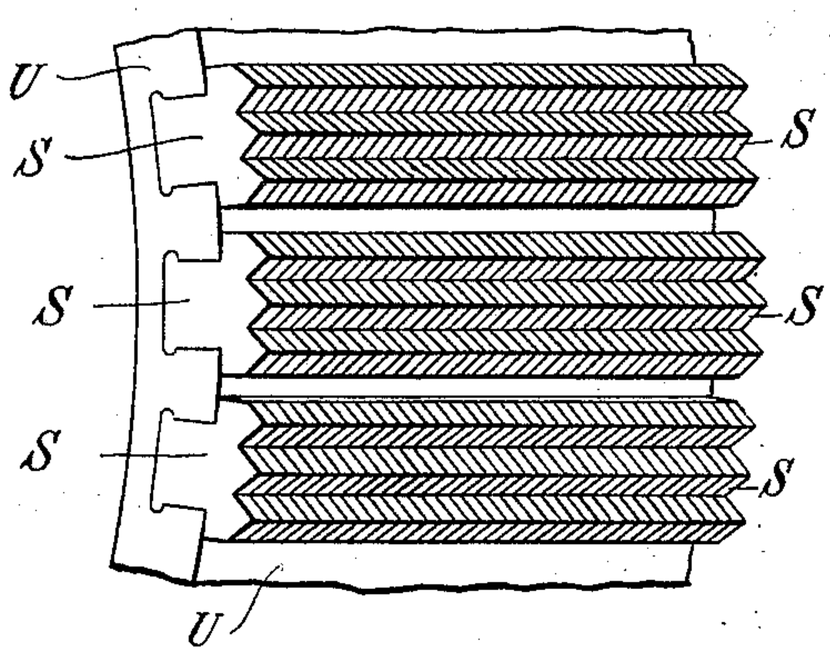
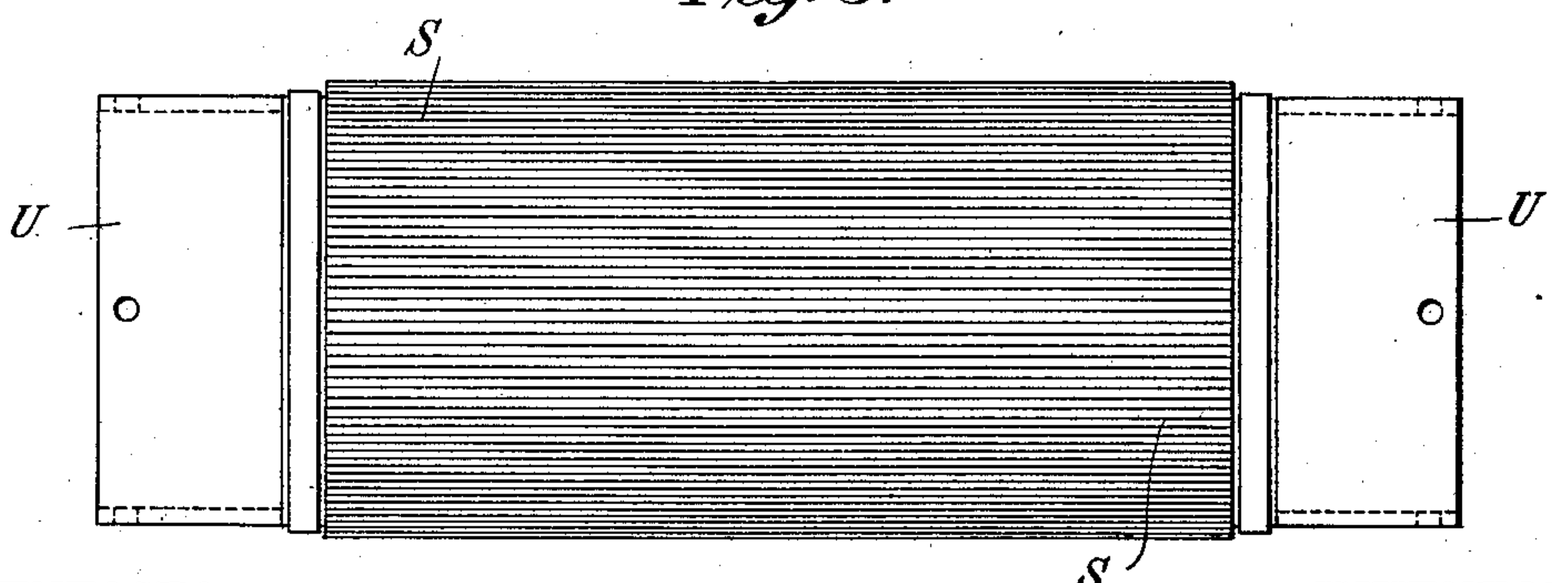


Fig. 3.



WITNESSES:

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No. 762,751. Patented June 14, 1904.

UNITED STATES PATENT OFFICE.

CLARENCE Q. PAYNE, OF STAMFORD, CONNECTICUT.

SEPARATING-CYLINDER FOR MAGNETIC SEPARATORS.

SPECIFICATION forming part of Letters Patent No. 762,751, dated June 14, 1904.

Application filed August 17, 1901. Serial No. 72,322. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE Q. PAYNE, a citizen of the United States, residing at Stamford, in the county of Fairfield, State of Connecticut, (having a post-office address at No. 99 John street, in the borough of Manhattan, in the city and State of New York,) have invented certain new and useful Improvements in Separating-Cylinders for Magnetic Separators, of which the following is a full and true specification, reference being had to the accompanying drawings, showing one embodiment of my invention, in which like letters indicate similar parts in the several views.

My invention relates to improvements of apparatus for the magnetic separation of substances of all degrees of magnetic susceptibility, and is especially adapted to that type of separator in which the magnetic field is formed between opposing magnetic surfaces.

In United States Letters Patent Nos. 641,147, 641,148, and 641,220, granted to me January 9, 1900, I have described the method of and apparatus for magnetically separating ores, in which the improvement consists largely in controlling the positions of the lines of force in a magnetic field formed between opposing magnetic surfaces. In said Letters Patent it was pointed out that the concentration of the lines of force in a magnetic field or the specific flux density therein does not alone determine the magnetic effect in moving the attracted ore particles undergoing separation, but that the difference of magnetic density or the "dispersion" of the flux density within the field is the active cause and the measure of effect of impressing motion upon the attracted ore particles.

My present invention consists, broadly, of improvement of means whereby dispersion of the flux density in a magnetic field may be more conveniently obtained. It constitutes, therefore, an improvement over the apparatus described in above Letters Patent Nos. 641,147 and 641,220.

In the accompanying drawings, Figure 1 is a sectional view of a magnetic field formed between opposing magnetic surfaces and illustrates an application of my invention to a separating-cylinder which passes through the magnetic field. Fig. 2 is an enlarged view of a portion of the above cylinder. Fig. 3 shows an outside view of such a separating-cylinder.

The essential feature of my present invention consists in the use of a series of thin iron or soft-steel plates which are so assembled that their outer edges or edge faces form the separating-surface of a cylinder or carrier which passes through a magnetic field and along a portion of which the separation of the ore particles takes place. I have found that great advantages are obtained by this construction in the practical work of ore separation.

The plates may be conveniently obtained by punching them from sheet metal, and their edges can thus be readily given any desired shape or outline. It is possible in this way to exert any desired effect upon the ore particles undergoing separation by thus securing wide variations of the flux density within the field or creating dispersions therein.

In the particular application of my invention shown in Figs. 1, 2, and 3 I have shown a hollow, cylindrical, or annular separating-carrier. This form of separating-cylinder may be conveniently employed when one of the two opposing magnetic surfaces between which the magnetic field is formed is placed on the inside and the other on the outside of the cylinder, as indicated in Fig. 1. The cylinder or cylindrical sleeve U, which supports the plates S, is preferably made of an alloy or composition, such as nickel or manganese bronze, which has a high electrical resistance and which thus tends to prevent or suppress Foucault currents when it is revolved through a strong magnetic field. The outer surface of the cylinder U may be provided with grooves, as shown in Figs. 1 and 2, of such a shape that when the lower parts of the plates S S are fitted into them they are firmly held in all positions during a complete revolution of the cylinder. The series of plates which fit into each groove thus constitute a laminated bar having several teeth upon its outer surface. This construction effectually suppresses all Foucault or eddy currents in the bars by their subdivision or lamination. A separating-cylinder so constructed can be revolved in a strong field at as high a speed as the conditions sur-

rounding the separation of the various ores may demand without loss of power due to the electrical resistance to moving the cylinder through the field and its consequent heating. Moreover, another important advantage secured by my invention is that the effect of wear or local injuries to the separating-surface of the cylinder can be far more readily repaired by substituting new plates than would be the case if the separating-surface of the cylinder were not thus subdivided.

I do not desire to limit my invention to the construction of the separating-cylinder shown in the illustrations nor to the particular form of field or method of employing the cylinder in the field shown in Fig. 1. Since the essential feature of my invention consists in a novel construction of the surface of a separating-carrier whereby important advantages are derived, it will be evident that my invention may be embodied in widely-different forms of separating-carriers and that these may also be combined in various ways in a complete ore-separating machine.

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

1. In a magnetic separator, a transversely-laminated separating-carrier, provided with a plurality of magnetizable laminæ having edge projections, in combination with means for magnetizing said carrier, substantially as described.

2. In a magnetic separator, a separating-carrier having a transversely-laminated separating-surface, formed by a series of magnetizable laminæ having projecting edges which extend longitudinally of the carrier, in combination with means for magnetizing said carrier, substantially as described.

3. In a magnetic separator, a separating-cylinder having a transversely-laminated separating-surface, formed by a series of magnetizable plates having projecting edges which extend longitudinally of the cylinder, in combination with two opposing magnetic surfaces, between which a magnetic field is formed, and between which said separating-cylinder is arranged to revolve, substantially as described.

4. In a magnetic separator, a separating-cylinder having a transversely-laminated separating-surface, formed by a series of magnetizable plates having toothed edges, in combination with means for magnetizing said cylinder, substantially as described.

5. In a magnetic separator, a transversely-laminated separating-cylinder, provided with a plurality of magnetizable laminæ, each of which has edge projections, and in combination with two opposing magnetic surfaces, between which a magnetic field is formed, and between which said cylinder is arranged to revolve, substantially as described.

6. In a magnetic separator, a separating-cylinder having its surface divided into a number of longitudinal sections which are transversely laminated by a plurality of magnetizable plates, having toothed outlines upon their outer edges, in combination with means for magnetizing said cylinder, substantially as described.

7. In a magnetic separator, a separating-cylinder provided with transversely-laminated bars, made up of a plurality of magnetizable plates having toothed edges, in combination with two opposing magnetic surfaces between which a magnetic field is formed, and between which said separating-cylinder is arranged to travel, substantially as described.

8. In a magnetic separator, a hollow separating-cylinder provided with a series of transversely-laminated bars made up of magnetizable plates whose outer edges have toothed outlines, in combination with two opposing magnetic surfaces located respectively inside and outside the cylinder, and between which said cylinder is arranged to revolve, substantially as described.

9. In a magnetic separator, a hollow separating-cylinder provided with transversely-laminated bars made up of a series of magnetizable plates, whose outer edges have toothed outlines and form the separating-surface of the cylinder, in combination with two opposing magnetic surfaces located respectively inside and outside said cylinder, between which said cylinder is arranged to revolve, and between which a magnetic field is formed, substantially as described.

10. In a magnetic separator, a hollow non-magnetic separating-cylinder provided with grooves upon its outer surface, transversely-laminated bars made up of a series of magnetizable plates engaging said grooves, and whose outer edges have toothed outlines, in combination with two opposing magnetic surfaces located respectively inside and outside said cylinder, between which said cylinder is arranged to revolve and between which a magnetic field is formed, substantially as described.

In witness whereof I have hereunto signed my name this 19th day of July, 1901.

CLARENCE Q. PAYNE.

In presence of—
WM. H. BERRIGAN, JR.,
JAMES J. COSGROVE.