No. 664,650. Patented Dec. 25, 1900.

E. KREUSER.

ELECTROMAGNETIC ORE SEPARATOR.

(Application filed Sept. 2, 1898.)

(No Model.) 2 Sheets—Sheet 1.

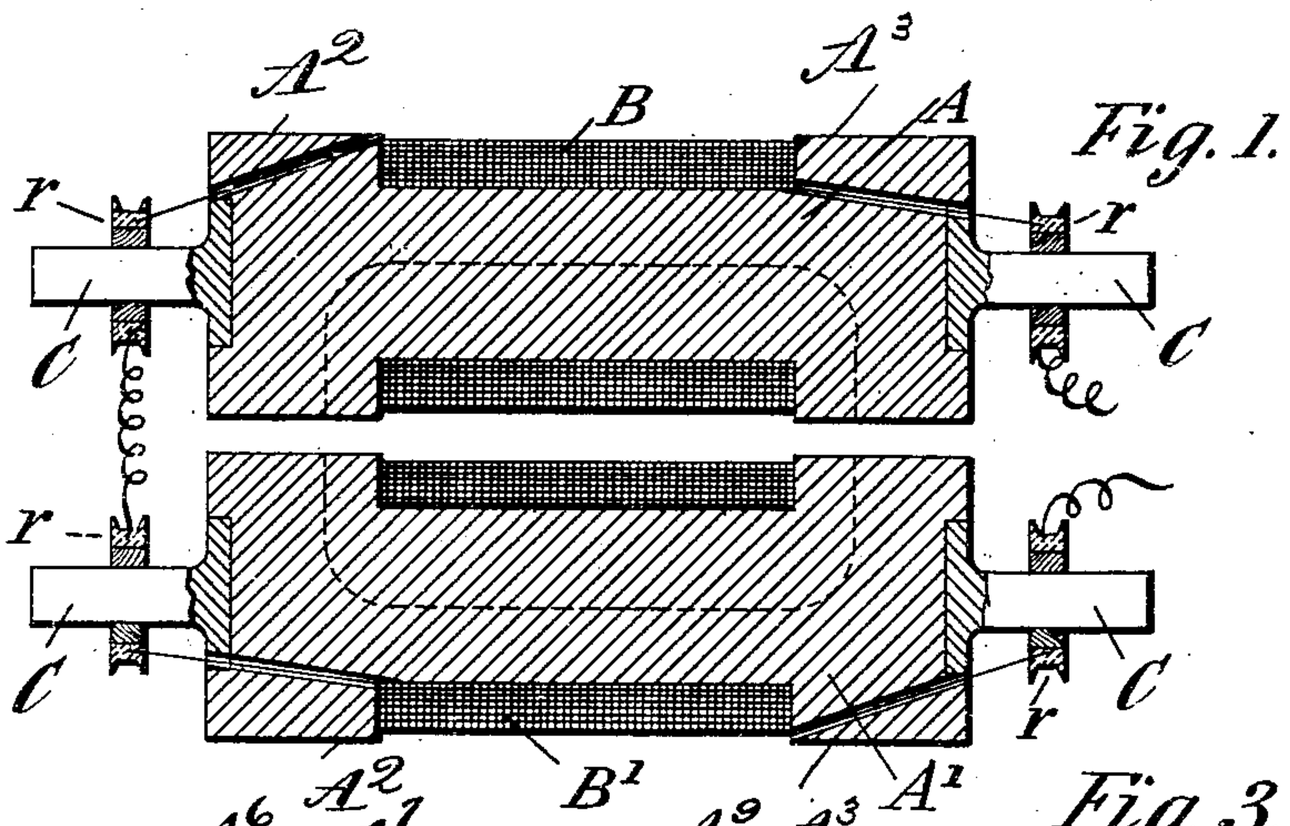


Fig. 1.

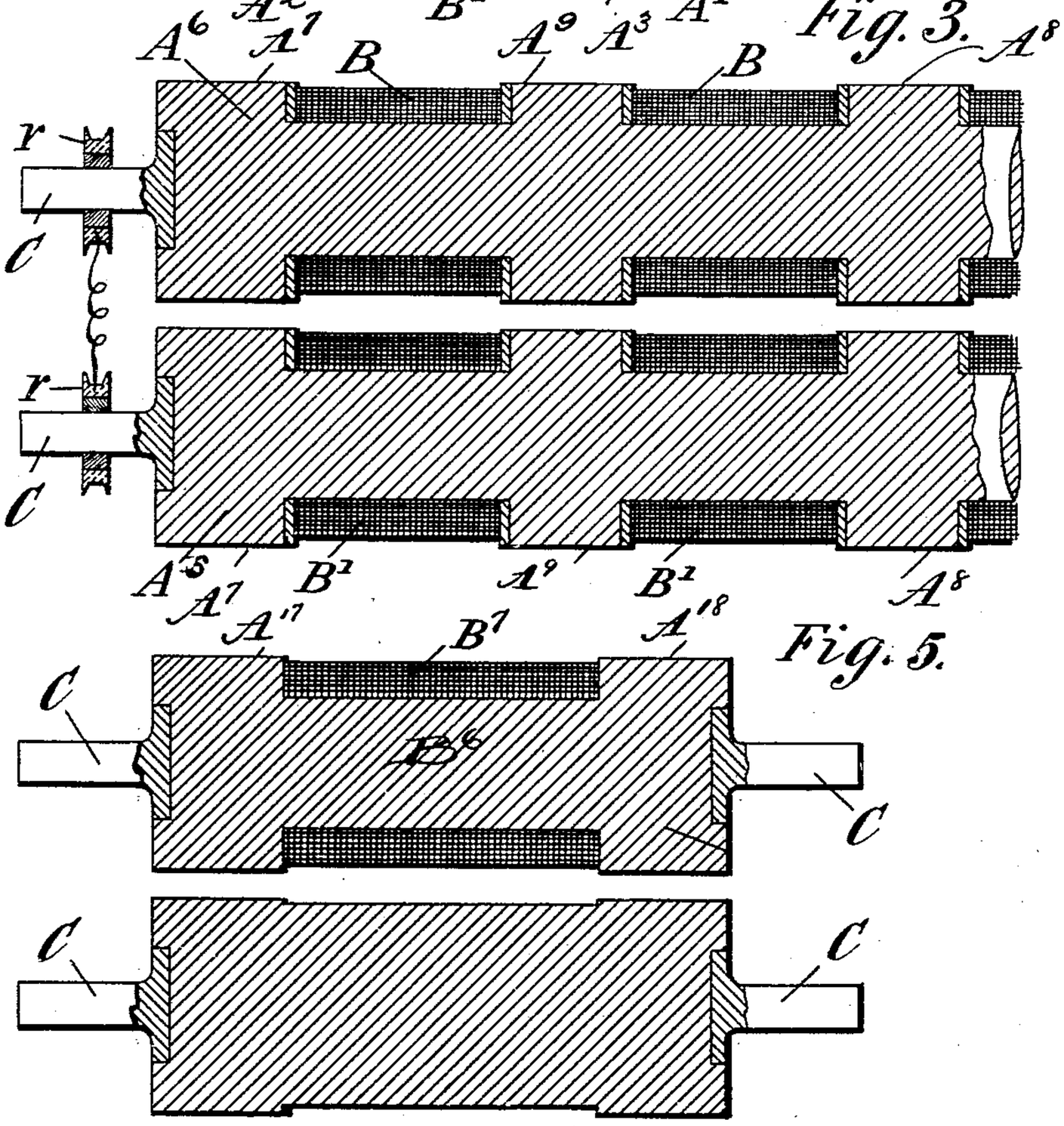


Fig. 3.

Fig. 5.

Witnesses
H. B. Keelor
Dennis Sumby.

Inventor
Emil Kreuser
by James L. Norris.
Atty

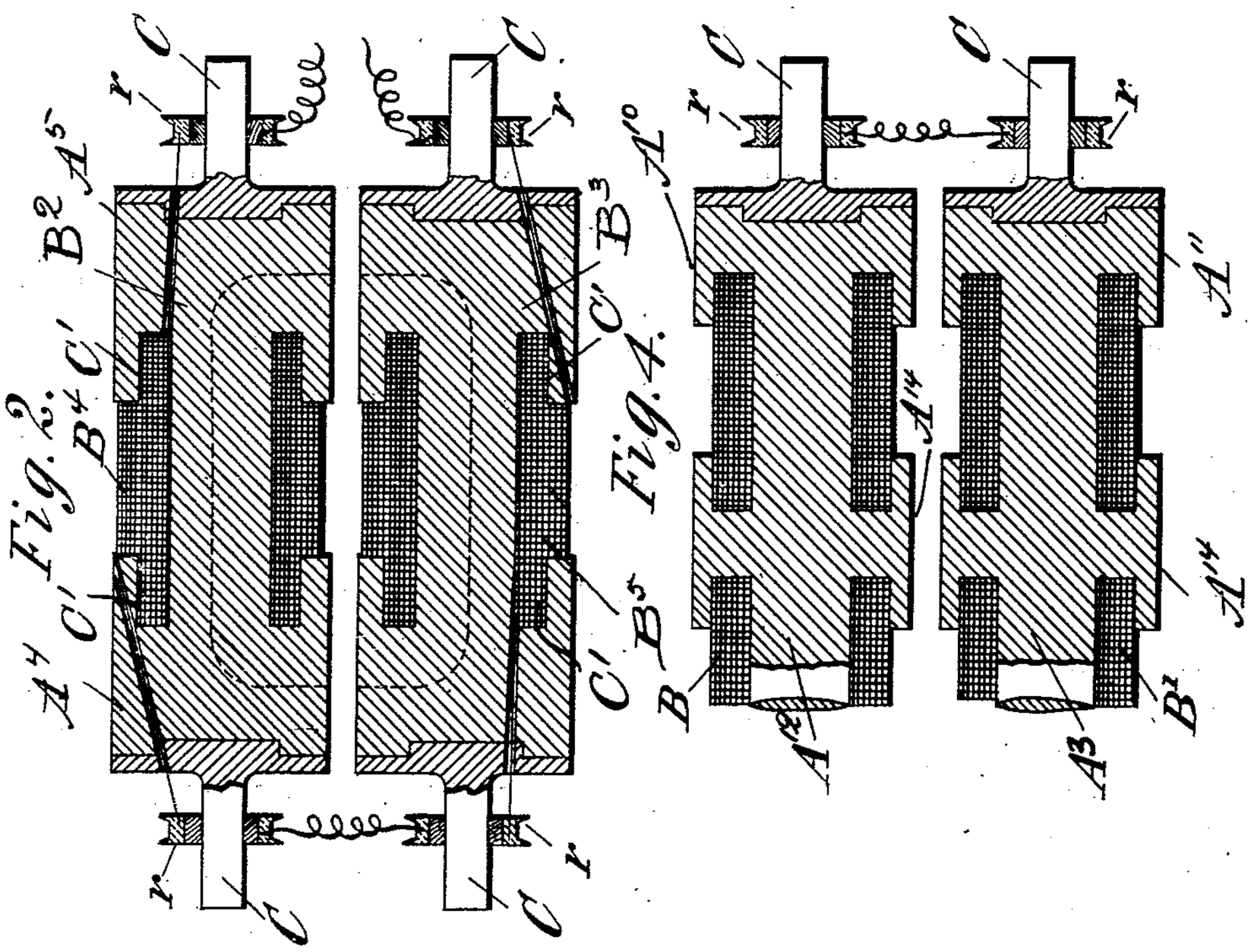
No. 664,650. Patented Dec. 25, 1900.

E. KREUSER.

ELECTROMAGNETIC ORE SEPARATOR.

(Application filed Sept. 2, 1898.)

(No Model.) 2 Sheets—Sheet 2.



Witnesses
W. B. Keeler
Dennis Sumby.

Inventor
Emil Kreuser
by James L. Norris.
Atty

UNITED STATES PATENT OFFICE.

EMIL KREUSER, OF MECHERNICH, GERMANY.

ELECTROMAGNETIC ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 664,650, dated December 25, 1900.

Application filed September 2, 1898. Serial No. 690,069. (No model.)

To all whom it may concern:

Be it known that I, EMIL KREUSER, a subject of the Emperor of Germany, residing at Mechernich, Rhine Province, Germany, have invented certain new and useful Improvements in Electromagnetic Ore-Separators, (for which I have obtained Letters Patent in Great Britain, No. 16,941, dated August 5, 1898,) of which the following is a specification.

This invention relates to electromagnetic ore-separators wherein two cylinders or rolls rotate in opposite directions.

The chief objects of my invention are to improve and simplify the class or type of separators referred to; to avoid the use of stationary magnets where two cylinders or rolls are employed, onto the surface of which the ore is directly delivered; to avoid the use of traveling bands or belts passing around the cylinders or rolls to carry the ore; to provide coöperating cylinders or rollers which of themselves constitute complete revolving bar-magnets; to provide electromagnetic cylinders or rollers having their ends of greater diameter than the body on which the wire is wound, the cylinders or rollers being so arranged as to present dissimilar cylindrical pole-surfaces to each other at the opposite ends in such manner that the magnetic lines of force are produced directly in the two coöperating cylinders or rollers themselves, whereby the path of the magnetic flux forms the shortest possible closed circuit, the lines of force having only to pass through a single air-space constituting the magnetic field, and the magnetic lines of force instead of being uniformly distributed over the whole periphery of the surfaces of a single cylinder or roller, as has heretofore been proposed, are according to my combination and arrangement concentrated at the places where the distance between the dissimilar pole-surfaces of the two rotary magnets is smallest and where the magnetic force is required for separating the ore, whereby the separator operates with the least possible magnetic resistance and with increased utilization of the electrical energy. To accomplish these objects, my invention involves the features of construction, the combination or arrangement of parts, and the principles of operation hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a horizontal sectional view taken longitudinally through the two rotary electromagnetic cylinders or rollers. Fig. 2 is a similar view showing a modified form of cylinder or roller. Fig. 3 is a similar view showing another modification. Fig. 4 is a similar view of portions of the two cylinders or rollers, showing another modification; and Fig. 5 is a horizontal sectional view showing another modification.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the drawings, wherein the letters A A′, Fig. 1, indicate the cylindrical electromagnetic cores of the two coöperating cylinders or rollers, and B B′ the wire coils or windings therefor. The end portions A^2 A^3 of each cylinder are cylindrical and of greater diameter than the cylindrical core or body part between such ends, and onto the naked cylindrical surfaces of these enlarged end portions the ore is delivered or deposited by any desired or suitable means. The opposite enlarged ends of each cylinder or roller constitute, respectively, a cylindrical north pole and a cylindrical south pole, and the two cylinders are so arranged that dissimilar poles are presented to each other—that is to say, the poles of one rotary electromagnet are presented to poles of different sign of the other magnet, whereby the magnetic lines of force (indicated by dotted lines) are produced directly in the cylinders or rollers themselves, the path of the magnetic flux (between the cylinders or rollers) forms a short closed circuit, the lines of force only require to pass through a single air-space constituting the magnetic field, and the entire magnetic force is concentrated at the places where it is required to separate the ore, in contradistinction to being uniformly distributed over the entire surface of a single cylinder or roller, as has been heretofore proposed.

The journals C of the rotary electromagnets may be made of any non-magnetizable material—such as brass, copper, or paper substance; but in large machines they may be iron or steel to avoid fracture, as experiments have shown that with iron or steel journals the amount of magnetic dispersion re-

sulting therefrom causes no material loss of useful effect. The journals are provided with insulated slip-rings *r* for conducting the electric current to and from the wire coils or windings B B′ of the electromagnetic cylinders or rollers. The forming of the enlarged cylindrical poles of two opposite magnets greatly facilitates the issue of the magnetic lines of force from the cylindrical poles, and thereby materially strengthens the magnetic flux between the two opposite poles.

In Fig. 1 the cylinders or rollers are each of approximately I shape in longitudinal section; but in Fig. 2 the enlarged cylindrical pole-surfaces A^4 A^5 of the cylindrical electromagnetic cores B^2 B^3, carrying wire windings B^4 B^5, are annularly channeled or grooved, as at C′, to receive portions of the wire windings and increase the capacity of the cylindrical pole-surfaces. In Fig. 3 the cylindrical electromagnetic cores A^6 and pole-surfaces A^7 A^8 are the same as in Fig. 1; but at the center there are similar cylindrical enlargements A^9, constituting additional surfaces.

In Fig. 4 the construction is the same as in Fig. 2 as regards the annularly channeled or grooved end pole-surfaces A^{10} A^{11} of cores A^{12} A^{13}; but intermediate channeled or grooved enlargements A^{14} are provided.

In Fig. 5 a pair of cylinders or rollers are shown, but one serves as an armature to the other, the latter having the cylindrical core B^6, cylindrical pole-surfaces A^{17} A^{18}, wire-winding B^7, and journals C.

By my invention several pairs of cylinders or rollers can be arranged to operate in a single machine, and it can therefore be adapted to perform any desired amount of work.

In my construction, arrangement, or combination and mode of operation I avoid all magnetic transmission resistance that necessarily occurs between fixed or stationary magnets and rotary poles. I can use iron cores of uniform size and unlimited power and produce a straight magnetic flux. I avoid the use of a traveling band or belt passing around a cylinder or roller, which is objectionable, especially in working on a large scale, and I obtain the useful advantages and results hereinbefore mentioned.

Having thus described my invention, what I claim is—

1. In an ore-separator, a pair of closely-placed coöperating rotary cylindrical electromagnets recessed at points intermediate their ends for inducing-coils, the winding of one coil being opposite that of the other, whereby magnetic lines of force are produced directly in the cöoperating magnets so that the path of magnetic flux forms the shortest possible closed circuit and the lines of force pass through a single air-space constituting the magnetic field, and connections between the coils and the source of energy which permits the rotation of the cylinders and coils therewith.

2. In an ore-separator, a pair of closely-placed coöperating rotary electromagnets, each provided with pole-surfaces and a cylindrical core having inducing-coils and arranged so that the magnetic lines of force are produced directly in the coöperating magnets, whereby the path of magnetic flux forms the shortest possible closed circuit and the lines of force pass through a single air-space constituting the magnetic field, and connections between the coils and the source of energy which permits the rotation of the cylinders and the coils therewith.

3. In an ore-separator, a pair of closely-placed coöperating rotary electromagnets, each provided with pole-surfaces and a cylindrical core having inducing-coils and arranged so that the magnetic lines of force are produced directly in the coöperating magnets, whereby the path of magnetic flux forms the shortest possible closed circuit and the lines of force pass through a single air-space constituting the magnetic field, connections for conducting the current from the coils of one magnet to and from the coils of the other, and connections between the coils and the source of energy which permits the rotation of the cylinders and the coils therewith.

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

EMIL KREUSER.

Witnesses:

NICKLAUS MAUER,

CARL ARZT.