No. 815,113. PATENTED MAR. 13, 1906.

F. J. ODLING & W. JAMIESON.

WET MAGNETIC ORE SEPARATOR.

APPLICATION FILED MAY 19, 1904.

2 SHEETS—SHEET 1.

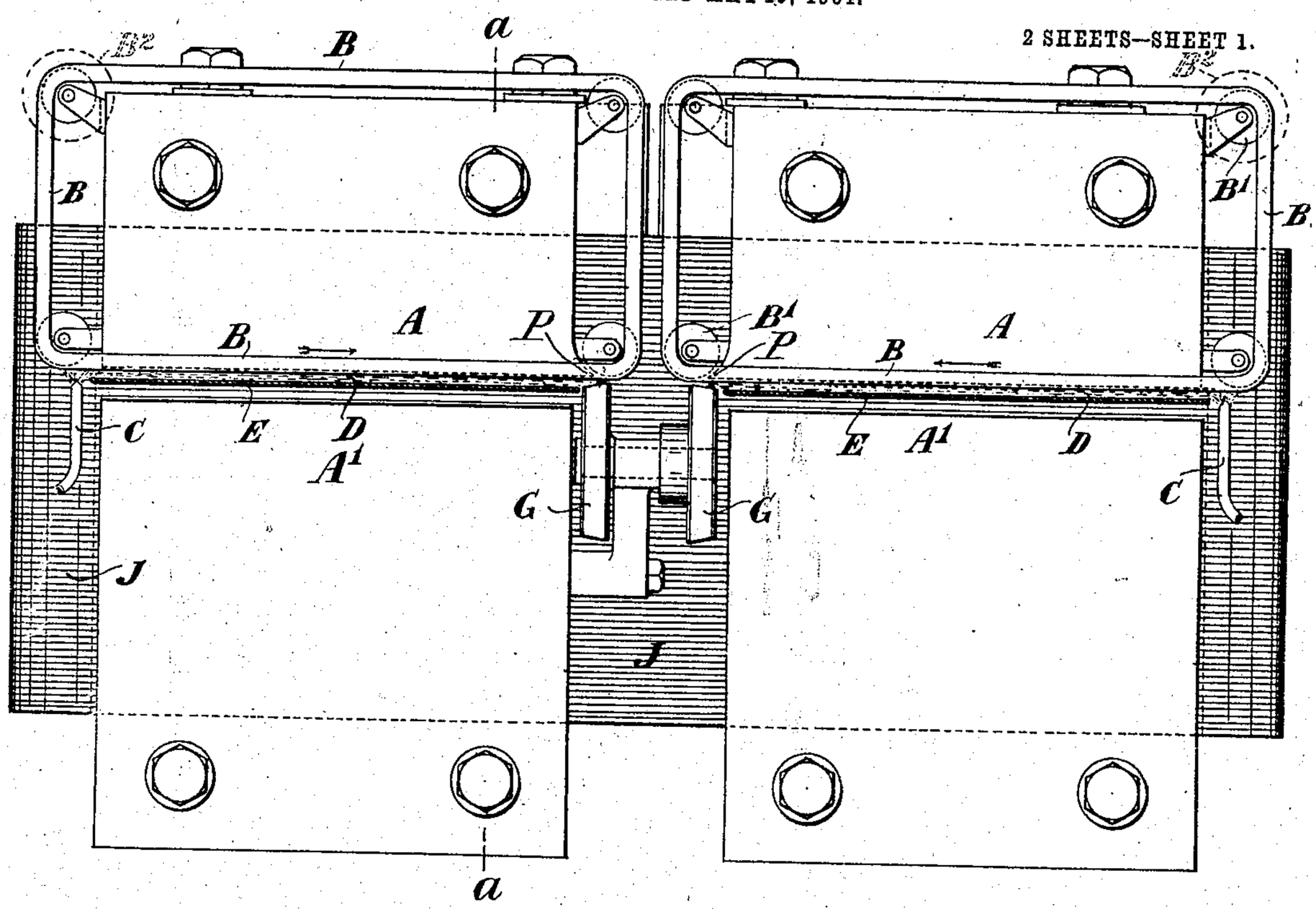

Fig. 1.

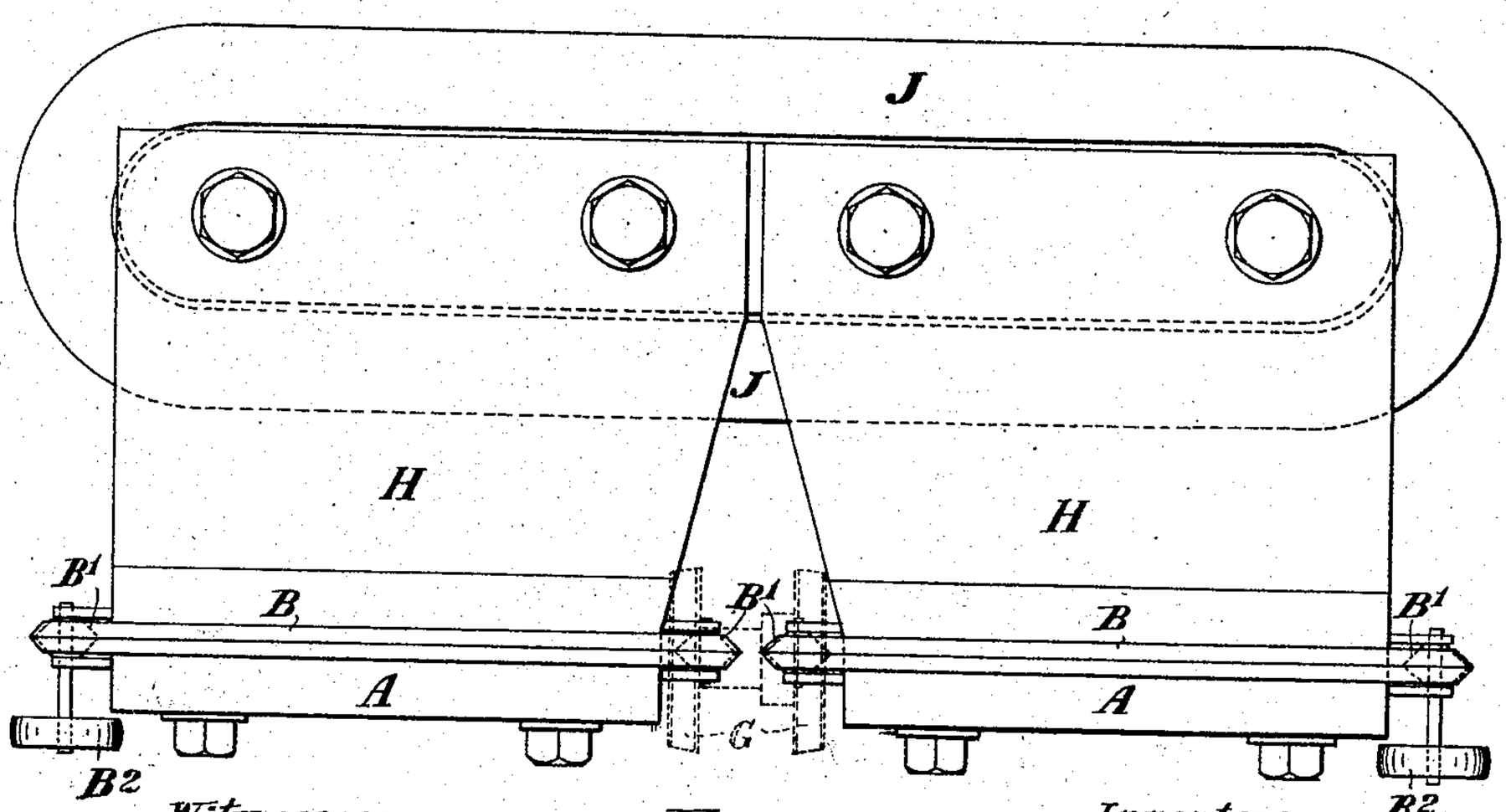

Fig. 2.

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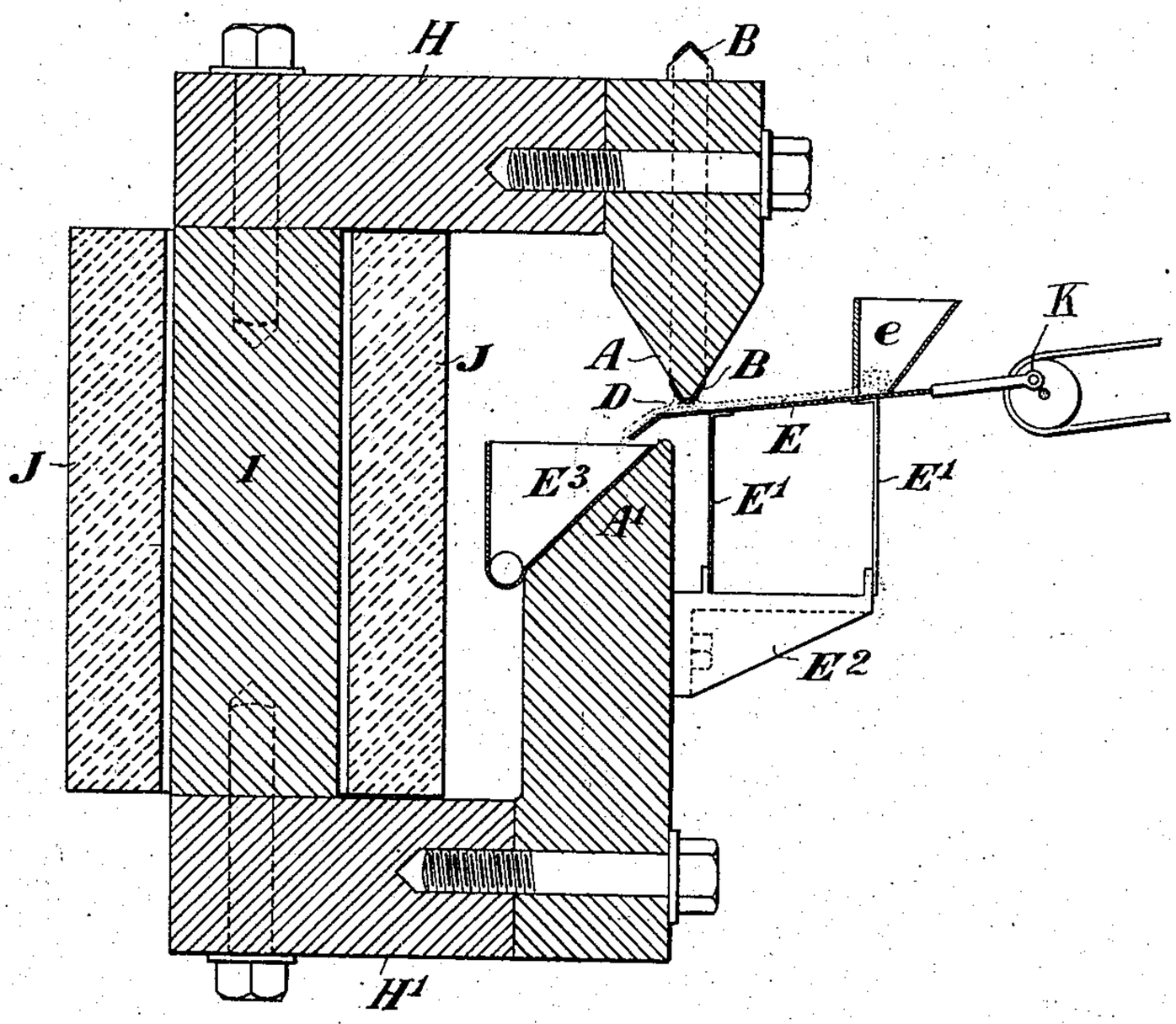


Fig. 3.

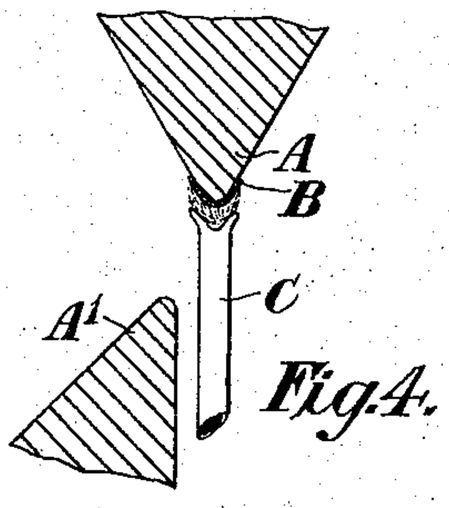


Fig. 4.

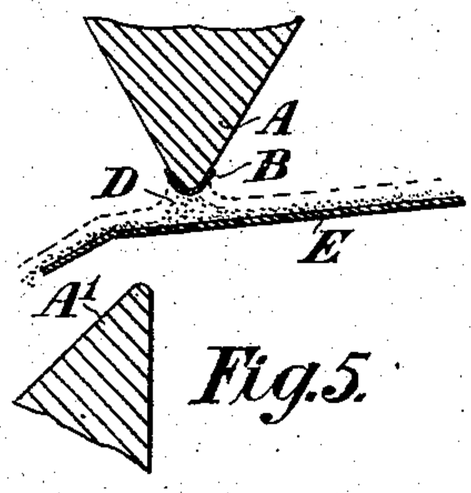


Fig. 5.

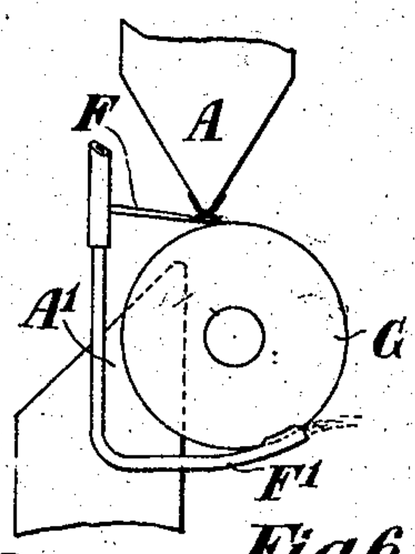
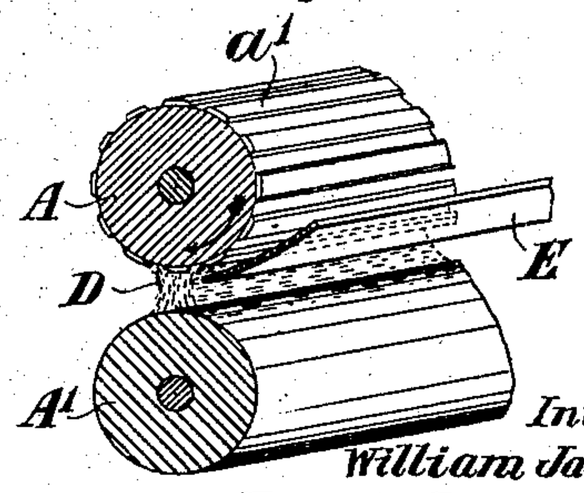


Fig. 6.

Fig. 7.



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UNITED STATES PATENT OFFICE.

FRANCIS JAMES ODLING AND WILLIAM JAMIESON, OF MELBOURNE, VICTORIA, AUSTRALIA.

WET MAGNETIC ORE-SEPARATOR.

No. 815,113. Specification of Letters Patent. Patented March 13, 1906.

Application filed May 19, 1904. Serial No. 208,652.

To all whom it may concern:

Be it known that we, FRANCIS JAMES ODLING, mining engineer, residing at No. 2 Princes Walk, Princes Bridge, and WILLIAM JAMIESON, gentleman, residing at Broken Hill Chambers, No. 31 Queen street, Melbourne, in the British State of Victoria, Commonwealth of Australia, subjects of the King of Great Britain and Ireland, have invented a new and useful Improvement in Wet Magnetic Ore-Separators, of which the following is a specification.

This invention relates to an improvement in wet magnetic ore-separators whereby a web, wall, or connecting-link of water (hereinafter called a "water web") is created or formed in the magnetic field and into which water web the pulverized materials under treatment pass in order that the magnetic particles may be attracted by the pole or poles, while the non-magnetic particles pass with the water to waste. To produce the said water web, it is necessary to cover one or both of the poles with a shield of non-magnetic material, and which shield has a coating of water imparted to it and is arranged to lie above the chute, table, or appliance by which the pulverized ore under treatment is fed to the magnetic field. Said water web is created and maintained (although the water is continuously flowing down the chute or table) partly by capillary attraction from the "wetted" or water-coated shield and partly by each attracted grain of ore carrying water with it, and hence said water web constitutes an easy passage-way or conduit for the particles of ore capable of magnetic attraction which are in the pulverized ore-grains flowing down in the water on the chute or table. The pole or poles are placed at such a distance apart as not to touch or intercept the flow until the water web is formed and maintained.

In order that the invention may be well understood, it will now be described aided by a reference to the accompanying sheets of drawings, which show how the water web is created in wet magnetic ore-separators, and in which—

Figure 1 is a front view, and Fig. 2 a plan, of a magnetic separator, while Fig. 3 is a vertical section on line *a a*, Fig. 1. Figs. 4 and 5 are detail sections of the poles, the former showing the water-pipe wetting the shield and the latter the water web created between the feed-table and the upper pole in the magnetic field, while Fig. 6 is a detail end view of the poles and the sheathed discharge-disk. Fig. 7 is a detail view showing as an alternative the water web formed between circular poles.

The upper poles A in the apparatus shown in Figs. 1 to 6 are covered with a shield B, which is in the form of an endless V-shaped rubber band supported on small sheaves B′, and to one of each set of sheaves motion is imparted by a belt-pulley B^2. Said shield B is coated with water issuing from a small open-ended vertical pipe C, arranged just outside the magnetic field, and out of the upper end of said pipe the water slowly flows and adheres to the shield as it is passing into the magnetic field, wherein the water on the shield attracts the feed-water to form the water web D. The upper and lower poles A and A′ are shown of V shape, and they may be arranged horizontally or vertically opposite each other or nearly so, or, in fact, in any position which will allow the pulverized ore to be fed in water onto a table E, to which a percussive or vanning motion is given by any well-known mechanical means, as by a crank movement K, and said table passes under the shield-covered pole A, so that the aforesaid water web D may be created or formed in the magnetic field. Table E is shown provided with a feed-hopper *e*, and the table is carried by spring-supports E′, projecting up from a bracket E^2, bolted to the lower pole-piece.

E^3 is a launder to receive the waste water and non-magnetic materials, and F and F′ are water-jets operating on a sheathed disk G.

In place of the rubber-band shield B a brass or other non-magnetic traveling shield may be employed.

H and H′ are upper and lower yoke-pieces carrying the poles, I the core-piece to the upper and lower faces of which the yoke-pieces are secured, and J is the insulated copper-wire bobbin.

This formation of the water web may be created on any type of magnetic separator having the poles and feed-table suitably situated for the purpose and with one or both of the poles furnished with a shield, which is wetted, as hereinbefore stated, or as an alternative the poles themselves may be ro-

tated or reciprocated, and in such case a shield is not necessary. For instance, as shown in Fig. 7, the poles A and A′ are cylindrical and caused to be rotated, the upper pole having longitudinal strips of non-magnetic conducting material *a′* on its surface, while the feed-table E terminates at the side of the water web D, which is formed between the poles.

In the working of the apparatus shown in Figs. 1 to 6 the pulverized ores are fed with water to the chute or table, and as the water web D is created and maintained in the magnetic field it serves as a conveying medium for the magnetic mineral, which when attracted is retained against the shield until such time as the shield passes beyond the end of lower pole-piece, where the magnetic field becomes weakened by reason of the formation of the upper poles with peaked prolongations P, and hence the magnetized particles will leave or drop from the shield and follow the magnetic field to and upon the revolving disk G, and in which transit they are aided by a water jet F playing on the shield. The upper part of the disk G and the particles thereon are influenced by the upper pole-piece, while the lower part of the disk is influenced by the opposite polarity of the lower pole-piece. The said magnetic particles will then be carried by the revolving disk until they are repelled by the reversal of the magnetic polarity in said disk, while any adhering particles will be swept off by the water jet F′. Again, when cylindrical revolving poles are employed, as is shown in Fig. 7, the magnetic mineral or particles will be carried by the upper pole to outside the magnetic field and thereat be swept off with a water jet, as before described.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a magnetic separator, the combination with a field-frame having opposed poles extending horizontally, of a table extending between said poles, means for feeding a mixture of water and the material to be separated to said table to flow below the upper pole, a band of non-magnetic material adapted to travel horizontally and adjacent to the face of the upper pole, and means for maintaining a water web between said non-magnetic band and said table.

2. In a magnetic separator, the combination with a field-frame having upper and lower poles extending horizontally, of a guiding-table extending between the poles, means for feeding a mixture of water and the material to be separated along said table and below the upper pole, an endless band of non-magnetic material adjacent to the face of the upper pole, means for causing said endless band to travel, and means for maintaining a water web between said traveling band and said table, the magnetic particles being carried by said web to be delivered at the side of the poles.

3. In a magnetic separator, the combination with a field-frame having upper and lower poles extending horizontally, of a supporting table or apron extending between the faces of the poles, means for causing a mixture of water and material to be separated to flow along said supporting-table toward the pole-faces, a band of non-magnetic material disposed adjacent to the face of the upper pole, means for causing said band to travel longitudinally along said upper-pole face, means for maintaining a film or coating of water on said band, and means for maintaining a water web between said film and the water on said table, the magnetic particles being carried by said traveling film and delivered at the sides of the poles.

4. In a magnetic separator, the combination with a field-frame having upper and lower poles extending longitudinally and separated by an air-gap, of a guiding table or apron extending through said gap and near the face of the upper pole, means for feeding the material to be separated to said table, means for vibrating said table to cause the material thereon to be moved toward the upper-pole face, a band of non-magnetic material adjacent to the upper-pole face, means for causing longitudinal travel of said band, and means for maintaining a film of water on said traveling band, the magnetic material being received by said film and carried thereby to be delivered at the side of the poles.

5. In a magnetic separator, the combination with a field-frame having an upper and a lower pole-piece extending horizontally and separated by an air-gap, means for causing a film of water to travel longitudinally along the face of the upper pole-piece, a supporting table or apron extending through said air-gap near the upper-pole face, means for feeding material to be separated to said table or apron, and means for vibrating said table to cause the material to move toward the upper-pole face, the magnetic particles of the material being attracted by the upper pole and conveyed by the traveling water film thereon to be delivered at the side of the pole-piece.

6. In a magnetic separator, the combination with poles, of means for maintaining a traveling film of water on one pole, means for feeding the material to be separated toward said film whereby the magnetic particles are attracted by the pole and carried by the film to the end thereof to be delivered.

7. In a magnetic separator, the combination with magnetic poles separated by an air-gap, of a supporting-table extending through said air-gap near one pole, means for feeding material to be separated to said table and toward said pole, means for maintaining a water web between said pole and said table, and

means for causing said water web to travel whereby the magnetic particles are attracted by said pole and conveyed by said traveling water web to be delivered.

8. In a magnetic separator, the combination with magnetic poles separated by an air-gap, of a guiding-table extending through said gap near one pole, means for causing a film of water to travel along the face of said pole, means for feeding a mixture of water and material to be separated to said table and toward said pole, said film and water cooperating to form a web between said pole and table, the magnetic particles being attracted by said pole and conveyed by said traveling film and web to the side of the pole to be delivered.

9. In a magnetic separator, the combination with a field-frame having upper and lower pole-pieces extending horizontally, said pole-pieces having V-shaped tips separated by an air-gap, a guiding-table extending through said air-gap near the tip of the upper pole-piece, means for feeding a mixture of water and material to be separated to said table and toward the upper-pole tip, and means for maintaining a traveling film of water along said upper-pole tip, said film and the water on the table coöperating to form a thin web between said pole-tip and the table, the magnetic particles being attracted by the upper pole and conveyed by the traveling film to be delivered.

10. In a magnetic separator, the combination with a field-frame having upper and lower pole-pieces extending horizontally, said pole-pieces having V-shaped tips separated by an air-gap, a guiding-table extending through said gap near the tip of the upper pole-piece, means for maintaining a web of water between the upper-pole tip and said table, means for causing said web to travel longitudinally along the upper-pole tip, means for feeding material to be separated to said table, and means for vibrating said table to cause the material to be conveyed toward the water web whereby the magnetic particles are attracted by the upper pole-piece and conveyed by the traveling water web to be delivered.

11. In a magnetic separator, the combination with a field-frame having upper and lower pole-pieces, said pole-pieces having V-shaped tips separated by an air-gap, a guiding-table extending through said air-gap near the upper-pole tip, means for causing a film of water to travel longitudinally along the tip of the upper pole-piece, means for feeding material to be separated to said table, and means for vibrating said table to cause the particles thereon to be conveyed toward said traveling film whereby the magnetic particles are attracted by the upper pole-piece and conveyed away by said traveling film.

12. In a magnetic separator, the combination with a field-frame having upper and lower pole-pieces, said pole-pieces having V-shaped tips separated by an air-gap, of a guiding-table extending through said gap near the upper-pole tip, a band adapted to embrace the point of the upper-pole tip, means for causing said band to travel longitudinally along said pole-tip, means for supplying water to said band whereby a thin film is formed thereon, and means for feeding material to be separated to said table and toward said film whereby the magnetic particles are attracted by the upper pole-piece and conveyed away by virtue of said traveling film.

13. In a magnetic separator, the combination with a field-frame having pole-pieces extending horizontally, said pole-pieces having V-shaped tips separated by a suitable air-gap, of a guiding-table extending through said air-gap near said upper-pole tip, a band of non-magnetic material embracing the end of the upper-pole tip, means for causing said band to travel longitudinally along said upper-pole tip, means for maintaining a film of water on said band, and means for feeding material to be separated to said table and toward said film whereby the magnetic particles are attracted by the upper pole-piece and conveyed away to be delivered by virtue of the film traveling with said band.

14. In a magnetic separator, the combination with a field-frame having upper and lower pole-pieces, said pole-pieces having V-shaped tips separated by a suitable air-gap, of a guiding-table extending through said air-gap near the upper-pole tip, a band embracing the end of the upper-pole tip and adapted to travel longitudinally along said tip, means for maintaining a film of water on said band, means for feeding a mixture of water and material to be separated to said table and toward said film, said film and water cooperating to form a traveling web between the upper-pole tip and said table, the magnetic particles being attracted by said upper pole-piece and conveyed away to be delivered by virtue of said traveling web.

15. In a magnetic separator, the combination with a field-frame having pole-pieces extending horizontally, said pole-pieces having V-shaped tips separated by a suitable air-gap, a guiding-table extending near the upper-pole tip, a band of non-magnetic material embracing the point of the upper-pole tip, means for causing said band to travel longitudinally along said pole-tip, means for supplying water to said band whereby a thin film is formed thereon, and means for feeding a mixture of water and material to be separated to said table and toward said band, said film and water coöperating to form a traveling water web between said pole-tip and said table whereby the magnetic particles are attracted by the upper pole-piece

and conveyed to one end thereof by virtue of the traveling web.

16. In a magnetic separator, the combination with a field-frame having upper and lower pole-pieces, said pole-pieces having V-shaped tips separated by a suitable air-gap, a guiding-table extending near the upper-pole tip, a band of non-magnetic material embracing the point of the upper-pole tip, means for causing said band to travel longitudinally along said pole-tip, means for maintaining a film of water on said band, means for feeding material to be separated to said table and toward said band whereby the magnetic particles are attracted by the upper pole-piece and conveyed to the end thereof by the film traveling with said band, and means at the end of the upper pole-piece for decreasing the attractive influence thereof whereby the magnetic particles are released and delivered.

17. In a magnetic separator, the combination with a field-frame having an upper and a lower pole-piece extending horizontally, said pole-pieces having V-shaped tips separated by a suitable air-gap, a guiding-table extending near the upper-pole tip, a band of non-magnetic material embracing the point of the upper-pole tip and adapted to travel longitudinally along said tip, means for feeding a mixture of water and material to be separated to said table and toward said band, means for supplying water to said band whereby a thin film is formed thereon to travel therewith, said film coöperating with the water on said table to cause a thin web between said pole-tip and said table to travel longitudinally across the table, the magnetic particles being attracted by the upper pole-piece and conveyed by said traveling web to the end of the pole piece, and means for diminishing the attractive influence at the end of the pole-piece whereby the magnetic particles are released to be delivered.

In witness whereof we have hereunto set our hands in presence of two witnesses.

FRANCIS JAMES ODLING.
WILLIAM JAMIESON.

Witnesses:
REDLINGTON BODYCOMB,
W. J. S. THOMPSON.