

A. H. BALCH & W. D. E. NELSON.

Improvement in Electro-Magnetic Separators.

No. 115,561.

Patented June 6, 1871.

Fig. I.

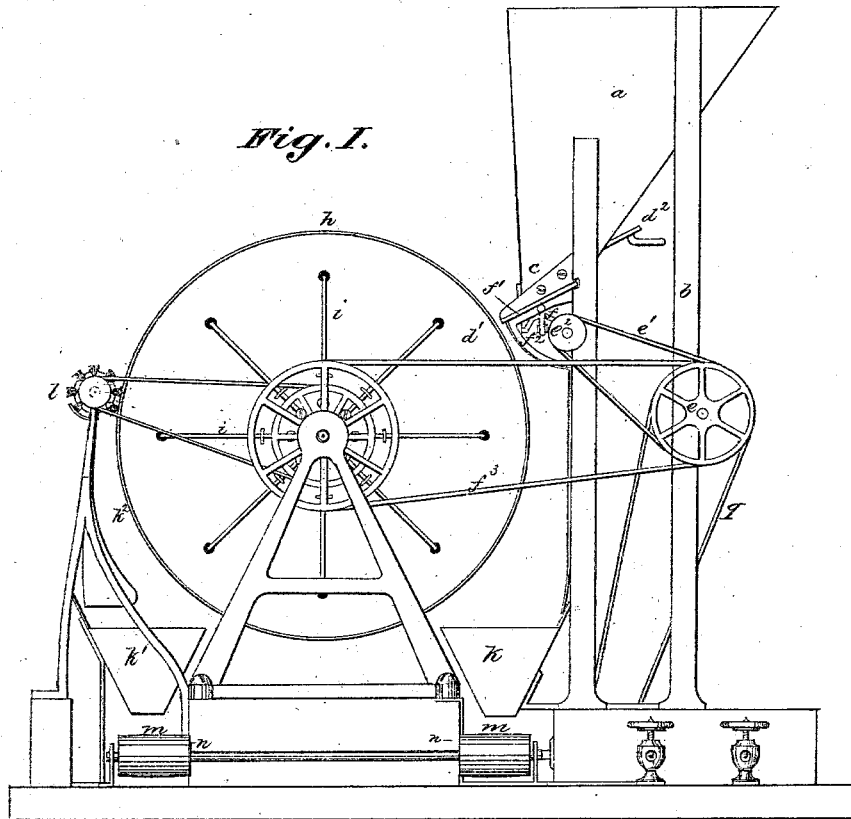
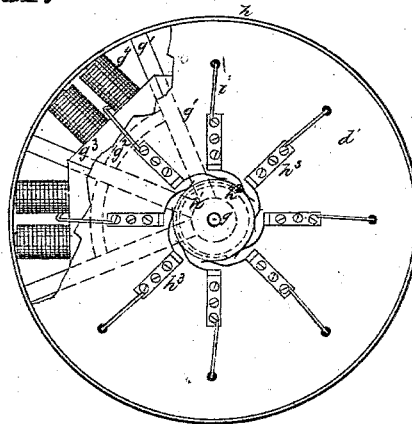


Fig. II.



WITNESSES

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Fig. III.

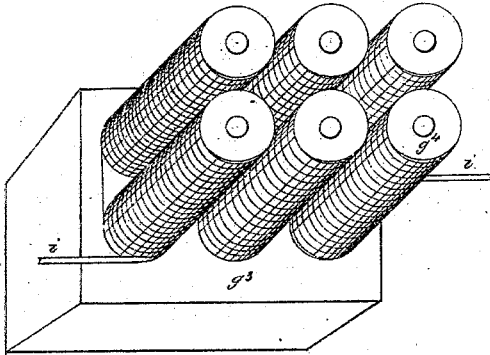


Fig. IV.

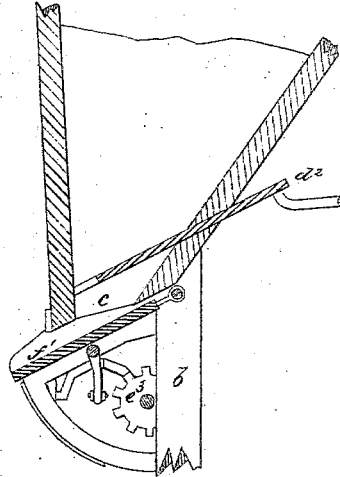


Fig. V.

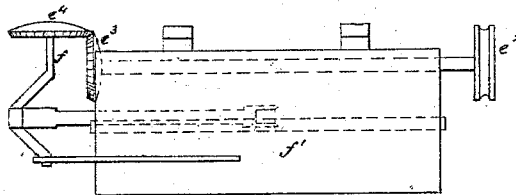
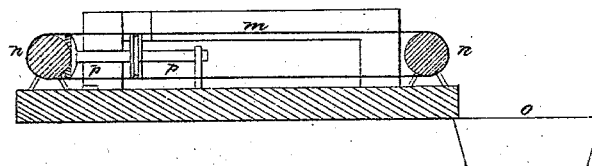


Fig. VI.



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UNITED STATES PATENT OFFICE.

ALFRED HOLME BALCH AND WOLFRED DAVID EMELIUS NELSON, OF
MONTREAL, CANADA.

IMPROVEMENT IN ELECTRO-MAGNETIC SEPARATORS.

Specification forming part of Letters Patent No. 115,561, dated June 6, 1871.

To all whom it may concern:

Be it known that we, ALFRED HOLME BALCH, of the city of Montreal, in the district of Montreal, in the Province of Quebec, gentleman, and WOLFRED DAVID EMELIUS NELSON, of the same place, medical student, have invented new and useful Improvements on Electro-Magnetic Iron-Separating Machine; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawing, where—

Figure 1 represents a side elevation of the machine. Figs. II, III, IV, V, and VI represent details of the machine.

This invention relates to improvements on machines for separating magnetic iron from sand and other foreign substances, but is more particularly adapted for use in dividing the minute particles of iron found in a native state at the Moisir, in the Gulf of St. Lawrence, and elsewhere. The iron thus found is of extremely good quality, and many devices have been made for separating it from the sand with more or less success, but all involving so large an amount of labor as to render them practically failures. To overcome this difficulty is the principal object of the present invention.

In the drawing hereunto annexed similar letters of reference indicate like parts.

Letter *a* is a general receiving-hopper, suspended from the upper floor of the building in which it may be placed, or supported by suitable columns or frame-work, *b*, from below. The hopper is formed at the bottom with an elongated opening, *c*. Underneath this a board, *f*¹, is placed for the sand to flow out on and to convey it to an electro-magnetic drum or cylinder, *d*¹, placed in front, hereinafter to be more particularly described. At any suitable position in the hopper a screen for preventing large pieces of material, such as stones, &c., from descending to the drum is placed, and the elongated opening *c* is provided with a regulating-board or valve, *d*², of any suitable construction; or, as shown in Fig. IV, this may be adjusted by screws or any other convenient device for regulating the flow of the sand. In any suitable position a driving-wheel and shaft, *e*, is placed to give the required mo-

tion to the various parts of the machine, as hereinafter described, with any suitable power provided for that purpose. From the wheel and shaft *e* a belt, *e*¹, gives the required motion to another wheel and shaft, *e*², provided with a gear-wheel, *e*³, at its other extremity, and a corresponding gear-wheel, *e*⁴, and crank-shaft *f*, supported in the proper position, and shown in Figs. I and V. To the crank, by any suitable connection, is attached an agitating feeding-board, *f*¹, shown also in Fig. IV. This is for causing the sand to flow equally from the opening *c* to the periphery of the drum *d*¹, the feeding-board *f*¹ being carried on any suitable grooved supports, *f*², for that purpose. The drum *d*¹ is placed in front of the feeding-board *f*¹, and in the position indicated in Fig. I, revolving, by means of the belt *f*³, in the direction shown by the arrow, its axles being carried by any suitable supports. The construction of the drum is as follows: On the shaft or axle *g* the frame-work *g*¹ is secured somewhat similar to that of the paddle-wheels of a steam-vessel. On the outer ring *g*² of this wheel suitable wooden bars *g*³, shown in detail, Figs. II and III, are secured. To the outer surface of these bars is attached a series of vertical and parallel electro-magnets, *g*⁴. The arms of the frame-work *g*¹ extend out beyond the outer ring *g*² of the frame, so that their extremities may be at equal distances from the center of the axle *g* to that of the outer end of the electro-magnets *g*⁴. To the ends of these extended arms, and to the poles of the electro-magnets, is attached a covering of very thin metal, *h*, forming the periphery of the drum *d*¹. The drum *d*¹ is carried by any suitable supports, one at each end, and to one of these supports is attached an insulated wheel, *h*¹, and so situated that one of the axles *g*, passes through its center, freely revolving through it. This wheel *h*¹ is placed as close to the end of the drum as possible without actual contact. The periphery of the wheel *h*¹ is formed of metal, with a covering of wood, *h*², extending around a suitable amount of the circumference. To the metal portion of the wheel one of the wires of a galvanic battery is attached. On the flush ends of the drum *d*¹ a number of scroll or other springs, *h*³, is attached, one of such springs

being provided for each of the bars g^3 , and connected with the magnets. These springs h^3 are so situated that their extremities may rest and slightly press upon the periphery of the wheel h^1 . To any suitable part of these springs copper-wires i are attached, connecting with the wire traversing the electro-magnet of each bar in such a manner that their poles are parallel. The other wire of the battery is connected with the magnets in any suitable manner. By this arrangement of the wheel h^1 and springs h^3 the electro-magnets are rendered active as they come to the required position during the revolution of the drum d^1 . This is so arranged that as the sand and iron fall from the feeding-board the magnetic iron is attracted, while the sand falls into a suitable receiving-hopper, k , while the iron is carried by the continued action of the magnets to about the point k^2 , situated above the hopper k^1 , a revolving brush, l , being arranged to sweep off any particles that may adhere in consequence of native magnetism to the surface of the sheet metal h . For convenience of removing the separated iron and sand the hoppers k k^1 may be provided with an endless belt, m , arranged on pulleys n , to convey them to suitable receptacles o , from which they may be removed as required. To give the required motion to the pulleys n the

shafting and gear p p are provided, actuated by a belt, q , driven by the shafting and pulley e .

Having now described the construction and operation of our invention, to which we have given the name of "BALCH and NELSON'S improved electro-magnetic iron-separator," we beg to state that we disclaim all other forms of magnetic iron-separators now in use.

What we claim as our invention, and wish secured by Letters Patent, is—

1. The arrangement of magnets within the periphery of the cylinder d^1 , as described.

2. The specific construction of the hopper a with its oscillating board f^1 , the latter being operated by means of the wheel, shaft, gearing, and crank-shaft, as described.

3. The insulated wheel h^1 , with its periphery of iron and wood, in combination with the springs of the cylinder-arms, as described.

4. The combination of the cylinder, having magnets arranged as described, with the hoppers, bolts, and hub, arranged as described, for the purpose set forth.

Montreal, 10th day of November, A. D. 1870.

ALFRED HOLME BALCH.

WOLFRED DAVID EMELIUS NELSON.

Witnesses:

CHARLES LEGGE,

CHARLES G. C. SIMPSON.