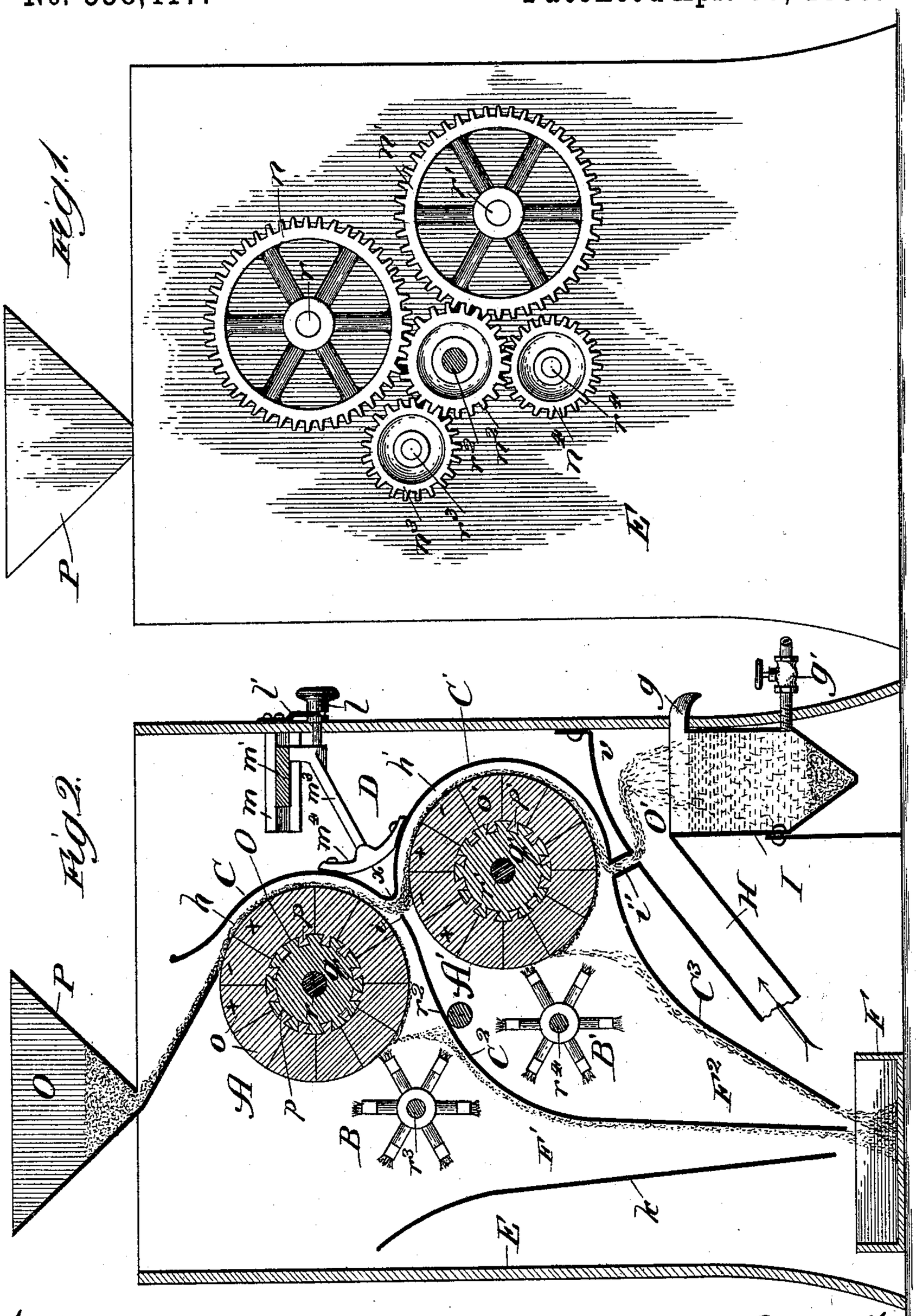
(No Model.)

J. HOULEHAN.

MAGNETIC ORE SEPARATOR.

No. 538,417. Patented Apr. 30, 1895.



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UNITED STATES PATENT OFFICE.

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MAGNETIC ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 538,417, dated April 30, 1895.

Application filed June 6, 1894. Serial No. 513,687. (No model.)

To all whom it may concern:

Be it known that I, JAMES HOULEHAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Magnetic Ore-Separators, of which the following is a specification.

The primary object of my invention is to provide a magnetic separator, which shall operate to separate, by magnetism, from the ore the precious metals (gold and silver) as well as the magnetic metals.

To this end my invention consists, in its broadest sense, in providing a suitable rotary magnet (either permanent or electro) and an armature opposed to the magnet and forming therewith an interposed ore-passage, through which the pulverized ore is fed, and in which it is subjected to the lines of magnetic force in the field between the magnet and its armature. By this construction the magnetic metals contained in the ore will be attracted by the magnet as in any magnetic separator, while the presence of the armature produces an induced magnetic current in the interposed non-magnetic metals, and, according to the law of induced currents, it is of contrary polarity at the points respectively presented to the magnet and keeper.

In the accompanying drawings, Figure 1 is a view in side elevation of my improved magnetic ore-separating apparatus, and Fig. 2 is a view of the same in vertical sectional elevation.

A is a rotary-magnet, which may involve any suitable construction, and may be of the electro-magnet or permanent magnet variety. As represented, it is the latter (though the former is preferred) and involves, as its construction, a properly journaled rotary shaft r, surrounded by a non-magnetic (as brass) cylinder q, having formed at suitable intervals lengthwise in its perimeter dove-tail grooves into which are introduced, endwise, and confined at their dove-tail shaped tongues p, magnetized steel bars o of the radially-inward tapering form in cross-section, or segmental form, illustrated. At their outer surfaces, or poles, the magnet-bars are successively of contrary polarity.

For my purpose, I prefer to provide two cooperating rotary magnets and show, in the drawings, besides the one already described, another, A′, of the same construction; and the corresponding parts in the latter are denoted by the same letters of reference as the former, with prime-marks.

The shafts r and r' carry at corresponding ends gear-wheels n and n' connected by a pinion n^2 on a shaft r^2, which may be the rotary driving-shaft for the apparatus; and the pinion n^2 also meshes with pinions n^3 and n^4 on counter-shafts r^3 and r^4, carrying rotary brushes B and B′, respectively, in position to operate against the surfaces of the two magnets A and A′.

C is an iron shield forming an armature for the magnet A; and C′ is a similar shield forming an armature for the magnet A′, the two armatures being represented as formed of a continuous sheet of metal bent to conform to the contours of the parts of the two circular magnets to which they are opposed, and being supported from the bend x, between the two magnets, by an adjustable support D. As shown the support D comprises a pair of horizontal guides m (one member, only, of which pair is shown in Fig. 2, owing to the nature of the view selected for the illustration) fastened to a casing E which envelops the mechanism of the apparatus. Between the guides is a sliding cross-head m', carrying a rigid stem m^3 terminating in a head m^4 fastened to the armatures C and C^1 near the bend x, and a set-screw l supported in a bearing l' on the casing and passing through the latter into engagement with the adjacent end of the stem m^3 serves to draw it back and forth and thus effect adjustment of the proximity of the two armatures with relation to the magnets. The shield forming the two armatures C and C′ is further supported by fastening it at its base, as at v, to the wall of the casing. From the bend x a branch C^2 of the sheet-metal shield is continued, and extends to form, with a shield k, a guide-chute F′ for the material to

a receptacle F. Adjacent to the bend x between the two armatures C and C′, the armature-extension C^2 has a discharge-opening i through it, by which the pulverized material which passes the first magnet escapes from the passage h between the magnet A and its armature to the passage h' between the magnet A′ and its armature, from which last-named passage the tailings discharge through an opening i' in the armature C′ into a conduit H covering a water-holder I and connected with an air-blower (not shown) whereby the fine material is diffused by the currents of air over the surface of the water-holder, supplied with water at g', the very fine particles floating on the surface of the water, and escaping at the overflow g', from which they are saved, and the coarser particles sinking in the holder H whence they may, from time to time, be removed for treatment to save any precious metal they may contain. The armature C′ also has an extension C^3, forming, with the extension C^2 of the armature C, a chute F^2 leading to the receptacle F.

My improved apparatus is operated as follows: The several shafts being set in motion, finely pulverized ore O (wet or dry) from a hopper P is fed to the passage h through which it passes under the magnetic influence of the magnet A, which attracts the magnetic particles of the ore, and, by the effect of the opposed armature, C, also particles of gold and silver that may be contained in the ore. The material O that does not adhere to the magnet A discharges through the opening i into the passage h', where it undergoes a secondary treatment similar to that in the passage h, the tailings O′ escaping through the opening i' to the flue H, whence they are disposed of in the manner already described. The brushes B and B′, into somewhat close proximity with which the armatures are extended, as shown wipe the material held by the magnets from their surfaces, whence it falls through the chutes F and F^2 into the receptacle F.

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

1. In a magnetic ore-separator, the combination of a movable magnet and an armature forming an interposed ore-passage, substantially as and for the purpose set forth.

2. In a magnetic ore-separator, the combination of a movable cylindrical magnet and an armature supported with relation to and conforming more or less to the peripheral surface of the magnet and forming therewith an interposed ore-passage, substantially as and for the purpose set forth.

3. A magnetic ore-separator comprising, in combination, rotary magnets A, A′, provided with armatures C, C′ forming with the magnets the ore-passages h, h', communicating between the magnets, the armatures having extensions C^2, C^3, forming chutes, rotary brushes B and B′ for the magnets, a water-holder I communicating with the discharge-end of the passage h', an air-blast conduit H, leading past the discharge from the said passage h' and over the surface of the said water-holder, and an inclosing case for the mechanism, the whole being constructed and arranged to operate substantially as and for the purpose set forth.

JAMES HOULEHAN.

In presence of—
M. J. FROST,
W. Y. WILLIAMS.