(No Model.)

C. F. PIKE.

ELECTRO MAGNETIC ORE STAMP.

No. 248,056. Patented Oct. 11, 1881.

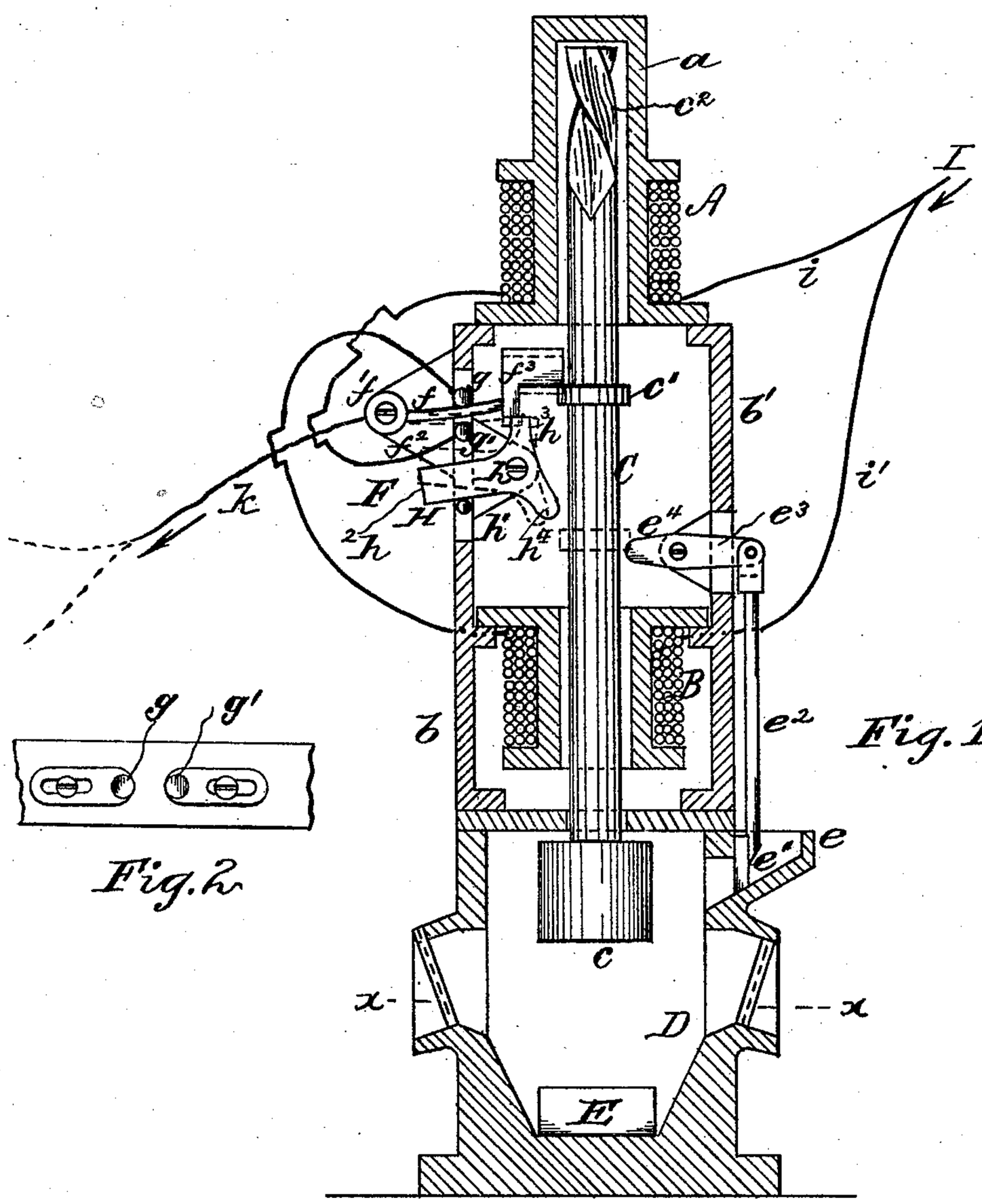

Fig. 1

Fig. 2

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ELECTRO-MAGNETIC ORE-STAMP.

SPECIFICATION forming part of Letters Patent No. 248,056, dated October 11, 1881.

Application filed February 21, 1881. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. PIKE, a citizen of the United States, resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electro-Magnetic Ore-Stamps, of which the following is a specification, reference being had to the annexed drawings, wherein—

Figure 1 is a longitudinal vertical section of an ore-stamp embodying my improvements. Fig. 2 is a detail view, showing adjustable contact-points.

My invention relates to ore-stamps, and has for its object to reciprocate the stamp-stem and attached shoe by electro-magnetism, to obtain a simple, cheap, and efficient ore-stamp which is less expensive, requiring less power for operation, and having the capacity of performing more work than is the case with ore-stamps of a relative size heretofore generally constructed.

My invention accordingly consists of the novel combination and arrangement of parts, having reference particularly to the following points: first, to the provision of a stamp-stem located axially within hollow electro-magnets or helices, whereby said stem and its attached shoe are positively reciprocated in both directions by electro-magnetism; second, in the combination, with a stamp-stem and attached shoe, of a series of helices surrounding said stem and a rheotome or circuit-breaker so constructed as to allow the stamp-stem to descend to such extent that its shoe will always strike the ore with a positive blow before the circuit is shunted to the helix which raises said stem and shoe, whereby said shoe will continue to strike the ore with a positively-actuated blow as said ore gradually lowers in height upon the die or anvil in the mortar; third, to the provision, with a stamp-stem electrically reciprocated, of means for rotating said stem by compressed air to cause its shoe to wear less rapidly and more evenly; fourth, to the provision, with a stamp stem and shoe electrically reciprocated, of means for feeding the ore to the mortar, said means being operated by mechanism on the stamp-stem; and, fifth, to the general combination of a suitable electrical generator, a voltaic circuit and connections, a series of helices, a core or stamp-stem common to both, said stem being provided with a shoe, and a circuit-breaker or rheotome for shunting the current at suitable times to impart the desired reciprocation to the stamp-stem.

Referring to the accompanying drawings, A and B represent two coils or helices or electro-magnets, supported on standards *b b'*, the coil A being provided at its upper end with a chamber or recess, *a*, for purposes hereinafter to be described.

C is a core common to both helices, and constitutes the stamp-stem. *c* is the shoe, secured to the lower end of said stem in the usual manner, the latter being also provided with an annular collar, *c'*, and has its upper end formed into or provided with a series of spiral blades, c^2 c^2, whereby, when said stem is reciprocated upwardly, the air in the chamber *a* will be compressed, and as it seeks to escape from said chamber will strike against the spiral blades c^2 c^2 and partially rotate the stem C. A partial rotation of the said stem will thus be effected on every upstroke thereof. Consequently the shoe *c*, rotating with the said stem, will wear out less rapidly and more evenly than it would do if no provision were made for such rotation. The compression of the air in the chamber *a* not only acts as a power or means for rotating the stamp-stem, but also serves as a buffer or cushion to prevent shocks or jars on the upstroke of the stamp-stem.

D is the mortar-box, made in the usual or any suitable manner, and may, if desired, form the foundation for the standards *b b'*, as shown, and E is the die or anvil therein upon which the ore is crushed, said mortar being provided with an ore-feed receptacle, *e*, closed by a gate, *e'*, having a rod, e^2, jointed to a lever, e^3, pivoted to the standard *b'*, as shown, its end e^4 nearly impinging against the stamp-stem C, so as to be in line with the collar *c'* thereon.

F is the switch or rheotome, and consists of a bar, *f*, pivoted at its end *f'* to a bracket, f^2, on the standard *b*, its opposite end being enlarged to form a weight, f^3, whereby the said bar will always tend to move downwardly on its pivoted point.

g g' are stops or contact-points secured to the standard *b* or a bracket thereon, at a suitable distance apart, and between which passes the pivoted bar *f*, as shown.

H is a bar pivoted at *h* to bracket *h'*, having

weighted end h^2 and tripping fingers h^3 and h^4, the tendency of weight h^2 being such as to cause the finger h^4 to move over toward the stem C and the finger h^3 to move in the reverse direction. Consequently when the end f^3 of bar f is lifted by the stamp-stem collar c' the finger h^3 will pass beneath said bar f to hold it in an elevated position in contact with stop g. At the same time the finger h^4 is projected over toward said stem C to come into the path of said collar c', whereby when the stem next descends the collar c' will strike the finger h^4, pushing the latter over to the left and causing the finger h^3 to pass out from beneath the bar F. The latter will then drop against contact-stop g', thereby providing for shunting the current from the helices alternately.

I is the conductor, coming from any suitable dynamo or magneto electric generator, (not shown in the drawings,) and is divided, the branch i going to the coil A and the branch i' to coil B, so that the circuit may pass alternately through each coil as it is shunted by the action of the rheotome F. The terminal from coil A leads to contact g', while that from coil B leads to contact g, both of said contacts being insulated from each other.

The ground or return wire k to the generator is connected to bar f, with the parts in the position shown in the drawing. The coil B is in circuit while the coil A is shunted out, and is therefore inactive. The operative force of said coil B acts to draw the stem C, and reciprocates it downwardly to cause the shoe c to strike or stamp with a positive blow the ore previously fed into the mortar to the height of the dotted line x, or thereabout. Just before said shoe strikes the ore the collar c' throws the finger h^4 to the left, the finger h^3 thereby moving to the right and releasing itself out of impingement with bar f, whereupon the latter falls by gravity upon contact g' to shunt the circuit from coil B to coil A to elevate or raise the stem C. But the stem traveling at such a high velocity by reason of the attraction exerted upon it by the coil B, the shoe strikes against and stamps the ore before the bar f falls sufficiently under the influence of gravity only to contact with the point g'. Consequently the ore receives the full force of the blow at each stroke before the current is shunted from the coil B to the coil A. The bar f coming into contact with the point g', the current is now through coil A, and the latter acts to raise or elevate the stem C. As it is drawn upward its momentum compresses the air in chamber a, and said air operates on the spiral blades c^2 to partially rotate said stem and shoe, as described. Its collar c', impinging against the under side of the head or weight f^3 of bar f, lifts the same to make contact with point g, allowing the finger h^3, under influence of weight h^2, to pass beneath said bar and hold it in said contact, whereupon the current is again shunted to the coil B, and the stem and shoe are reciprocated forwardly or downwardly, as before set forth, these operations being repeated at every stroke of the stamp-stem. The latter is very rapidly reciprocated under a positive power. Therefore the stem and shoe may be, and are designed to be, made much smaller and of less weight than stamp-stems and shoes have heretofore been constructed. Consequently less power will be required to operate the stamp, and the high speed at which it may be reciprocated (which may be, if desired, from two thousand five hundred to three thousand per minute) will cause the stamp to perform a much greater amount of work than stamps of the same relative capacity heretofore constructed, according to the well-known law that a small object traveling at a high rate of speed is capable of producing greater and more powerful results than a heavier object traveling at a low rate of speed. As the ore is crushed or stamped it gradually lowers in height below the line $x\ x$; but the shoe still continues to strike said ore by reason of its greater velocity compared with that which the bar f acquires as it falls by gravity upon the contact-point g'—or, in other words, between the times of the bar f breaking contact with the point g and making contact with point g' there is an interval, and such interval, small though it be, is sufficient to allow the force of magnetism to cause the stem to descend and allow the shoe to strike the ore, no matter what may be the height of the same upon the die in the mortar. The rheotome or switch for ore-stamps must be constructed to produce such interval between shunting of the circuit and the termination of the forward stroke of the stamp-stem, because the feed is not continuous, but only intermittingly so. Such construction of the rheotome, to provide an interval between the shunting of the current when the stem is reciprocating downwardly, avoids the employment of mechanism to feed the coils and said stem and shoe down to the ore as its height lowers in the mortar, and dispenses with the necessity of raising the same every time a fresh supply of ore is fed into said mortar. Said interval can be regulated to be greater or less by causing the contact-points $g\ g'$ to be adjusted to and from each other. Mechanism to secure such adjustment is shown in Fig. 2. It is obvious that the longer the interval the greater the distance the stem will fall, and vice versa. During said interval the magnetic force in coil B has an opportunity of fully expending itself on the stamp-stem, so that when the coil A begins to act thereon it is not resisted by any residual magnetic force in coil B. When the ore on the die has decreased in height to such extent that the collar c' strikes the end e^4 of lever e^3 the latter will be operated to raise the gate e' and allow the requisite amount of ore to pass into the mortar, and when said collar is released from said lever the gate e^4 closes by gravity and shuts off the feed until the ore just previously admitted to the mortar is

stamped, when the gate is again opened, as set forth.

I have shown and described the rotation of the stamp-stem and shoe as taking place on the upstroke of the stamp-stem; but, if desired, such rotation may be effected on the downstroke.

Instead of sending the current to ground or back to the generator through wire *k*, the latter may be divided and connected to the next succeeding stamp of a series of such machines to form a stamp-battery, whereby they will all be operated in succession by the same current, the wire on the last stamp of the series going to ground or returned to the generator.

What I claim as my invention is—

1. In an ore-stamp, the combination of a series of helices surrounding or inclosing the stamp-stem, whereby the latter and its shoe are electrically reciprocated, and of means whereby said stem and shoe are partially rotated by compressed air during such reciprocation, substantially as set forth.

2. In an ore-stamp, the combination of helices surrounding the stamp-stem of a rheotome or circuit-breaker, constructed and arranged substantially as shown and described, to operate not to shunt the circuit during the downward or forward stroke of said stem until the latter has fully completed its stroke to stamp the ore, substantially as set forth.

3. The combination, in an ore-stamp, of a series of helices, a voltaic circuit, a stamp-stem located axially within said helices, a rheotome or circuit-breaker, a connection between the latter and the helices, a mortar, anvil, or die, and a feeding mechanism, substantially as set forth.

4. In an ore stamp consisting, essentially, of a stamp-stem, a mortar, and an anvil-block, the combination of a series of helices, located one above the other, so as to be some distance apart, a frame or standard supporting said helices, and a rheotome or circuit-breaker secured to said frame between the helices, the stamp-stem passing through said helices, and provided with means for causing said rheotome to direct alternate electric currents through said helices, substantially as set forth.

5. The combination, with a series of helices, one of which is provided with an air-chamber, of a core passing axially therethrough and reciprocated thereby, said core being provided with mechanism whereby it is partially rotated during its reciprocations by the compression of the air in said chamber, substantially as set forth.

6. An ore-stamp constructed substantially as shown and described, whereby the stamp-stem is electrically reciprocated, and during such movement is partially rotated by compressed air, as set forth.

7. The combination, with helices A and B and a core common to both and located axially, and reciprocated thereby, of a rheotome or circuit-breaker, constructed and arranged, substantially as shown and described, to operate to permit an interval to elapse between the alternate shunting of the currents to the helices, whereby said core is reciprocated to its fullest limit or extent of travel in a downwardly or forward direction before being returned or retracted, substantially as set forth.

In testimony whereof I have hereunto set my hand this 14th day of February, 1881.

CHAS. F. PIKE.

Witnesses:
CHAS. F. VAN HORN,
EDWIN PARAMORE.