This invention relates to reciprocating electric hammers of the kind comprising a magnetic metal cased solenoid, whose inner core is moved to and fro by the actions of electromagnetic attraction, and the reactions of spring means, the principle features of this hammer being that it can work automatically in a permanently closed circuit of alternating current no controlling outfit being included in the circuit to regulate the alternations.

The present invention consists of a reciprocating electric motor of the kind stated, characterized in that the casing of magnetic material for the coil of the solenoid is constituted by substantially C-shaped plates or strips, ribbed in order to strengthen the strips and reduce their bulkiness, and placed radially round the coil, which arrangement ensures the conveyance of electromagnetic forces, eliminates eddy or Foucault currents, provides for effecting cooling of the inner parts owing to the large surface of the armor exposed to the air and constitutes a protection for the inner coil and is a part of the outer casing of the hammer.

The invention also consists of the novel construction of the inner core, or cores, which is made of a bundle of ribbed strips of magnetic metal, radially disposed and so grooved and compressed into each other that the whole bundle is kept together without the aid of rivets.

A form of the invention, as applied to a percussive hammer, is illustrated, by way of example, on the accompanying drawing, wherein—

Figure 1 represents a longitudinal section through the machine.

Figure 2 represents a cross section on line 2–2 of Fig. 1.

Figure 3 represents a cross section on line 3–3 of Fig. 1.

Figure 4 represents a cross section on line 4–4 of Fig. 1.

Figure 5 shows another form of the same hammer.

Figure 6 is a diagrammatic view of the permanently closed circuit of the hammer, no controlling outfit being included in the circuit to regulate the alternations of the current.

Referring to the drawings; the tool has a coil 1 arranged in a cage 2 of C-shaped ribbed plates 3 of magnetic material placed around the coil. The plates extend parallel to the axis of the coil 1 and are radial thereto. The coil carries inside a core 4, made of magnetic metal plates, radially disposed, and tightly grooved into each other, the outer permissive end 5 being soldered. Another core 6, which does not move, is placed inside the coil and is hollow in order to contain a helical spring 7. This core is made similar to core 4 and its left hand ends are soldered to form a head. The helical spring 7 tends to force the core 4 out of the coil 1. Another spring 9 acts in the opposite direction, after the core has imparted a blow on the tool stem 8 of the tool 23.

A regulator 10 having a set screw 11 is placed at one end of the spring 7, so that by turning the regulator 10, the reaction of the spring can be adjusted. The back casing 12 of the hammer has a pivot 13 on one side and a movable nut-latch 14 on the other side, allowing the back cover 15 and handle 16 to swing round and leave open the interior of the machine for inspection, oiling or cleaning.

The handle 16 has a lever 17 pivoted in it, which acts on a rod 18, by means of a spring 19, operating a switch 20 placed inside the casing 12. This casing 12 also bears a ring 21 holding a double line conducting cable 22 to be connected to a suitable source of electric energy. A front casing 23 keeps together the C-shaped plates 3 by means of a split ring 27 of two semi-circular parts and screws 27 and carries the tool 25 by means of a hard metal collar 24.

The second core 6 is not always necessary; in hammers of a short tool stroke said core can be eliminated, as illustrated in Fig. 3, where the hammer is provided only with the movable axe shaped core 4, formed by a bundle of strips radially disposed like the strips of the movable core 4 of Fig. 1. In this hammer, the coil 1 is shorter and has its outer diameter greater than that of the coil 1 of Fig. 1, and the outer casing 2 also formed by radial strips is suitably enlarged in correspondence with the enlarged coil diameter. All the other parts are identical to the corresponding parts of Fig. 1.

Fig. 6 shows the electric connection of the hammer; 10 is the coil attached to the feeder 30 by a live current plug 31 and in the circuit whereof is inserted a pulsating switch 29; 28 illustrates the movable core; 29 the tool and 7 the opposing spring.

To operate the hammer the cable conduc-
tor is connected to an ordinary live current plug 31. Then whilst grasping the handle of the hammer the operator depresses the rod thereby closing the switch sectors and completing the circuit of the current in the coil, whose core is normally constrained by the spring against the stem of the tool. Immediately the coil 1 is energized and the core is drawn inside thus compressing the spring. But during the passage of the current between a positive alternation or phase and the next negative alternation or phase the spring acts upon the core causing it to withdraw violently to its original position thus imparting a blow to the stem of the percussive tool.

Therefore the hammer gives as many strokes per minute as the number of alternations or phases given by the electric current, that is to say twice the number of cycles. For instance, with an alternating current of 60 cycles the hammer strikes 120 blows per second. By specially adjusting the elastic reaction of the back spring, or by adjusting also the reaction of the front shock absorbing spring, it is possible to reduce the strokes to the half or to the quarter, that is to say to an exactly submultiple number.

What I claim is:

1. In an electromagnetic hammer, a striker comprising radial longitudinally directed plates soldered together at their impact end, a core, spring means to support the core for free oscillations, a device to adjust the tension of the spring means a winding surrounding the core and in which the core moves, a laminated magnetic field member whose laminations extend longitudinally of the core and winding, casing members connecting the ends of the laminations and supporting said spring means, a tool holding means on one casing member and a handle on the other casing member, said core reciprocating substantially in phase with the current.

2. In an electromagnetic hammer, the combination with a casing member; of a closure member hinged thereto and when swung on said hinge exposing the entire end of said casing member, a handle forming part of the closure member, electric contact operating means in the closure member, a pair of electric contacts in the casing member arranged for actuation by said operating means, and a grip on the handle for actuating said operating means.

3. In an electromagnetic hammer, a field winding, a magnetic member enclosing the winding, and a central core divided into two portions, each composed of longitudinally directed radial plates, the plates of each portion connected together at one end by a fused metal connection, one of said portions being stationary and the other reciprocable, a spring for each end of the latter portion, means for adjusting spring tension and means for supplying alternating current to said winding, said reciprocable portion oscillating with the current supplied.

4. In an electro-magnetic hammer, the combination with a fixed counter-core; of a movable core acting as striker, spring means supporting the movable core for free oscillation, an energizing coil for the core, means for supplying at will and continuously alternating current to said coil, the core making a reciprocation for each current phase, a magnetic field member surrounding the counter-core, core and coil, and constituted by radial longitudinally directed ribbed plates and cover members secured on the opposite ends of said plates, said plates and cover members forming a casing for the hammer and acting at the same time as magnetic circuit, body and support of the hammer and heat radiating member.

5. In an electro-magnetic hammer, the combination of a movable core constituted by radial plates tightly grooved into each other, a percussion member on one end of the core, springs at the opposite ends of said movable core to support the core for free oscillation, means to regulate the tension of one of said springs, an energizing coil for the core, a hand operated switch to feed alternating current to said coil at will and continuously, a magnetic field member surrounding the core and coil and constituted by radial longitudinally directed ribbed plates and cover members secured on the opposite ends of said plates, said plates and cover members forming a casing for the hammer and acting at the same time as magnetic circuit, body, and support of the hammer and heat radiating member.

In testimony that I claim the foregoing as my invention, I have signed my name.

ALBERTO BETTICA.