To all whom it may concern:

Be it known that I, FOREST R. STOLL, a citizen of the United States, residing at Carey, in the county of Wyandot and State of Ohio, have invented new and useful Improvements in Electromagnetic Well-Drilling Machines, of which the following is a specification.

The object of my present invention is the provision of an improved electromagnetic well drilling machine capable of efficient operation at a high rate of speed, susceptible of being controlled by one operator, and adapted to be conveniently transported or moved from place to place.

To the attainment of the foregoing, the invention consists in the improvement as hereinafter described and definitely claimed.

In the accompanying drawings, forming part of this specification:

Figure 1 is a vertical sectional view illustrating the machine constituting the best practical embodiment of my invention of which I am aware.

Figures 2 and 3 are enlarged detail views of the switch mechanism comprised in the machine.

Figures 4 to 8 are enlarged views of detail features of the machine.

Figure 9 is a diagrammatic view illustrating the electrical connections complementary to the machine.

Similar numerals of reference designate corresponding parts in all of the views of the drawings.

Among other elements my novel machine comprises a cylindrical metallic shell or casing 1 which is preferably made in sections, jointed at 2. The head 3 at the upper end of the casing 1 is equipped with stuffing box 4, and at the lower end of the casing is a stuffing box 5, lugs 6 to secure the said stuffing box 5, and a shield 7 over the said stuffing box 5. It will also be noticed that the lower end portion of the casing 1 is equipped with upright shoes 8 the outer faces of which are convex in vertical section so as to enable the shoes to guide and facilitate endwise movement of the casing in a drilled hole.

Interiorly the casing 1 is provided at a point adjacent to its lower end with a bracket 9, and adjacent to its transverse center the casing is provided with a stop block 10.

Supported in the upper portion of the casing 1 is a solenoid 11 the armature rod of which is designated 12 and is preferably of iron. The said rod 12 or another rod permanently joined thereto is carried upwardly through the stuffing box 4 and is connected at its upper end with lever mechanism 13 to expand and contract shoes 14, the said shoes 14 being hingedly mounted in a bail 15 on the upper end of the casing 1 which bail serves for the connection through antifriction means 16 of a hoisting cable 17. At 18 the head 3 of the casing 1 is provided with a water pipe slip connection through which extends a cable 19; the said cable containing wires in proper electrical connection with the solenoid 11 and a source of electric energy 20 as shown in Figure 9.

The slip connection referred to permits of the cable 19 being pulled upwardly with respect to the casing 1 when desirable. Manifestly when the machine is suspended in a drilled hole by the cable 17, and current is supplied to the solenoid 11 said solenoid will operate to raise the armature rod 12 with the result that through the upper portion 12' of the rod, which portion 12' is preferably of brass, the shoes 14 will be held under pressure against the wall of the well and in consequence turning of the machine in the well will be practically precluded. The solenoid 11 is electrically connected through a cable 20 with a main contact 21 of an electrical switch best shown in Figures 2 and 3. The said switch also includes terminals 21', 22 and 23 together with a brush 24, preferably of carbon. Arranged in the lower portion of the casing 1 is a solenoid 30 the armature rod 31 of which is preferably of iron and is joined to a lower steel stem 32 through the medium of an interposed brass section 33. Said section 33 is interposed between the iron rod 31 and the steel stem 32. At its upper end the rod-like armature 31 is joined to a brass sleeve 34 in which are apertures 35 to relieve compression as hereinafter described. With the electrical connections arranged as illustrated it will be observed that current passes from the solenoid 11 through the connection 20 to the main contact or terminal 21 of the switch, provided the drill is in contact with the bottom of the well and the carbon brush 24 is in contact with the terminal 22, and the drill will be operated. When the drill is not being lowered to a sufficient extent the flange 40 on the sleeve 34 will rest on the stop block 10 which will put the carbon brush 24 in contact with the terminal 23 and which is grounded as shown.
Therefore, inasmuch as the negative brush of the dynamo 31 is also grounded through an electric signal 42, the current will pass from the terminal 23 through the ground; and the signal through the negative brush of the dynamo. On sufficient lowering of the machine a spring 50 will operate to move the carbon brush 24 back into contact with the terminal 22 whereupon current will pass through a cable 51 and the upper coil 52 of the solenoid 30 with the result that the armature 31 will move upwardly until the flange 40 strikes the switch operating arm 30 which will operate to raise the carbon brush 24 until it comes in contact with the terminal 21 whereupon current will pass through the cable 70 through the lower coil 71 of the solenoid 30. This energization of the lower coil 71 in cooperation with the iron armature 31 will move the armature suddenly and powerfully downwardly with the result that the drill 80 at the lower end of the stem 92 will strike a hard blow, and this operation is repeated so long as current is supplied.

At 81 is a steel rod, of square form in cross section having a twist of about 291/2 degrees. This rod 81 slides in the sleeve 34 or rather in the square bearing at the top of said sleeve. Therefore, when the drill stem 92 is raised, the rod 81 will be turned, and when the drill stem is moved downwardly the rod 81 will be prevented from turning by the ratchet wheel 82 in cooperation with a spring pressed pawl 83; the said ratchet wheel 82 being fixed on the upper end of the rod 81, and the pawl 83 being carried by the casing 1. From this it follows that the drill 80 will be turned step by step as is desirable.

While I prefer to employ a cruciform or four wing drill I would have it understood that it is within the purview of my invention to employ a drill of any description compatible with the purpose of my invention. I have entered into a detailed description of the construction and relative arrangement of parts embraced in the present and preferred embodiment of my invention in order to impart a full, clear and exact understanding of the said embodiment. I do not desire, however, to be understood as confining myself to the said specific construction and relative arrangement of parts inasmuch as in the future practice of the invention various changes and modifications may be made such as fall within the scope of my invention as defined in my appended claims.

Having described my invention, what I claim and desire to secure by Letters-Patent, is:

1. The combination in a drilling machine, of a casing, a solenoid in the upper portion thereof, means to supply electric current to the solenoid, a hoisting bail on the casing, shoes hingedly connected to said bail, an armature rod complementary to the solenoid and means operable by said rod to expand and contract said shoes.

2. The combination in a drilling machine, of a casing, a solenoid in the upper portion thereof, means to supply electric current to the solenoid, a hoisting bail on the casing, shoes hingedly connected to said bail, an armature rod complementary to the solenoid and means operable by said rod to expand and contract said shoes; said means including a rod section on the armature rod and lever connections between said rod section and the shoes.

3. In a drill, the combination of a casing having a head equipped with a stuffing box and a slip connection, said casing arranged in the casing, a hoisting bail connected to the casing, jaws hingedly connected to the hoisting bail, a cable containing electric wires and extending through the slip connection and connected to the solenoid, an armature rod complementary to the solenoid and having a rod section extended through said stuffing box, and means operable by said rod section to expand and contract the shoes.

4. In an electromagnetic drill, the combination of a casing, a drill stem extending below the casing, a solenoid arranged in the casing, an armature complementary to the solenoid and arranged therein and connected with the stem, a sleeve connected with the said armature and having a square bearing in its upper end, a square twisted rod disposed in the said bearing, a ratchet wheel on said rod, a pawl carried by the casing and arranged to cooperate with said ratchet wheel, an abutment on the sleeve, and an electric switch arranged in the casing and adapted to be connected with a source of electric energy and having portions adapted to be operated by the said abutment on the sleeve.

5. In an electromagnetic drill, the combination of a casing, a drill stem extending below the casing, a solenoid arranged in the casing, an armature complementary to the solenoid and arranged therein and connected with the stem, a sleeve connected with the said armature and having a square bearing in its upper end, a square twisted rod disposed in the said bearing, a ratchet wheel on said rod, a pawl carried by the casing and arranged to cooperate with said ratchet wheel, an abutment on the sleeve, and an electric switch arranged in the casing and adapted to be connected with a source of electric energy and having portions adapted to be operated by the said abutment on the sleeve; the said casing being provided with a stuffing box at its lower end, a shield over the stuffing box, lugs to secure the stuffing box in the casing, and shoes arranged laterally on the lower portion of the casing.

In testimony whereof I affix my signature.

FOREST R. STOLL.