(No Model.) 5 Sheets—Sheet 1.

A. L. PARCELLE.

VIBRATING ELECTRIC MOTOR.

No. 345,720. Patented July 20, 1886.

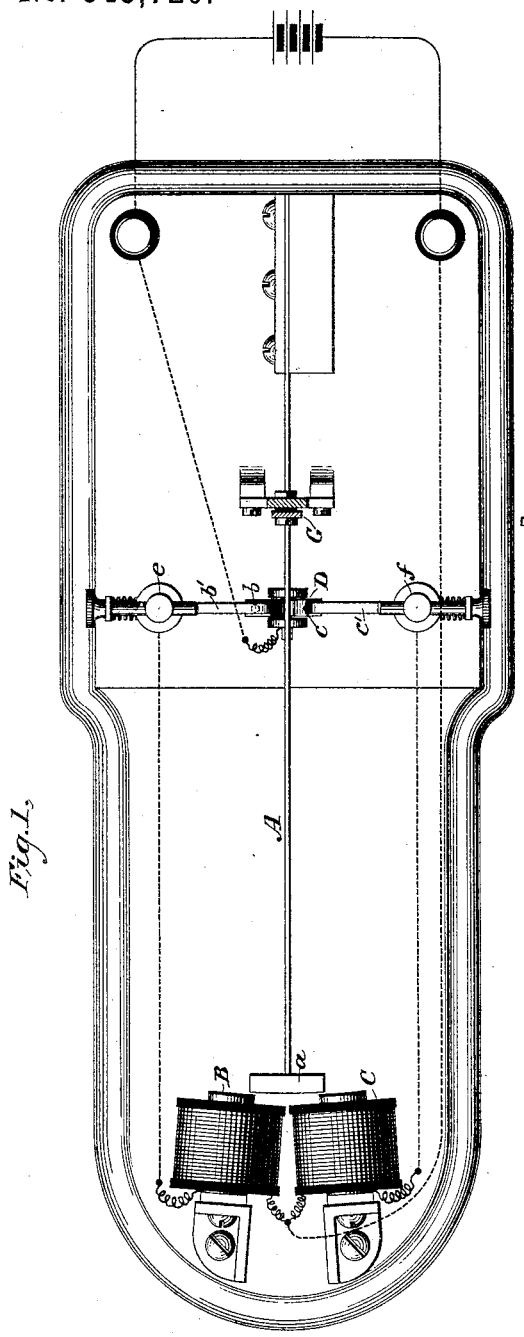


Fig. 1.

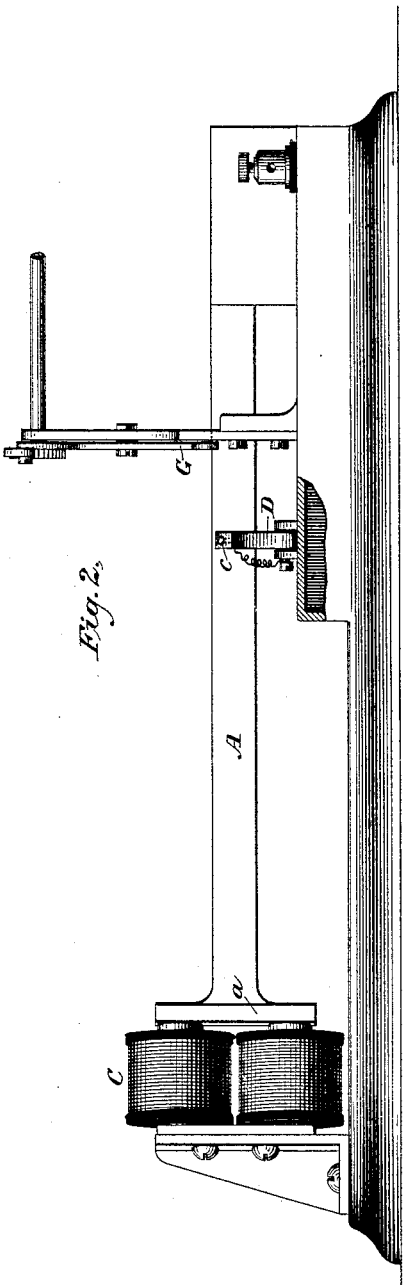


Fig. 2.

Witnesses
Geo. W. Breck.
Carrie E. Ashley

Inventor
Albert L. Parcelle
By his Attorneys
Baldwin, Hopkins & Peyton

(No Model.) 5 Sheets—Sheet 2.

A. L. PARCELLE.

VIBRATING ELECTRIC MOTOR.

No. 345,720. Patented July 20, 1886.

Fig. 5.

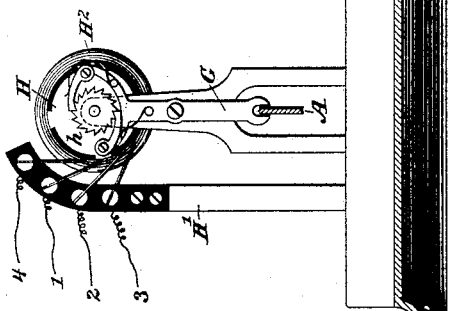


Fig. 3.

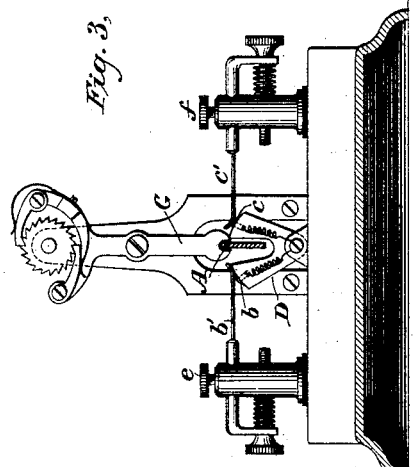
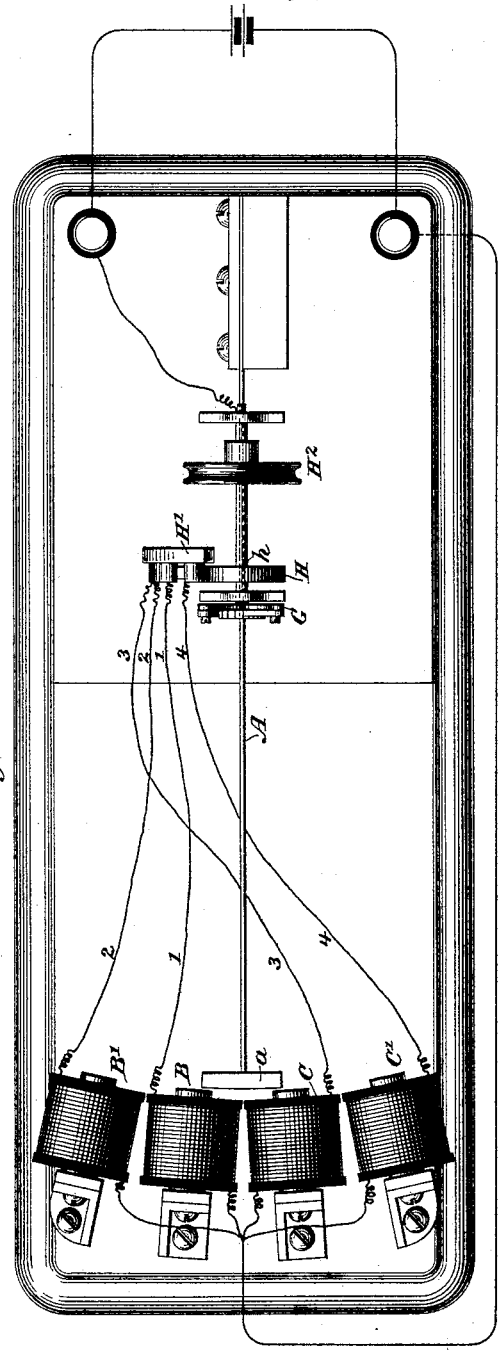


Fig. 4.



Witnesses
Geo. W. Breck.
Carrie E. Ashley

Inventor
Albert L. Parcelle,
By his Attorneys
Baldwin, Hopkins & Peyton

(No Model.) 5 Sheets—Sheet 3.

A. L. PARCELLE.

VIBRATING ELECTRIC MOTOR.

No. 345,720. Patented July 20, 1886.

Fig. 6.

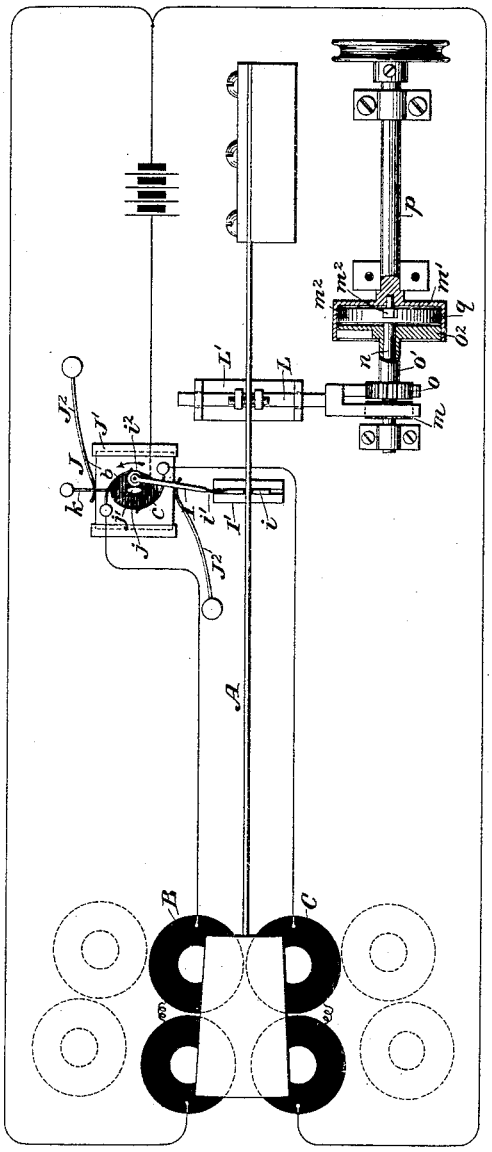
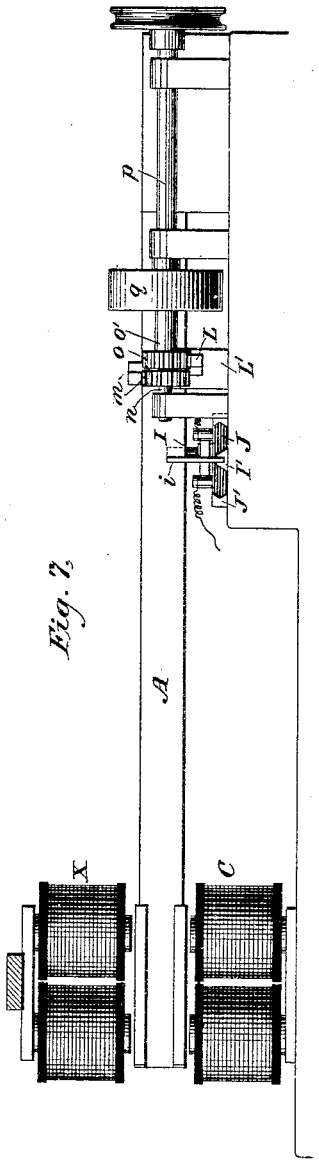


Fig. 7.



Witnesses
Geo. W. Breck.
Carrie E. Ashley

Inventor
Albert L. Parcelle
By his Attorneys
Baldwin, Hopkins & Peyton.

(No Model.) 5 Sheets—Sheet 4.

A. L. PARCELLE.

VIBRATING ELECTRIC MOTOR.

No. 345,720. Patented July 20, 1886.

Fig. 8.

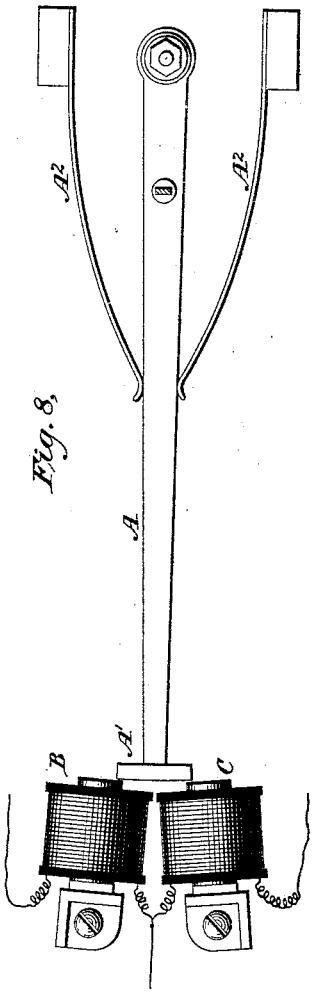
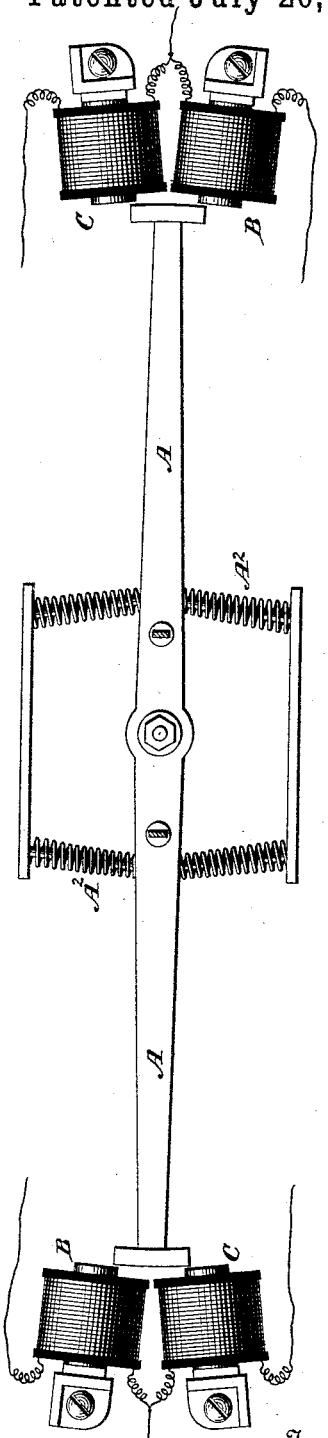


Fig. 9.



Witnesses
Geo. W. Breck.
Carrie E. Ashley

Inventor
Albert L. Parcelle,
By his Attorneys
Baldwin, Hopkins & Peyton.

(No Model.) 5 Sheets—Sheet 5.

A. L. PARCELLE.

VIBRATING ELECTRIC MOTOR.

No. 345,720. Patented July 20, 1886.

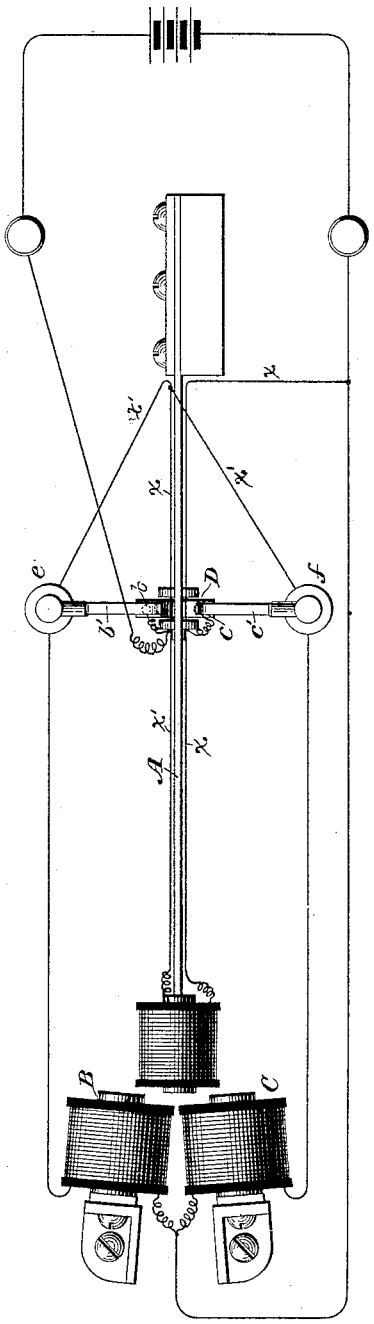


Fig. 10.

Witnesses
Geo. W. Breck.
Carrie E. Ashley

Inventor
Albert L. Parcelle
By his Attorneys
Baldwin, Hopkins & Peyton.

UNITED STATES PATENT OFFICE.

ALBERT L. PARCELLE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE NATIONAL ELECTRICAL COMPANY, OF NEW YORK, N. Y.

VIBRATING ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 345,720, dated July 20, 1886.

Application filed August 10, 1885. Serial No. 174,008. (No model.)

To all whom it may concern:

Be it known that I, ALBERT L. PARCELLE, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Vibrating Electric Motors, of which the following is a specification.

The invention has special reference to the class of motor shown in Letters Patent No. 324,152, granted to me August 11, 1885. The details are fully set forth below. This motor, as well as that shown in my patent, is adapted for higher power than the running of telegraph and other light instruments.

In the accompanying drawings, Figure 1 is a plan, and Fig. 2 a side elevation, of a motor showing the vibrator-magnets arranged as in my prior patent. Fig. 3 is a transverse section through Fig. 1; Fig. 4, a plan view showing the use of additional or auxiliary vibrator-magnets; Fig. 5, a transverse section through Fig. 4, showing the switch devices. Fig. 6 is a plan view, partly in diagram; and Fig. 7, a side elevation showing a different arrangement of motor or vibrator magnets and power conveying or driving devices. Fig. 8 is a view showing a non-resilient pivoted vibrator having independent springs bearing upon it. Fig. 9 is a view of a centrally-pivoted "walking-beam" vibrator with accessory springs, and Fig. 10 is a view in which the armature on the vibrator is shown as an electro-magnet.

The different novel features of the motor are illustrated detached in the various figures. Of course they may all be combined in one motor, and are intended so to be.

Referring now specially to Figs. 1, 2, and 3, A is the vibrator, which may be secured adjustably or otherwise in its support, and *a* the transverse armature carried on its end. The motor-magnets B C are arranged opposite the armature or end of the vibrator outside of its curve of vibration, as in my prior patent. In the present instance I dispense with the supplemental spring-circuit contacts shown in my patent and employ switch devices only. The special form of switch illustrated in Figs. 1, 2, 3, is as follows: The moving V-shaped switch D is pivoted at its apex in a suitable bearing in the base-board, and the vibrator A works in or between its legs or arms, as clearly shown in Fig. 3. The upper faces of the two legs of the switch are curved or inclined downwardly from the inside outwardly, and have seated in them the circuit-contacts *c b*, through which the circuits of the vibrator-magnets are completed. The switch spring-fingers *c' b'*, which rub over the contacts *c b*, are respectively mounted in brackets *e f* on opposite sides of the pivoted switch-block D, and are adjustably secured in the brackets by means of screw thumb-bolts, as clearly shown in Fig. 3. Obviously, by adjusting the fingers *c' b'* the moment of magnetizing and demagnetizing the vibrator-magnets C B may be varied to regulate the amplitude of vibration, or to bring the contacts into the most advantageous position, so as to act most economically as regards consumption of battery-power. The circuits are clearly and unmistakably shown by the diagram in Fig. 1, and description is unnecessary. The vibrator, as in my prior patent, is straddled by the arms of an anchor-lever, G, the rocking of which, through the medium of suitable spring-pawls and a ratchet-wheel, imparts motion to the shaft to be driven. In the present case, however, the vibrator has little or no play in the jaws of the anchor-lever, but moves it positively in each direction. This arrangement is best adapted for a higher-power motor, and also serves to impart a greater speed to the driven shaft, as there is no lost motion.

Referring to Figs. 4 and 5, it will be observed that, in addition to the vibrator-magnets C B, I employ an additional magnet, C' or B', placed outside of the magnet C or B. The operation is as follows: As the armature is drawn up to C or B the circuit in that magnet is broken and the circuit completed through C' or B', as the case may be, so that magnet also acts upon the armature, thus increasing the power and amplitude of the movement. The makes and brakes of circuit are of course so timed as to act on the armature when it is in the position of greatest advantage. The vibrator returns from its extreme position by its own resiliency until again acted on by the magnet C or B. More than one additional magnet on each side might

be used, if desired. The vibrator is here shown as driving a rotating shaft, as in Fig. 3, but in the organization shown in Figs. 4 and 5 I employ a rotating switch or commutator, H, mounted on the driven shaft. The switch is clearly illustrated in Fig. 5. Its metallic hub *h*, which is connected with one pole of the source of energy, is exposed at four points, the spaces between the exposed sections being covered with insulating material, and rotates in contact with the four spring-fingers 1 2 3 4, which are mounted in a post, H′. The fingers 1 2 3 4 may be independently adjustable, so that the moment of magnetization of each magnet may be varied, if desired. Thus by changing the period of magnetism of the outer magnets they may be caused to act less vigorously on the armature and the amplitude of vibration will be reduced, or the four fingers may be bodily adjusted in a gang to vary the period of magnetization of all the magnets, and consequently the amplitude of vibration. The legs of the circuit leading to the several vibrator-magnets are numbered to correspond with contact-fingers 1 2 3 4, and the running of the circuits will be clearly understood. Thus, assuming that the circuit marked 4 has just been completed, the next will be 1, then 2, then 3, and then 4 again. The rotation of the hub is so timed as to bring a contact-surface on it to the fingers at the proper time. Obviously, an impulse of vibration having been imparted to the reed or vibrator, the magnets C C′ B B′ will continuously drive it. In such an arrangement power may be taken from the rotating commutator-shaft by means of a pulley, H².

Referring to Figs. 6 and 7, I have shown a switch device which is the equivalent of the rotary switch shown in Fig. 5. The vibrator in its movement reciprocates a switch-arm, I, which is provided with uprights *i*, which embrace the vibrator and travel in a suitable guide, I′. The switch-arm is flexible or elastic, as indicated at the point *i′*, and carries on its end a roller, which is either metal or has its periphery faced with metal. This roller has its bearing on a downwardly-projecting pin, and travels in a curved socket or track, *j*, in a block of insulating material, J. An oval-shaped conducting-post, *j′*, stands in the center of the socket *j*, and is connected with one pole of the source of energy. The wires leading from the magnets C B are respectively connected with spring contact-fingers *c b*, mounted on the insulating-block J, and projecting into the path of the roller or contact maker on the end of the arm I. As the arm I is reciprocated by the vibrator the contact-maker or roller *i²* travels around the conducting-post *j′*, being deflected in the proper direction at the limit of its stroke by a spring, *k*, one of which may also be placed on the side of the switch next the motor. It passes between the finger *c* or *b* and the post *j′*, in contact with both the finger and post, and alternately completes the legs of the battery-circuit, which include the vibrator-magnets. The block J is shown as sliding in guides J′, so as to accommodate itself to varying degrees of amplitude of the vibrator, and may be steadied by springs J², secured on the bed-plate and bearing against each end. Instead of placing the vibrator-magnets opposite the end of the reed, I may locate them above or below, or both above and below, on each side of the center of vibration, with their poles in a plane parallel with the plane of vibration and opposite the outer end portion of the reed, as clearly shown in Figs. 6 and 7. In that case the armature or armatures A′ may be arranged on the outer end portion of the reed, and may be parallel with it, as shown. The circuit-connections are the same as with the other arrangement. The magnets C B may be arranged on one side of the vibrator only—*i. e.*, either above or below; but I prefer to employ magnets X, placed opposite C and B, respectively, to act on the opposite side of the armature, as such arrangement gives better and more economical working. Of course the upper and lower magnets on each side may be included in the same circuit. As indicated by dotted lines in Fig. 6, additional magnets arranged on the same principle as those in Fig. 4 may be used. The legs of the circuit including them will run to additional spring contact-fingers to be placed on the block of insulating material J in proper relation to the traveling circuit-maker *i²*. With this construction the vibrator has the same freedom of motion, and may be drawn beyond the poles of the vibrator-magnets. The distinguishing feature of my invention, both in this form and as shown in my patent, is this capacity of the vibrator, which is of course due to the novel relation of the magnets to the vibrator. In these figures I have shown another manner of taking power from the vibrator. A pitman, L, sliding in a suitable guide, L′, is provided with adjacent vertical lugs having adjustable screws, between which the vibrator is clamped. The pitman carries at its end two racked arms, one of which gears with the upper side of a pinion, *m*, and the other with the under side of a pinion, *o*. The pinion *m* is fast on a shaft, *n*, which has one bearing in a suitable post and the other in the end of the main shaft P, and carries a friction-disk, *m′*, which rotates within the open face of a flanged disk or drum, Q, fast on the end of the shaft P. The disk *m′* is provided with friction clutch-blocks *m²*, pivoted in sockets therein, and so arranged either to be thrown out by springs or drawn out by friction to clamp the disk and drum together when the pinion *m* rotates in one direction, and permit the free rotation of the disk *m′* when the pinion rotates in the other direction. Such clutch devices are well understood, and more elaborate illustration is unnecessary. The pinion *o* is fast on a sleeve, *o′*, on the shaft *n*, and carries a disk, *o²*, which

also rotates within the drum Q, and is equipped with similar clutch devices. Obviously the main shaft P will be continuously rotated in the same direction, the movement of the pitman in both directions acting to produce the rotation of the shaft P in one direction. As there is no lost motion of the vibrator between the screws carried by the pitman, it follows that the greater the amplitude or vibration the higher will be the speed of the driven shaft P. This is also true of the ratchet-and-pawl arrangement shown in Fig. 3, as the greater the amplitude of vibration the greater the number of teeth on the ratchet-wheel which will be traversed by the pawls. The vibrator, instead of being resilient, may be rigid and pivoted and have springs A^2, either plate or coiled, acting against each side of it, as clearly shown in Fig. 8.

In Fig. 9 I have shown a walking-beam vibrator pivoted at its middle and having an armature at each end. Magnets C B are arranged to act on each end in conjunction with each other, as will be plain. The vibrator is returned to its central position by the action of the accessory springs A^2. Power may be taken from the vibrator in any of the ways shown or in any suitable manner.

The armature may be an electro-magnet, as illustrated in Fig. 10. In that case the circuits may remain the same as in Fig. 1, with the addition of the armature circuit, as follows: One insulated wire, *x*, leading from the armature-coil may be carried along the vibrator to its support, and then connected with the minus wire of the battery, as shown. The other wire, *x'*, which may also be carried along the vibrator, is connected with both posts *e f* of the spring-fingers *e b*. In this arrangement the armature and field magnets are connected in arc; but any other arrangement of circuits may of course be used. For instance, the coils may all be connected in series, or the armature-coil and field-coils might be connected in different circuits. It is also of course so that the opposite field-coils may each have independent circuits. The running of the circuits in Fig. 10 will be plain.

I have now described the several features of my invention. While they are illustrated as embodied in a practical working manner, I do not of course limit them to the specific structures shown, as, doubtless, variations may be made without departing from the principles of the invention.

Motors constructed in accordance with my invention may be used for all the purposes to which electric motors are applicable. They run with a smooth and regular action, and are economical in construction and consumption of battery-power. These advantages are due, among other reasons, to the facts, first, that the power is applied at a distance from the fulcrum or fixed point of the vibrator and a distance from the load, thus giving a large leverage in favor of the motor; and, second, because of the great absence of induced counter-currents in the coils and circuits.

It should be understood that in my improved motor the rate of vibration remains the same, and that variation of magnetic attraction affects the amplitude only.

I claim as my invention—

1. The combination, in an electric motor, of a vibrating bar fixed at one end, the vibrator-magnets arranged with their poles opposite the edge of the vibrator and in a plane parallel or substantially parallel with the plane of vibration, and the circuit and circuit-connections of the vibrator or motor magnets, whereby the vibrator is continuously actuated.

2. The combination, in an electric motor, of the vibrating bar fixed at one end, vibrator-magnets arranged opposite the edges of the vibrator on both sides, with their poles in planes parallel or substantially parallel with the plane of vibration, and the circuit and circuit-connections of the vibrator-magnets, whereby the vibrator is continuously actuated.

3. In an electric motor, the combination of the vibrator, a series or succession of magnets arranged on each side of the center of vibration, electric circuits, and switch or commutator devices for successively completing and interrupting the circuit through the magnets on each side of the center of vibration as the vibrator moves from the center outwardly, substantially as set forth.

4. In an electric motor, the combination of the resilient or spring-controlled vibrator, the vibrator-magnets arranged in succession on each side of the central line of vibration, electric circuits and switch or commutator devices for successively making and breaking the circuit through the magnets on each side of the central line of vibration, the arrangement being such that the vibrator returns to the central position by its own resiliency, and is then attracted outwardly on each side by the successive action of the vibrator-magnets.

5. In an electric motor, the combination of the resilient or spring-controlled vibrator, an armature rigidly fixed on the end thereof, the vibrator-magnets the poles of which are arranged to be in close proximity with said armature as the vibrator vibrates, but always out of contact therewith, and rotary switch or commutator devices and circuits, substantially as set forth.

6. In an electric motor, the combination of the resilient or spring-controlled vibrator, the vibrator-magnets, switch devices and circuits, and a reciprocating power-conveying pitman connected with the vibrator between its armature end and its fixed end, substantially as set forth.

7. The combination of the resilient or spring-controlled vibrator, the vibrator-magnets, switch devices and circuits, a reciprocating

pitman, and clamp devices for connecting the pitman with the vibrator, substantially as set forth.

8. In an electric motor, the combination of the spring-controlled walking-beam vibrator, and the vibrator-magnets arranged out of the path of vibration, substantially as set forth.

9. In an electric motor, the combination of the spring-controlled centrally-pivoted walking-beam vibrator, an armature on each end thereof, and the vibrator-magnets arranged to act on each armature.

10. In an electric motor, the combination of a resilient or spring-controlled vibrator, the vibrator-magnets, the circuits, the switch-block, the hub, and adjustable contact-fingers, substantially as set forth.

11. In an electric motor, the combination of a resilient or spring-controlled vibrator, an electro-magnetic armature carried thereby and rigidly fixed thereon, vibrator-magnets arranged out of the path of vibration of said armature, and having their poles so arranged as to be in close proximity to the pole of the electro-magnetic armature as the vibrator vibrates, but not in contact therewith, electric circuits, circuit making and breaking devices, and circuit-connections whereby the vibrator is continuously actuated by the vibrator-magnets, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

ALBERT L. PARCELLE.

Witnesses:

ALVAH WISWALL,

E. C. DAVIDSON.