(Model.)

O. C. WOOLSON.

ARMATURE FOR ELECTRO MAGNETS.

No. 255,749. Patented Mar. 28, 1882.

Fig. 1.

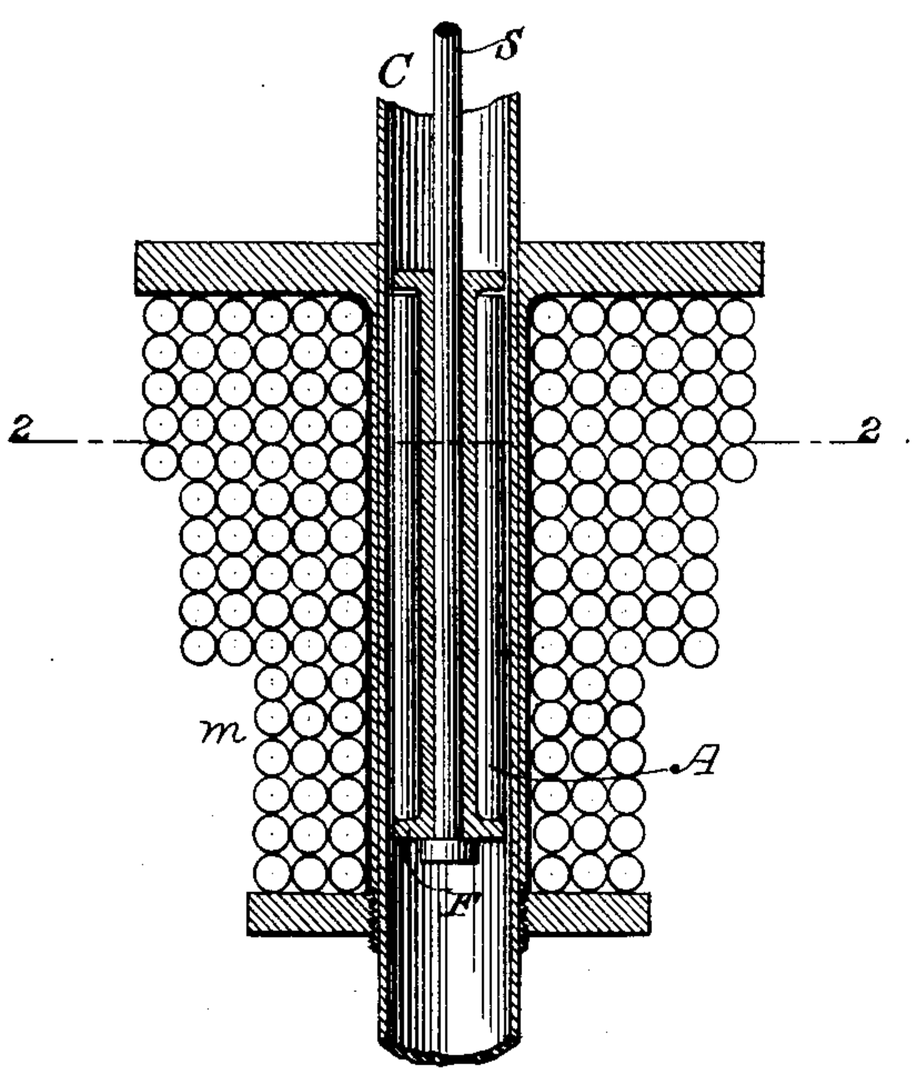


Fig. 2

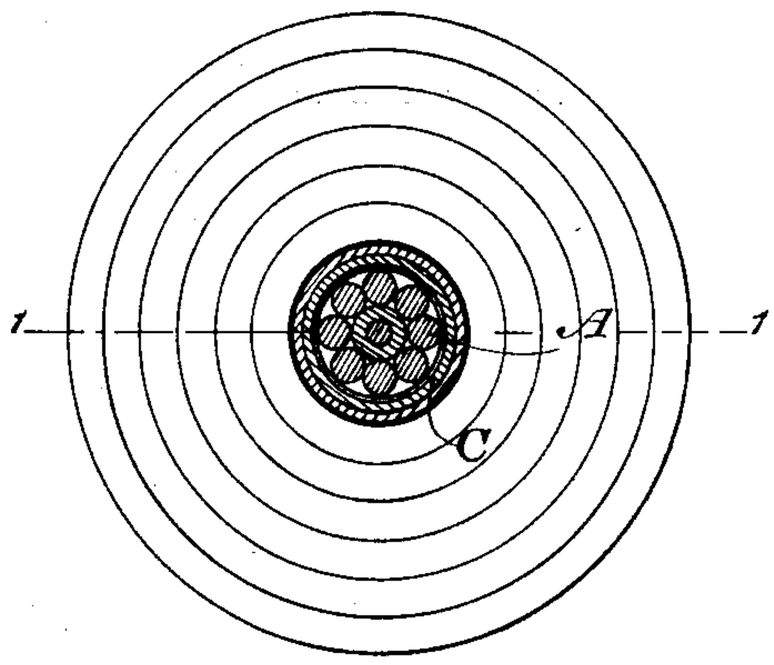


Fig. 3.

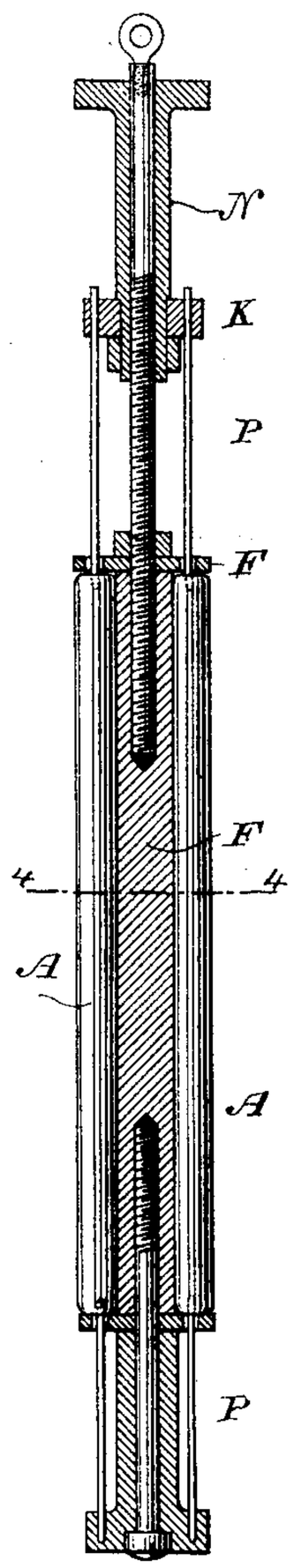


Fig. 4.

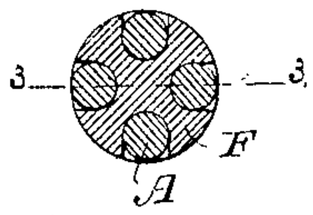
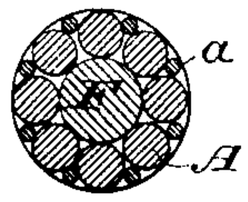


Fig. 5.



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ARMATURE FOR ELECTRO-MAGNETS.

SPECIFICATION forming part of Letters Patent No. 255,749, dated March 28, 1882.

Application filed April 13, 1881. (Model.)

To all whom it may concern:

Be it known that I, OROSCO C. WOOLSON, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Armatures for Electro-Magnets, of which improvements the following is a specification.

The object of my invention is to attain an armature (composed of separable disconnected sections) movable freely laterally relatively to its supports, so as when properly energized to be held in frictional contact with a surface against which it rests, in order to hold said surface and armature in a fixed relation to each other, and to be automatically released therefrom when demagnetized, so as to allow the surface and armature to move longitudinally relatively to each other. Such an armature is capable of numerous useful applications in the arts, which will readily suggest themselves to persons skilled therein. As one especially valuable application I may mention its adaptability to the automatic control of the carbons of an electric light, which adaptation will form the subject of another application for Letters Patent.

The details of construction of my improved armature may be modified in various ways without departing from the principle of my invention.

Some of the parts of the apparatus herein described may be used without the others, and in organizations differing in their details of construction from those herein set forth.

The accompanying drawings represent so much of my improved apparatus as is necessary to illustrate the subject-matter claimed, and show various modifications of the invention.

Figure 1 represents a central longitudinal section through the apparatus; Fig. 2, a transverse section therethrough on the line 2 2 of Fig. 1; Fig. 3, a central longitudinal section through another form of the apparatus; Fig. 4, a transverse section therethrough on the line 4 4 of Fig. 3; and Fig. 5 represents a corresponding transverse section through another modification of the apparatus.

Fig. 1 shows an ordinary magnet-spool, M, with a coil or helix, *m*, of properly-insulated wire wound thereon, so as to diminish in diameter from one end to the other. In this instance the coil is shown as diminishing by steps; but obviously the wire might be wound in a conical form. The effect of this winding is of course to produce a greater energizing effect at one end of the coil than at the other, as is well understood, or, in other words, to transfer the center of the magnetic field proportionately nearer to the larger end of the coil. The spool is of course to be secured in a suitable frame. A supporting-frame (shown as made in the form of a tube, C, of non-magnetic metal, and capable of moving freely endwise through the spool) is connected with the object to be sustained, suspended or acted upon (not necessary to be shown here) in well-known ways. A skeleton-frame would answer the same purpose. A cage or carriage, F, is suspended within this tube by a rod, chain, or support, S. This cage may be of magnetic or non-magnetic metal, as preferred. It is shown as constructed in the form of a spool, around which are arranged a series of disconnected rods, A, of magnetic metal—such, for instance, as soft iron; or they may, if preferred, consist of permanent magnets. These rods are not hinged or connected with their supports, but are prevented from longitudinal play, except to a slight extent, by the heads or flanges of the cage or carriage F, above mentioned. They are, however, capable of moving freely laterally in the space between the tube and cage.

When a number of iron or steel rods of small diameter and of equal length are placed loosely within the central opening of a helix or coil and parallel to its longitudinal axis, and a current of electrity is made to traverse the wire of the coil, the rods will tend instantly to place themselves as far from the axis of the helix and from each other as possible, and they will therefore assume a position in which they will all be in contact with the inner surface of the helix at different points, and will press against it with a degree of force dependent upon the strength of the exciting-current. I avail myself of this principle in the construction and operation of the apparatus hereinbefore described.

When a current of electricity is passed through the coil, the separable rods A are caused

to press against the inner surface of the supporting frame or tube C, and thus hold it by their frictional contact with a force proportioned to the energy of the actuating-current. When this current ceases their contact is released and the tube is again free.

In addition to the action above described, owing to the fact that in this instance the center of the magnetic field, or of the magnetic attraction of the helix, is nearer its upper than its lower end, the first effect of the energizing-current is a tendency to draw the armatures and cage upward, their frictional contact causing the tube to be lifted with them until they reach the neutral point of the magnetic field, or one where the actuating forces are balanced, when they will be held there as long as the energizing-current flows. In order that the lifting action may be exerted, it is of course necessary that the cage should move freely upon the supporting rod or chain S, as otherwise the clamping action alone would take place. The normal position of the cage with reference to the helix or spool may also be adjusted by means of the said rod or chain, if desired.

In Figs. 3 and 4 the suspended cage or carriage is shown as consisting of a body, F, (shown in transverse section in Fig. 4,) which body may be either of magnetic or non-magnetic metal. The armatures A are retarded in their lateral motions by means of springs P P′, secured to suitable heads and passing through openings in the flanges F of the carriage, the degree of resiliency of these springs being regulated by means of a screwed spindle, N, working through a collar, K, to adjust its distance relatively to the flange F of the carriage, and thus alter the length of the operative portion of the springs. These adjustments might be effected in various other equivalent well-known ways. These springs, it will be observed, are not at all necessary to the support of the separable armature sections or rods A, their essential function being that of modifying the action of the armature to a certain extent, as above described.

Fig. 5 represents a transverse section through another form of compound armature, consisting of a central core, F, surrounded by disconnected separable armature-sections A, preferably of soft iron, between which are interposed disconnected separable small rods or bars *a*, which are permanently magnetized. These latter, being constantly magnetic, produce a slight but continuous friction, even when the current is not passing through the helix—a result which is of practical utility in the operation of certain classes of mechanism. The arrangement shown in the figure may be modified by constructing the larger armature-sections, A, of steel and rendering them permanently magnetic, and the smaller ones, *a*, of soft iron.

The disconnected separable armature-sections above described in all cases lie (and move laterally) in planes substantially parallel with the axes of their energizing-coils, instead of being arranged transversely thereto, as usual heretofore. They are brought, moreover, by magnetic induction or attraction, in direct frictional contact with the surfaces upon which they are to act without the intervention of gearing or other mechanism. By the term "expanding armature," then, I mean one composed of disconnected separable sections movable laterally toward and from each other in planes substantially parallel with the axis of their energizing-coil.

I am aware that armatures moving transversely to their energizing-coils, and acting through gearing, pivoted levers, or similar devices to clamp the carbons of an electric light, have been used, and do not claim such devices, as they can in no sense be called expanding armatures, and differ essentially in principle, function, and operation from my improvement; neither do I claim herein armatures consisting of expansible and collapsible tubes, strips fastened at their ends and capable of bulging at their centers, or armature-sections pivoted or fastened at one end and capable of moving laterally at the other, as these devices constitute the subject-matter of another division of this application.

I claim as my invention—

1. The compound armature hereinbefore described, consisting of disconnected sections lying parallel with each other and with their energizing-coil and movable laterally parallel therewith, substantially as herein set forth.

2. The combination, substantially as hereinbefore set forth, of the energizing-coil and the expanding armature-sections inclosed and movable laterally therein parallel, or substantially parallel, with its axis.

3. The combination, substantially as hereinbefore set forth, of the energizing-coil, the expanding laterally-movable armature-sections inclosed therein, and the interposed supporting-frame of non-magnetic metal.

4. The combination, substantially as hereinbefore set forth, of the energizing-coil, the armature-sections movable laterally therein, and its longitudinally-adjustable supporting-cage.

5. The combination, substantially as herein set forth, of a coil or helix, a supporting frame or tube movable therein, a cage or carriage movable in the supporting-frame, and an expanding armature movable in the cage.

6. The combination, substantially as herein set forth, of a coil or helix, a supporting frame or tube of non-magnetic metal movable therein, a cage or carriage movable in the supporting-frame, and a series of independent armatures movable laterally in and with the cage.

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