No. 812,445. PATENTED FEB. 13, 1906.

H. G. PAPE.

MULTIPOLAR ELECTROMAGNET.

APPLICATION FILED MAY 17, 1904.

Fig. 1.

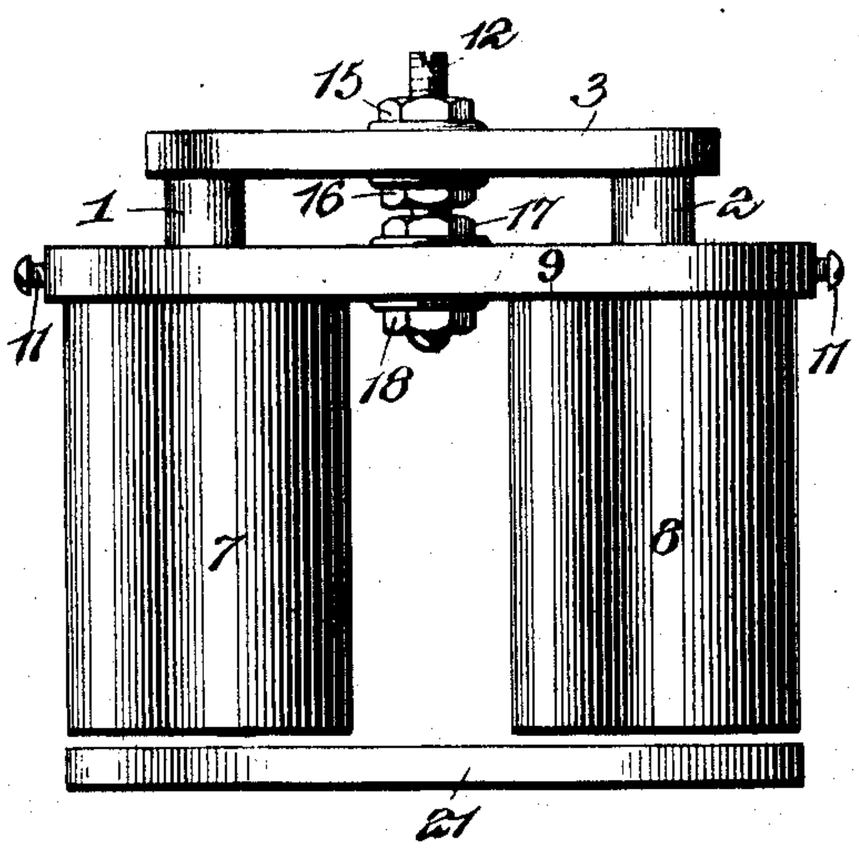
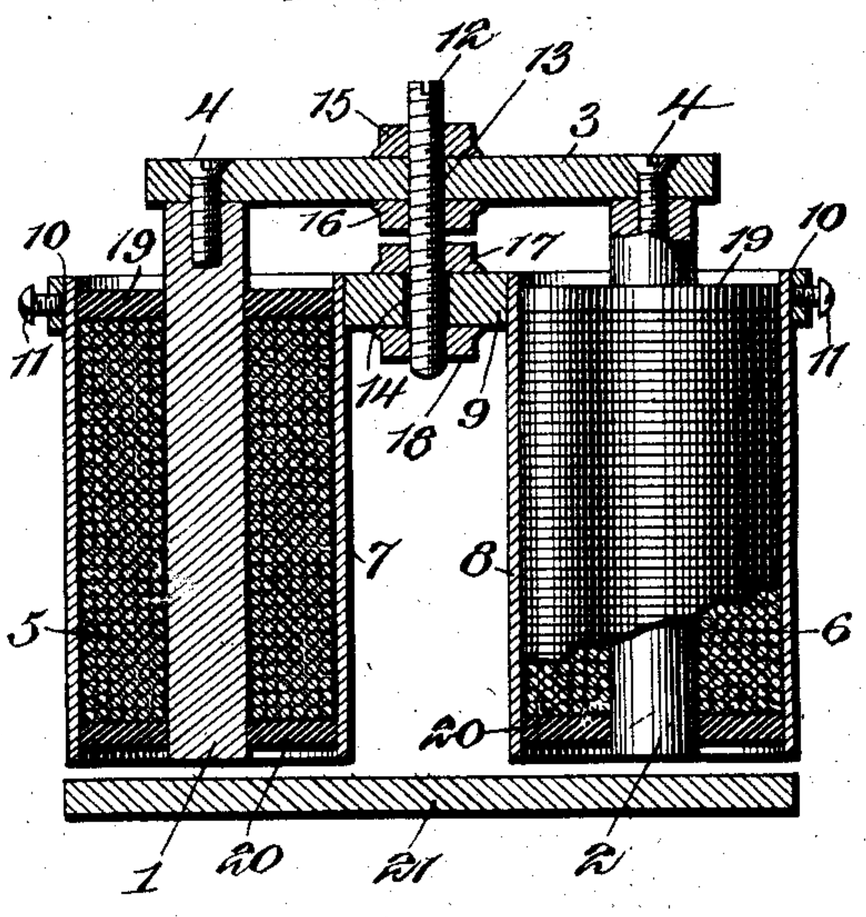


Fig. 2.



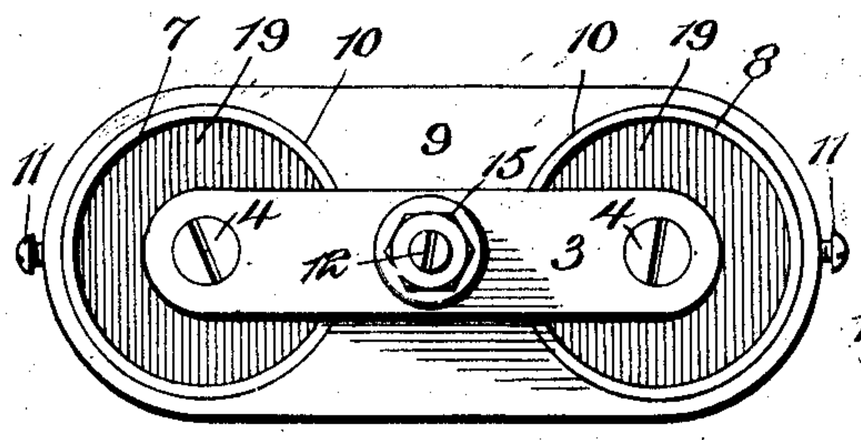


Fig. 3.

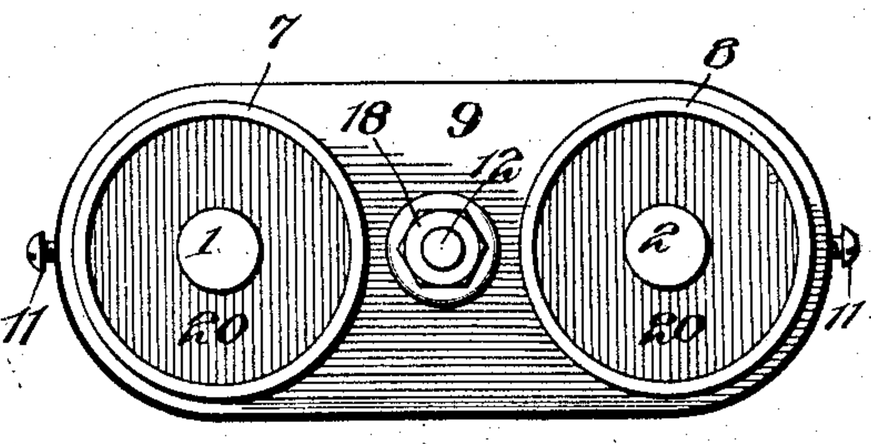


Fig. 4.

Witnesses
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UNITED STATES PATENT OFFICE.

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MULTIPOLAR ELECTROMAGNET.

No. 812,445. Specification of Letters Patent. Patented Feb. 13, 1906.

Application filed May 17, 1904. Serial No. 208,469.

To all whom it may concern:

Be it known that I, HERMANN G. PAPE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a new and useful Multipolar Electromagnet, of which the following is a specification.

This invention relates to a novel electromagnetic device, the object being to provide a simple, inexpensive, and compact structure which will exert a maximum attractive force with a minimum expenditure of electrical energy.

To the accomplishment of this primary object and others subordinate thereto, the invention consists in connecting a plurality of magnetic cores in series and surrounding said cores with sleeves connected in series and in interposing between each sleeve and core a coil of wire through which a current of high voltage but low amperage may be passed to powerfully energize the device thus produced.

In the accompanying drawings, Figure 1 is an elevation of my electromagnetic device and its armature. Fig. 2 is a sectional elevation thereof, and Figs. 3 and 4 are elevations of the opposite ends of the structure.

Like numerals designate corresponding parts in the several views.

1 and 2 indicate a pair of cores of soft iron or other suitable material connected by a terminal cross-bar or keeper 3, secured to the ends of the cores by suitable screws 4. The cores 1 and 2 are wound with wire, the wire coils 5 and 6 being surrounded by soft iron or steel sleeves 7 and 8, which not only protect the wire, but serve as magnetic poles. The sleeves or shells 7 and 8 terminate at one end in the plane of the adjacent ends of the cores 1 and 2, but the opposite connected ends of said cores extend beyond the adjacent ends of the sleeves, so that the latter will be separated from the cross-bar 3 by a considerable interval. The sleeves, like the cores, are terminally connected, as by a keeper or connector, in the form of a plate 9, provided with openings 10, into which the adjacent ends of the sleeves or shells are fitted and rigidly secured by set-screws 11.

In order to permit the elements of the device to be assembled in a rigid organization with the parts bearing the proper relation to each other, the pole-connectors 3 and 9 are connected midway of their ends by a bolt 12 of non-magnetic material—as, for instance, brass. The bolt 12 is screwed into a threaded opening 13 in the bar 3 and is extended through a plain opening 14 in the plate 9, lock-nuts 15 and 16 preventing movement of the bolt relative to the bar 3 and similar nuts 17 and 18 being screwed against the opposite faces of the plate 9 to prevent movement of the latter after the sleeves and cores have been assembled in their proper relative positions. By preference, hard rubber or other suitable insulating-heads 19 and 20 are fitted into each of the sleeves or shells to inclose and protect the wire.

At the end of the device opposite the connectors 3 and 9 is located the armature 21. In the drawings the armature is shown as a single piece or bar of soft iron extended entirely across the end of the structure. Obviously, however, a divided armature may be employed, or, if preferred, an armature composed of soft-iron ends and an intermediate connection may be utilized. It will now be apparent that the connected cores 1 and 2 constitute, in effect, a U-shaped magnet, of which the cores constitute the respective north and south poles. Similarly the sleeves and the connecting-plate 9 constitute a U-shaped magnet having hollow poles, the sleeve surrounding the north pole of the first-named magnet constituting the south pole of the second magnet, the other sleeve similarly differing in polarity from the core surrounded by it. In other words, the device includes a plurality of legs or branches, each comprising a plurality of poles of unlike polarity, the south pole of one magnet being paired with the north pole of another magnet. It will also be noted that each coil or core winding serves to energize two dissimilar concentric poles and that the electromagnetic device thus produced is of general U-shaped form and has each leg or branch thereof composed of a pair of dissimilar poles associated with an interposed wire coil and connected with those poles of the other leg or branch which are of corresponding form, but of different polarity. Attention is, furthermore, directed to the fact that by reason of the rigid connection of the sleeves and poles the various elements of the entire device are combined in a rigid organization which renders it exceedingly durable, as well as of compact form and of great attractive power. Furthermore, it should be noted that what have been termed the "legs"

of the device may be considered as separate magnets, whose poles are disposed for serial coöperation, it being immaterial, so far as the invention in its broader aspects is concerned, whether these coöperating poles are actually connected in a mechanical sense or not. Broadly, the essential feature is that arrangement whereby a plurality of magnets, each comprising two members, whether connected or not, and magnetized by a coil or coils common to both members, are made to coöperate with other poles having a serial relation, so that while each magnet is in itself compound the several magnets will have serial coöperation.

It will of course be understood that the several poles may be of soft iron or the device may be polarized by constructing certain of the poles of steel or by any other well-known expedient.

It is thought that from the foregoing the construction of my electromagnetic device and the many advantages accruing therefrom will be clearly apparent; but while the present embodiment of the invention appears at this time to be preferable, I desire to reserve the right to effect such changes, modifications, and variations of the illustrated structure as may come fairly within the scope of the protection prayed.

What I claim is—

1. An electromagnetic device, including a plurality of legs or branches each comprising a plurality of poles of unlike polarity, each of said poles having paramagnetic connection with a pole of another leg or branch.

2. An electromagnetic device, including a plurality of legs or branches each comprising a pair of poles of unlike polarity and an exciting-coil, each pole having paramagnetic connection with a pole of another leg or branch of the device.

3. An electromagnetic device, including a plurality of legs or branches each having a plurality of poles and an interposed coil, and paramagnetic connectors each connecting a pole of one leg to a pole of another leg.

4. An electromagnetic device, including a plurality of legs or branches each including a plurality of poles of unlike polarity, and a plurality of paramagnetic connectors located at the same end of the device and each connecting a pole of one leg to a pole of another leg or branch.

5. An electromagnetic device, including a plurality of legs or branches each including a plurality of poles, a plurality of paramagnetic connectors located at the same end of the device and each connecting a pole of one leg to a pole of another leg or branch, and a diamagnetic connection between the connectors.

6. An electromagnetic device, including a plurality of legs or branches each including a shell, a core and an interposed coil, the shells and cores being paramagnetic, a paramagnetic connection between the cores, and a similar connection between the shells.

7. An electromagnetic device, including two magnets of approximate horseshoe form, both poles or ends of both magnets being disposed in approximately the same direction, and one or more exciting-coils common to the adjacent legs of said magnets and extended between the same.

8. An electromagnetic device, including a plurality of magnets all of whose poles are spaced apart throughout and disposed in approximately the same direction, and one or more exciting-coils common to said magnets.

9. An electromagnetic device, including a plurality of separate and distinct magnets spaced from each other, but having all of their poles disposed in approximately the same direction, and one or more exciting-coils common to the magnets and interposed at least in part between the same.

10. In an electromagnetic device, a plurality of magnets all of whose poles are disposed in approximately the same direction, and exciting-coils each of which is common to a plurality of magnets, each coil inclosing one pole and serving to excite another pole uninclosed thereby.

11. In an electromagnetic device, a plurality of magnets all of whose poles extend in approximately the same direction, and exciting-coils common to said magnets, said coils encircling the respective legs of one magnet and serving to excite another magnet the legs of which are not inclosed by the coils.

12. An electromagnetic device, comprising a plurality of legs each including unlike poles, unlike poles of different legs being paramagnetically connected.

13. An electromagnetic device comprising a plurality of legs each including unlike poles and a coil, unlike poles of different legs being paramagnetically connected.

14. An electromagnetic device, comprising a plurality of legs each having unlike poles and an interposed coil, and separated paramagnetic connectors connecting unlike poles of different legs.

15. An electromagnetic device, comprising a plurality of legs each including unlike poles and a coil, spaced paramagnetic connectors rigidly connecting unlike poles of different legs, and diamagnetic means uniting the connectors.

16. An electromagnetic device, comprising a paramagnetic plate having a plurality of openings, paramagnetic shells terminally secured therein, and concentric cores within the shells and extended beyond the connected ends thereof, a paramagnetic bar connecting the extended ends of the cores, a diamagnetic bolt rigidly connecting the bar and plate, and coils wound upon the cores.

17. An electromagnetic device, including

a plurality of magnets having their unlike poles paired, one or more exciting-coils common to said magnets, and an armature.

18. An electromagnetic device, including a pair of magnets spaced apart throughout but having their unlike poles disposed in adjacent relation and extended in the same direction, exciting-coils common to both magnets and mounted on the respective legs or poles of one magnet, and an armature common to both magnets.

19. An electromagnetic device, comprising a plurality of legs each including unlike poles, unlike poles of different legs being paramagnetically connected, and an exciting-coil common to the unlike poles of a leg.

20. An electromagnetic device, including a plurality of magnets having their unlike poles paired, and one or more exciting-coils common to said magnets and extended between the same.

21. An electromagnetic device, including a plurality of magnets spaced apart and having their unlike poles paired, one or more exciting-coils common to the magnets, and diamagnetic means connecting said magnets.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

HERMANN G. PAPE.

Witnesses:
JOHN H. SIGGERS,
SULLIVAN V. JOHNSON.