(No Model.)

W. R. MICHL.

CORE ATTRACTING SOLENOID.

No. 521,269. Patented June 12, 1894.

Fig. 1.

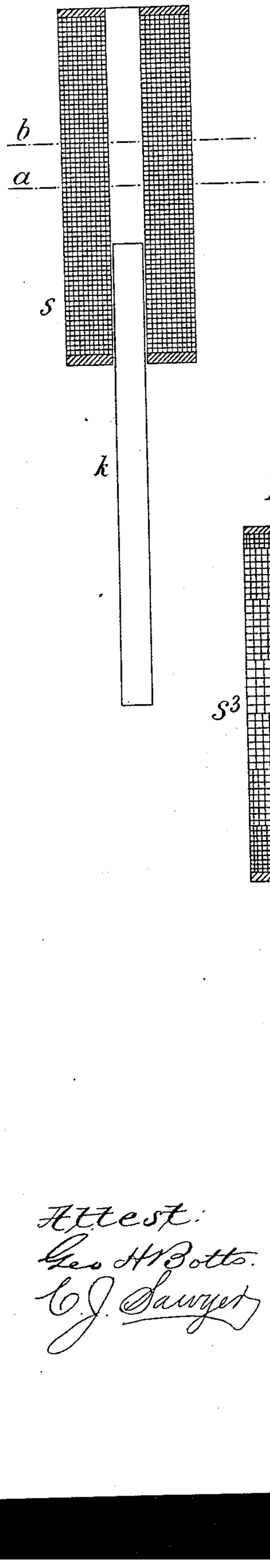


Fig. 2.

Fig. 3.

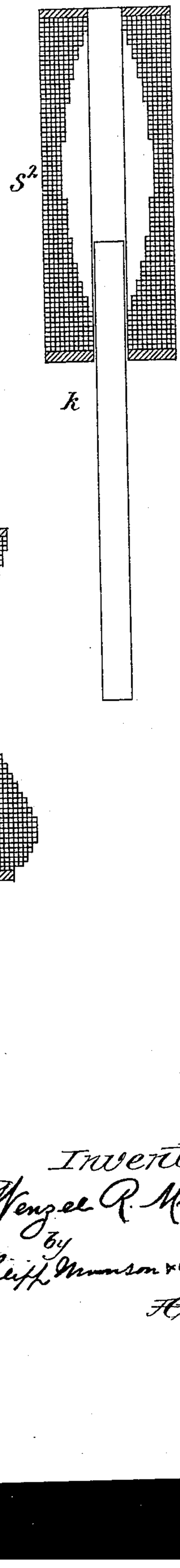


Fig. 4.

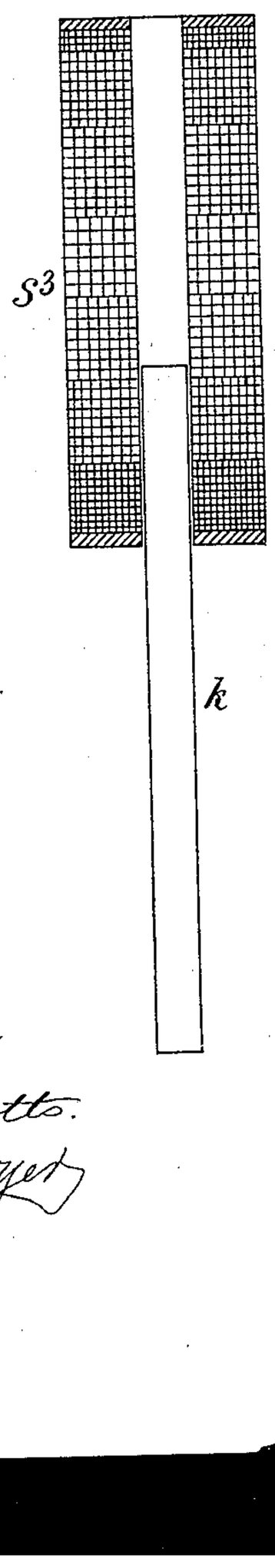
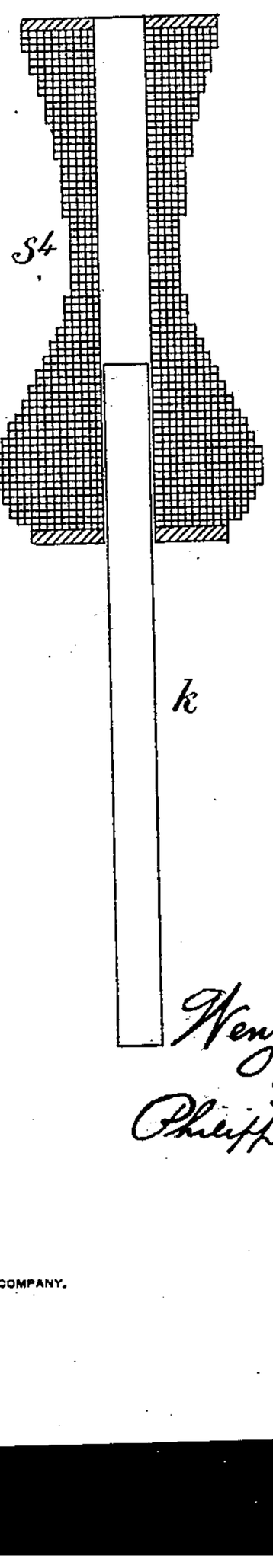


Fig. 5.



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WENZEL ROBERT MICHL, OF WETTER-ON-THE-RUHR, GERMANY.

CORE-ATTRACTING SOLENOID.

SPECIFICATION forming part of Letters Patent No. 521,269, dated June 12, 1894.

Application filed April 26, 1892. Serial No. 430,734. (No model.) Patented in Germany February 3, 1891, No. 61,179 in France September 21, 1891, No. 216,242, and in Belgium October 12, 1891, No. 96,755.

To all whom it may concern:

Be it known that I, WENZEL ROBERT MICHL, a subject of the Emperor of Austria-Hungary, residing at Wetter-on-the-Ruhr, Kingdom of Prussia, Germany, have invented a new and useful Improvement in Core-Attracting Solenoids, (for which I have obtained Letters Patent in Germany, dated February 3, 1891, No. 61,179; in France, dated September 21, 1891, No. 216,242, and in Belgium, dated October 12, 1891, No. 96,755,) whereof the following is a specification.

My invention relates to the combination of a solenoid and of a movable iron core designed to be attracted by and drawn into the solenoid, and the object of the improvement is to render the action of the solenoid on the core uniform throughout the course of the latter. If the coils of wire constituting a solenoid, are arranged uniformly in all portions thereof, and if the transverse sections of the core are all alike, the said core, when introduced with one end into the solenoid energized by an electric current, will be drawn in with a force which increases until the end of the core has arrived at or near the center of the solenoid; thereupon the attracting force will remain constant for a short distance, and finally it will decrease again. Now, in order to render the said force uniform, I wind the coils of the solenoid in such manner that the number thereof contained in consecutive sectional portions of the same length, decreases from the core-introduction end to the middle of the solenoid and then increases again.

In the annexed drawings Figure 1 is a sectional elevation of an ordinary cylindrical solenoid. Figs. 2, 3 and 4 are sectional elevations of solenoids of uniform core-attracting power, constructed according to my invention. Fig. 4 is a like view of a solenoid in which the attractive power varies in a prescribed ratio. In all the views each square formed by the horizontal and vertical intersecting lines indicates a wire.

In the solenoid *s*, Fig. 1, constituted of convolutions of wire that are wound uniformly in all portions of the same, and which thus form together a hollow cylindrical body, the force operating to draw in the core *k*, increases in the measure as the upper end of the latter rises from the bottom or ingress-end of the solenoid to line *a*. The said force then remains constant up to about the line *b* and thence decreases again. In the solenoid *s'*, Fig. 2, the number of convolutions is gradually reduced in the consecutive sectional portions from the bottom to the middle and is then augmented again in the inverse ratio of the increase and decrease of the force produced by solenoid *s*, Fig. 1, the wire being so coiled as to render the aggregate body of wire in vertical section concave outside and cylindrical inside. The solenoid s^2 represented by Fig. 3 differs from the foregoing one only in this respect that the body of wire is cylindrical outside and concave in vertical section on the inside. In the solenoid s^3 shown by Fig. 4, the gradual reduction and following increase in the number of convolutions are attained by coiling the wires in the consecutive portions at different distances apart. This may be done by varying the thickness of the insulating coverings of the wires, or by placing any suitable insulating material in layers of different thickness between the coils, or by employing wires of different diameter for the succeeding portions of the coil.

Fig. 5 finally shows a solenoid s^4 in which the lowest portion contains a greater number of convolutions than the solenoids represented by Figs. 2, 3 and 4, the effect thereof being to cause a stronger force to act on the core at the beginning in order to start the same more speedily.

I claim as my invention—

The combination of a solenoid composed of convolutions of a single insulated wire the number whereof decreases in the consecutive sectional portions of the solenoid from one end to the middle and then increases again toward the other end with a core arranged within the solenoid so as to be capable of movement in the direction of its long axis, substantially as and for the purpose described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WENZEL ROBERT MICHL.

Witnesses:

W. HAUPT,

L. A. EDWARDS.