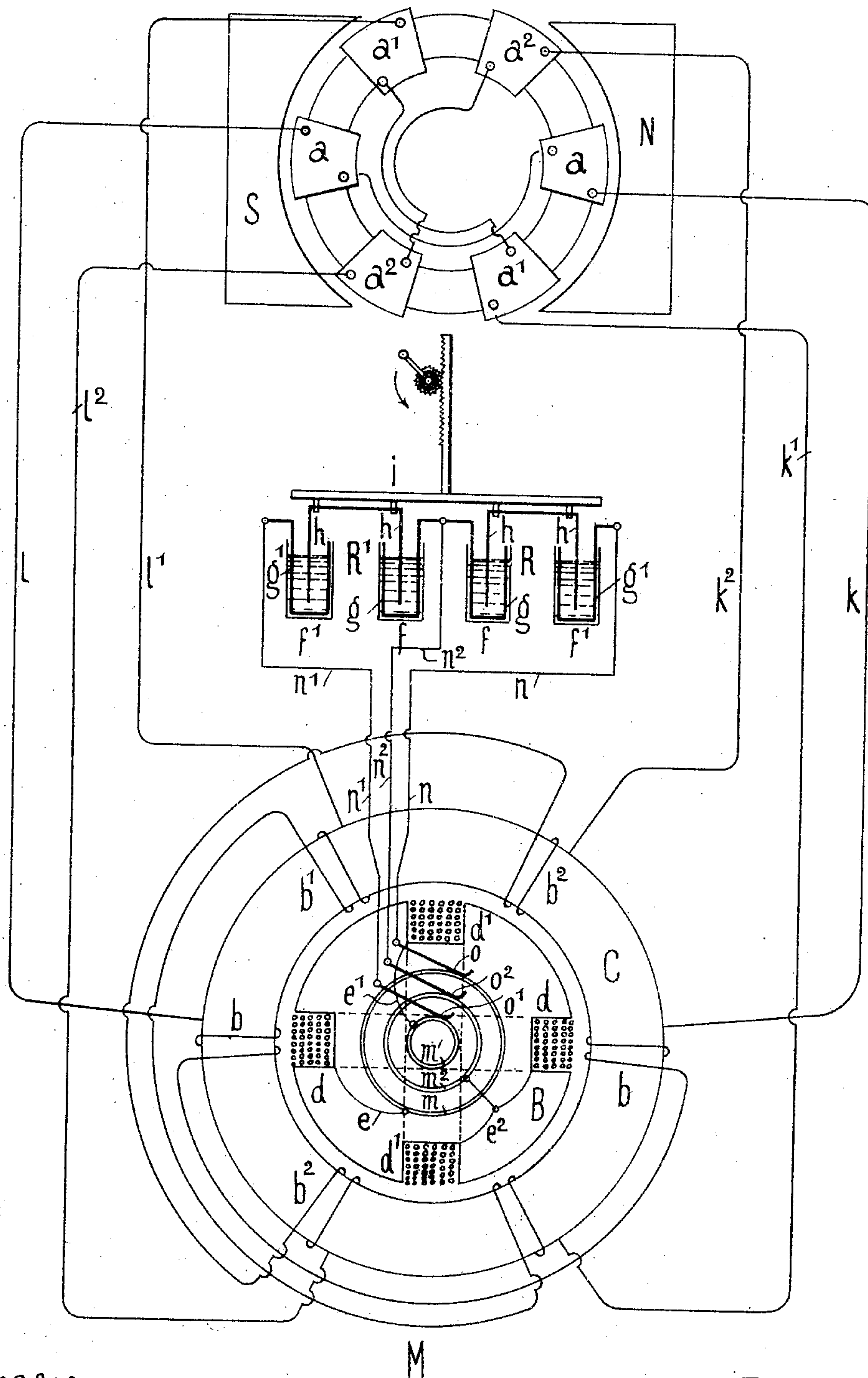


(No Model.)

M. VON DOLIVO-DOBROWOLSKY.
REGULATION OF ALTERNATING CURRENT MOTORS.

No. 503,038.

Patented Aug. 8, 1893.



Witnesses:
L. C. Hills
C. W. L. Hill

Inventor:
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UNITED STATES PATENT OFFICE.

MICHAEL VON DOLIVO-DOBROWOLSKY, OF BERLIN, GERMANY, ASSIGNOR
TO THE ALLGEMEINE ELEKTRICITÄTS GESELLSCHAFT, OF SAME PLACE.

REGULATION OF ALTERNATING-CURRENT MOTORS.

SPECIFICATION forming part of Letters Patent No. 503,038, dated August 8, 1893.

Application filed December 23, 1890. Renewed February 17, 1893. Serial No. 462,780. (No model.) Patented in Luxemburg December 20, 1890, No. 1,388; in Belgium December 31, 1890, No. 93,088; in Italy March 14, 1891, LVI, 172; in France March 25, 1891, No. 210,221; in England April 14, 1891, No. 20,425; in Spain April 20, 1891, No. 11,746; in Austria-Hungary April 22, 1891, No. 56,909 and No. 15,090, and in Switzerland September 30, 1892, No. 3,062.

To all whom it may concern:

Be it known that I, MICHAEL VON DOLIVO-DOBROWOLSKY, a subject of the Emperor of Russia, residing at Berlin, Prussia, Germany,
5 have invented a new and useful Improvement in the Regulation of the Speed and Power of Alternating-Current Motors, (for which I have obtained Letters Patent in Belgium December 31, 1890, No. 93,088; in France March 25, 1891,
10 No. 210,221; in Great Britain April 14, 1891, No. 20,425; in Italy March 14, 1891, No. 172, Vol. LVI; in Austria-Hungary April 22, 1891, No. 56,909 and No. 15,090; in Luxemburg December 20, 1890, No. 1,388; in Switzerland Sep-
15 tember 30, 1892, No. 3,062, and in Spain April 20, 1891, No. 11,746,) of which the following is a specification.

My invention relates to alternating current motors consisting in a field-magnet provided
20 with three or more coils or sets of coils that are supplied from a dynamo or a transformer with currents of respectively differing phases, and in an armature wound with magnetizing-coils, each of which forms in itself a closed cir-
25 cuit not connected to any source of electricity.

The object of the invention is to provide the said motors with improved means for regulating their speed and power. For this purpose I connect to each of the armature-coils a
30 separate adjustable resistance-device, which may be formed by metals, liquids, lamps, induction-coils, &c., and I provide these devices with means for adjusting them all simultaneously either by hand or automatically in view
35 of uniformly increasing or diminishing the degree of resistance presented by the same.

The annexed drawing is a diagrammatic view of a motor, M, comprising my improvement, in combination with a dynamo, D, for
40 generating alternating currents of differing phases. The dynamo consists in a field-magnet, indicated by the pole-pieces N S, and an armature, A, provided with three pairs of coils $a a, a' a', a^2 a^2$, placed sixty degrees apart from
45 each other, and being thus adapted to produce three currents differing in their phases by one sixth of a phase. The motor is composed of

the annular field magnet C carrying three pairs of coils $b b, b' b', b^2 b^2$, and the cylindrical armature B having two coils $d d'$, wound
50 lengthwise upon the body of the same and at right angles to each other. The coils $a a$ of the dynamo are connected to the coils $b b$ of the motor by the wires $k l$, the coils $a' a'$ to the coils $b' b'$ by the wires $k' l'$, and the coils
55 $a^2 a^2$ to the coils $b^2 b^2$ by the wires $k^2 l^2$. (The contact-rings and brushes required for this purpose in the dynamo, are not shown in the drawing.) By the co-operation of the three
60 differential-phase currents generated in the coils of the dynamo and acting in the motor-coils, there is produced in the motor a rotative magnetic field, which creates in the armature-coils currents that magnetize the armature,
65 and thus cause the same to revolve.

R and R' are the resistance-devices by which the currents in the armature-coils are regulated. Each of them comprises two vessels
70 $f f'$ containing a liquid by which the resistance is to be created, the conductors $g g'$ consisting in plates of metal, permanently immersed in the liquid, and the conductor-plate
75 h , dipping with its ends, which are bent downward, into the liquid in the respective vessels $f f'$ and adapted to lead the current from one vessel to the other.

To the conductor g' of resistance R is connected one end of coil d through the medium of wire e , contact-ring m , brush o and wire n . In like manner a connection is established
80 between the conductor g' of resistance R' and coil d' by the wire e' , contact-ring m' , brush o' , and wire n' , while for the return-currents there is a common connection between the
85 other ends of the two coils $d d'$ and the conductors $g g'$ of the respective resistance R R', consisting in the branched wire e^2 , ring m^2 , brush o^2 , and wire n^2 . The current excited in armature-coil d takes its course through
90 wire e , ring m , brush o , and wire n to resistance R. The current excited in coil d' flows through wire e' , ring m' , brush o' and wire n' to resistance R', while both currents return from the resistances R R' through wire n^2 ,

brush o^2 , ring m^2 and branched wire e^2 to the coil d or d' from which it emanated. Thus the current in each coil of the armature is controlled separately by the resistance connected thereto.

For regulating the resistances simultaneously, the conductors $h h$ are attached to a bar i provided with a mechanism for lowering and raising the same in view of causing the conductors $h h$ to dip more or less deeply into the liquid.

When a motor provided with my improved means of regulation is to be started, the resistance-devices are adjusted to present considerable resistance to the flow of the currents in the armature-coils, in consequence whereof the currents will be of reduced strength. If strong currents were allowed to be induced at the time in the coils, the motor would not start, because such currents react on the exciting magnetic field and, as it were, annihilate the same. Besides this, a considerable reduction of strength of the currents causes the motor to begin rotating slowly. Subsequently the resistance is decreased until the motor has attained its normal speed. If this speed is exceeded the resistance is increased again.

In the drawing the field-magnet of the motor has been shown provided with six coils, and its armature with two. These numbers are, however, variable, the former depending

on the number of armature-coils of the dynamo.

I am aware that resistance-devices have heretofore been applied to closed circuit armature coils of electric motors, and I therefore do not broadly claim this combination as new, but

I claim as my invention—

In an alternating current motor, the combination of a field-magnet provided with three or more coils or sets of coils, a like number of circuits connected to the said coils or sets of coils, means for supplying the circuits with differential-phase alternating currents, a rotative armature having coils or sets of coils which are independent of each other, adjustable resistances equal in number to that of the coils or sets of coils of the armature, contact-rings on the armature, brushes and conductors whereby each coil or set of coils of the armature is separately brought in circuit with one of the resistances, and a regulating-mechanism common to all the resistances, substantially as described.

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

MICHAEL VON DOLIVO-DOBROWOLSKY.

Witnesses:

OSKAR VON GOEBEN,
SIMON ROOS.