(No Model.) 2 Sheets—Sheet 1.

W. M. THOMAS.

DYNAMO ELECTRIC MACHINE FOR PLATING.

No. 550,663. Patented Dec. 3, 1895.

Fig 1

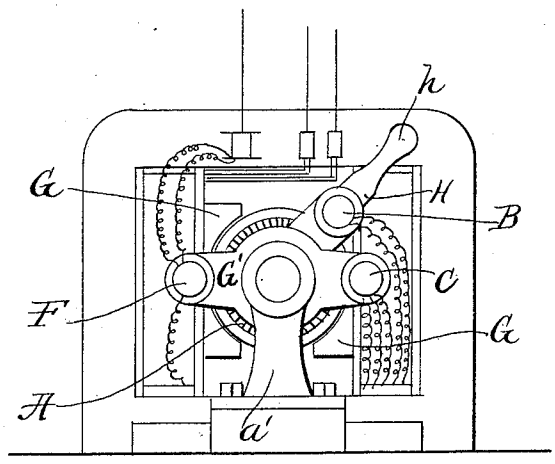


Fig 2

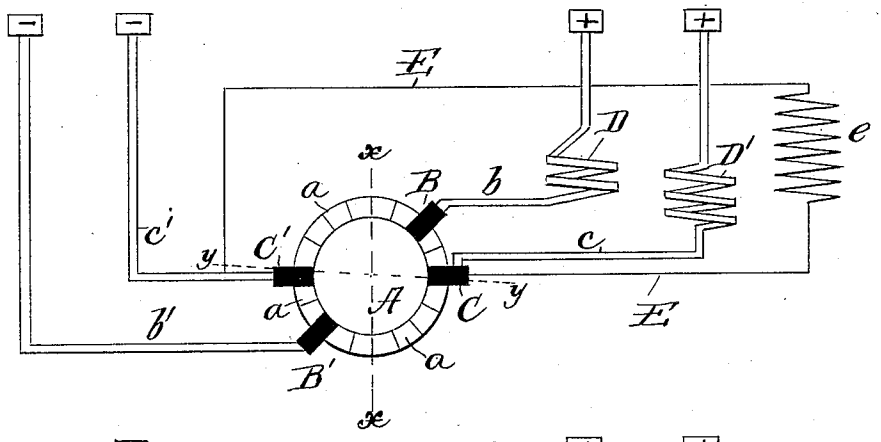
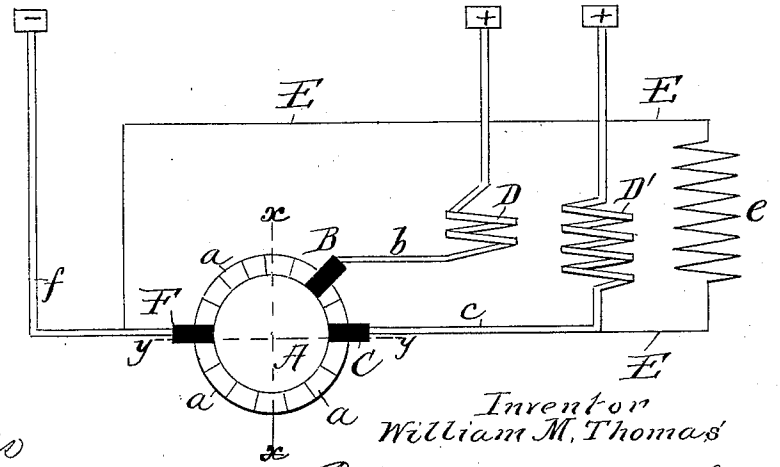


Fig 3



Witnesses.
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R. C. Page

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(No Model.)

2 Sheets—Sheet 2.

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DYNAMO ELECTRIC MACHINE FOR PLATING.

No. 550,663. Patented Dec. 3, 1895.

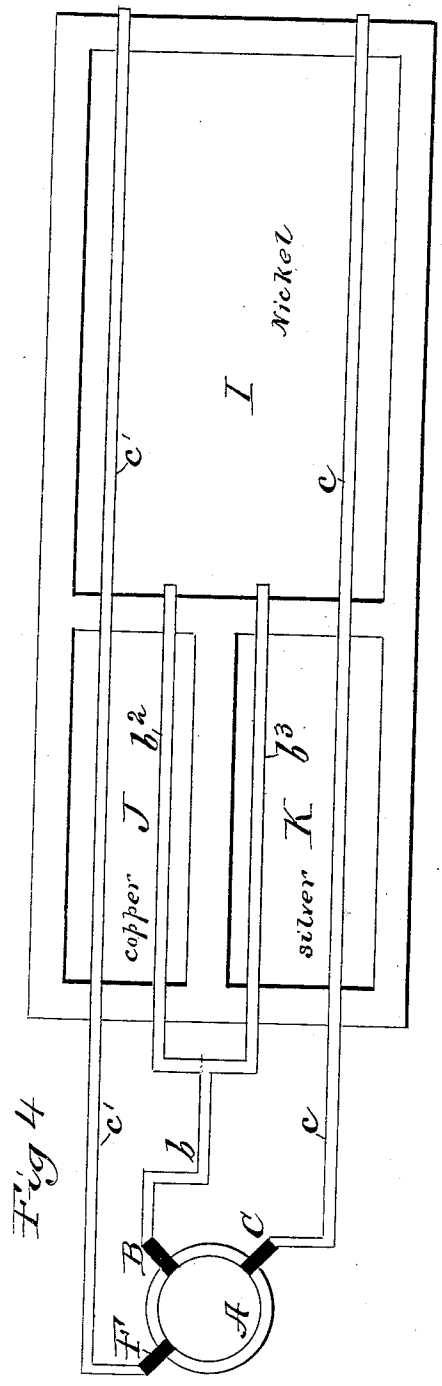

Fig 4

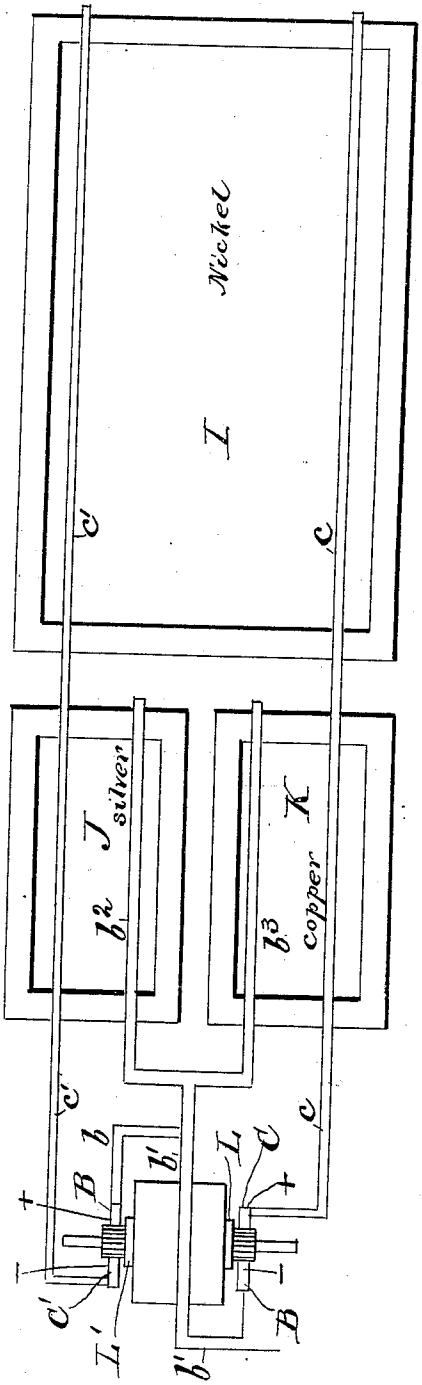

Fig 5

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UNITED STATES PATENT OFFICE.

WILLIAM M. THOMAS, OF CHICAGO, ILLINOIS.

DYNAMO-ELECTRIC MACHINE FOR PLATING.

SPECIFICATION forming part of Letters Patent No. 550,663, dated December 3, 1895.

Application filed March 25, 1893. Serial No. 467,551. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. THOMAS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Dynamos for Plating, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents an end elevation of a dynamo with my improvement arranged for service; Fig. 2, a diagram showing the arrangement of the circuits for the use of two pairs of brushes; Fig. 3, a similar view showing three brushes instead of four, two of the former view being combined in one; Fig. 4, a diagram showing armature with three brushes, as in Fig. 3, and three plating-baths to which current is distributed; and Fig. 5, a similar view showing the armature divided in two parts, with two pairs of brushes on the plan illustrated in Fig. 2, with three plating-baths, to which the current may be supplied from this armature.

My invention relates to dynamo-electric machines designed for use in plating with different metals; and the object is to provide a dynamo which will produce two or more circuits of different potentials or volts and varying quantity of ampères without interference with one another.

The invention consists in certain devices relating to the armature and brushes and the circuit connections therewith, whereby the above results are obtained and two more circuits are produced which are automatic and independent, each having a different voltage, which remains constant, while the current-flow or ampères may be varied from zero to the limit of the machine without the use of resistance in any of these circuits. Such a machine will serve advantageously in many of the arts. Herein it is shown employed in the art of electroplating, to which it is especially applicable, and, as illustrated in the drawings, working three solutions, each requiring different voltage of current.

I will now describe in detail the construction and operation of the machine applied to electroplating, as shown in the drawings, and will then point out more definitely in claims the particular improvements which I believe to be new and wish to secure by Letters Patent.

In the diagrammatic view shown in Fig. 2, A represents the armature, and *a* the sections thereof, under any ordinary construction. This diagram illustrates the arrangement of circuits for the use of two separate pairs of brushes. The dotted line *x x* shows the minimum points of commutation of the dynamo and the line *y y* the points of maximum commutation. One pair of brushes is indicated by B B′ and another pair by the letters C C′. The conductors for the brushes B B′ are indicated by the letter *b* for the positive and *b′* for the negative and those of the brushes C C′ by the letter *c* for the positive and *c′* for the negative. In each circuit a series coil is placed, indicated in this figure by the letter D for the circuit of brushes B B′ and D′ for the brushes C C′. The usual shunt E, with series coil *e*, is also provided for the field-coil. In using dynamos with a field-shunt alone it is well known that the voltage falls when the machine is put to work through a range of about ten per cent. from "no load" to "full load." The series coils are applied to and used in connection with the shunt to overcome this defect. These coils D and D′ are used one in each working circuit, for the purpose of reinforcing the fields as the shunt falls when the machine is put to work, as just stated. The shunt is of course connected to the respective poles of the high-pressure or maximum circuit. Now the series coils are compounded with the shunt-coil in the usual way—that is, the series coils are wound upon the shunt-coil, and, of course, in the same direction. Hence in operation the series will reinforce the shunt as the latter falls, and necessarily through the shunt also reinforce the fields correspondingly. The voltage is therefore maintained practically constant, and it is to be noted that this result is obtained automatically. There are no adjustments to be made by an attendant, and, in fact, no movable parts to be actuated either by an attendant or in any other way. After the dynamo is set to work it takes care of itself. As stated in the brief description of the drawings, all the figures of the drawings, with the exception of Fig. 1, are diagrams. Hence it is impossible to show

the actual mechanical construction of these compounded coils, and in Figs. 2 and 3 they are necessarily shown separate because the figures are diagrams; but the compounding of coils is understood and perfectly well known in the art, and the actual mechanical construction will be perfectly well understood by any one familiar with the art without any further illustration. Now in this Fig. 2 the brushes C C′ are shown set at the maximum points, and so will take the extreme voltage of the machine, whatever it may be. If the brushes B B′ are set on the line *x x*, they will take nothing; but if set at any point between the minimum points and the maximum points on which the brushes C C′ are placed they will take current expressing a portion of the full voltage of the machine all the way from zero to the extreme voltage, according to the arrangement of the brushes, the voltage being increased with each step of adjustment around the armature from the zero-points toward the maximum points. For instance, if this pair of brushes be adjusted to forty-five degrees, or half-way between zero points and maximum points, the current taken will be just one-half the full voltage of the machine. This adjustment is shown in the said Fig. 2. And if the extreme voltage of the machine is, say, five volts the circuit of the brushes B B′ will be expressed by two and one-half volts.

In ordinary practice it is not necessary to have two distinct pairs of brushes. The brush B′ may be consolidated with C′ and only one brush used for this negative conductor of each circuit. Fig. 3 is a diagrammatic illustration of this construction. All the parts are the same and are therefore lettered the same, except the combined brush on the negative side, which is marked F in the drawings and represents both B′ and C′ in Fig. 2. This construction of course requires but one negative conductor *f* for both circuits. The operation and result are precisely the same as in the construction shown in Fig. 2; but only the one brush B is adjusted for the purpose of regulating the weaker current. This construction with three brushes and a single negative conductor is of course simpler and cheaper than that illustrated by Fig. 2. It will be understood, of course, that the brushes C F remain stationary at the maximum points, the same as the brushes C C′ in Fig. 2.

In Fig. 1 I have shown so much of the dynamo as will illustrate the practical devices for the application of this improvement. Here G represents the field of the machine, of which A is the armature. Upon the bearing and supporting post *a′* of the armature there is fixed a horizontal arm G′, which carries the brushes F and C, as shown in Fig. 3, being arranged so as to bring these brushes upon the points of maximum commutation. A lever or handle-arm H is mounted upon a pivotal support concentric with the axis of the armature and is movable about said support. This arm carries the brush B and is provided with a handle *h*, by means of which it may be turned upon its support in one direction or the other, and obviously this movement will enable the brush B to be adjusted to any point desired between zero and maximum points, as already explained.

In Fig. 4 of the drawings I have shown a diagram illustrating the application of this invention. This figure represents the armature A, with the three brushes B, C, and F, in accordance with the plan shown in Fig. 3, as already explained. There are here represented three solution-tanks, lettered, respectively, I, J, and K. The conductors *c c′* for the brushes C and F are shown as extending to the tank I. It will be remembered that this is the circuit taking the maximum of voltage, and if this be expressed by five volts the current supplied to this tank I will also be expressed by five volts. The conductor *b* of the adjustable brush B branches, with one branch, b^2, running to the tank J and the other, b^3, to the tank K. The conductors *c c′* are also arranged in connection with these two last-named tanks, so that with the conductors of the brush B current is also distributed to each of these tanks, and the conductors of the brush B will act as a neutral or equalizing wire, as in the three-wire system. If the brush B be set at forty-five degrees, as already explained, and the maximum voltage of the machine is five volts, there will be distributed to each of the tanks J and K a current of two and one-half volts, one being the current between F and B and the other between C and B. Now, a current of five volts is suitable for the proper deposit of nickel and a current of two and one-half volts is sufficient for the successful deposit of copper or silver. Evidently, then, with the construction and arrangement shown in Fig. 4 current may be distributed at one and the same time to the three baths, I being nickel and J and K copper and silver, respectively. This same result may be accomplished with two separate machines or one machine having its armature divided in two parts, which is the construction illustrated diagrammatically in Fig. 5 of the drawings. This figure illustrates the practical application of the construction shown by the diagram in Fig. 2, in which two separate complete pairs of brushes are used. Here the armature is divided, the two parts being indicated, respectively, L and L′. The maximum brushes C C′ are applied one to one of these sections and the other to the other, as seen in the figure. The brushes B B′ are also applied in a similar way, but with an adjustment between the zero and maximum points, as already explained in connection with Fig. 2. Connections are made between the separate pairs of brushes and the several tanks I, J, and K in like manner as explained in connection with Fig. 4. Evidently

the same results are obtained in the distribution of current to these several tanks.

By varying the relative position of the brush or brushes B to the brushes C C′ or C F, which are always on the maximum point, and so transfer current of maximum voltage, a variation in the voltage of the current product of the machine may be obtained. As already explained in connection with Figs. 4 and 5, the current to the tank I will always be of maximum voltage, while the current to J and K may be varied. If the brush or brushes B are placed at an angle of forty-five degrees to the former pair, the current taken off by these brushes and distributed, respectively, to the tanks J and K will be in each one-half that of the maximum, and if the latter is five volts the other two will be two and one-half volts, respectively; but the volts distributed to the tanks J and K may be varied from one to three by the adjustment of the brush or brushes B in any of the arrangements described above and illustrated by the drawings without interfering with the volts of the maximum circuit supplied to the tank I—that is, if the latter is provided with a nickel solution the current required for nickel-plating is constantly distributed to said tank, while that sent to the tanks J and K may be varied, according to the solutions therein used. It is obvious, however, that in any adjustment of the brushes the current in each circuit will be maintained at a constant voltage so long as the particular adjustment is maintained. The one does not in any way interfere with the other.

I have here shown and described the application of my invention to the art of electroplating; but a dynamo provided with this invention may be successfully used for other purposes also, and I do not wish to be understood as limiting my invention to electroplating, but contemplate its use wherever a dynamo thus constructed is applicable.

Having thus described my invention, what I believe to be new, and desire to secure by Letters Patent, is—

1. In a dynamo electric machine, the armature in combination with mechanism whereby current may be furnished for two or three circuits of different constant voltage, a field shunt and series coils arranged in the divided circuits and compounded with the shunt, substantially as described.

2. In a dynamo electric machine, the armature A in combination with a pair of brushes fixed at the maximum point of commutation, a brush, or pair of brushes, adjustable with reference to the former between the minimum and maximum points, a field shunt, and series coils for the several circuits compounded therewith substantially as described.

3. In a dynamo electric machine, the armature A, in combination with the brushes C. F. fixed on the maximum point of commutation, the brush B mounted on a movable support whereby it may be adjusted to any point between the minimum and maximum points of commutation, a field shunt, and series coils for the several circuits compounded therewith substantially as described.

4. In a dynamo electric machine, the armature, A, in combination with the brushes C. F. arranged as described, the adjustable brush, B, the conductors, *b*, *c*, and *f*, the field shunt, E and the series coils, D, D′, arranged in the respective divided circuits and compounded with the shunt, substantially as described.

5. The armature, A, of a dynamo electric machine, in combination with the brushes, C. F., arranged as described, the adjustable brush B, the conductors *c*, *c′*, and *b*, b^2, b^3, the field shunt, E, series coils, D and D′, compounded therewith and the plating tanks, I, J, K, substantially as described.

WILLIAM M. THOMAS.

Witnesses:
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W. C. CORLIES.