(No Model.)

S. D. FIELD.

DYNAMO ELECTRIC MACHINE.

No. 436,408. Patented Sept. 16, 1890.

Fig. 1.

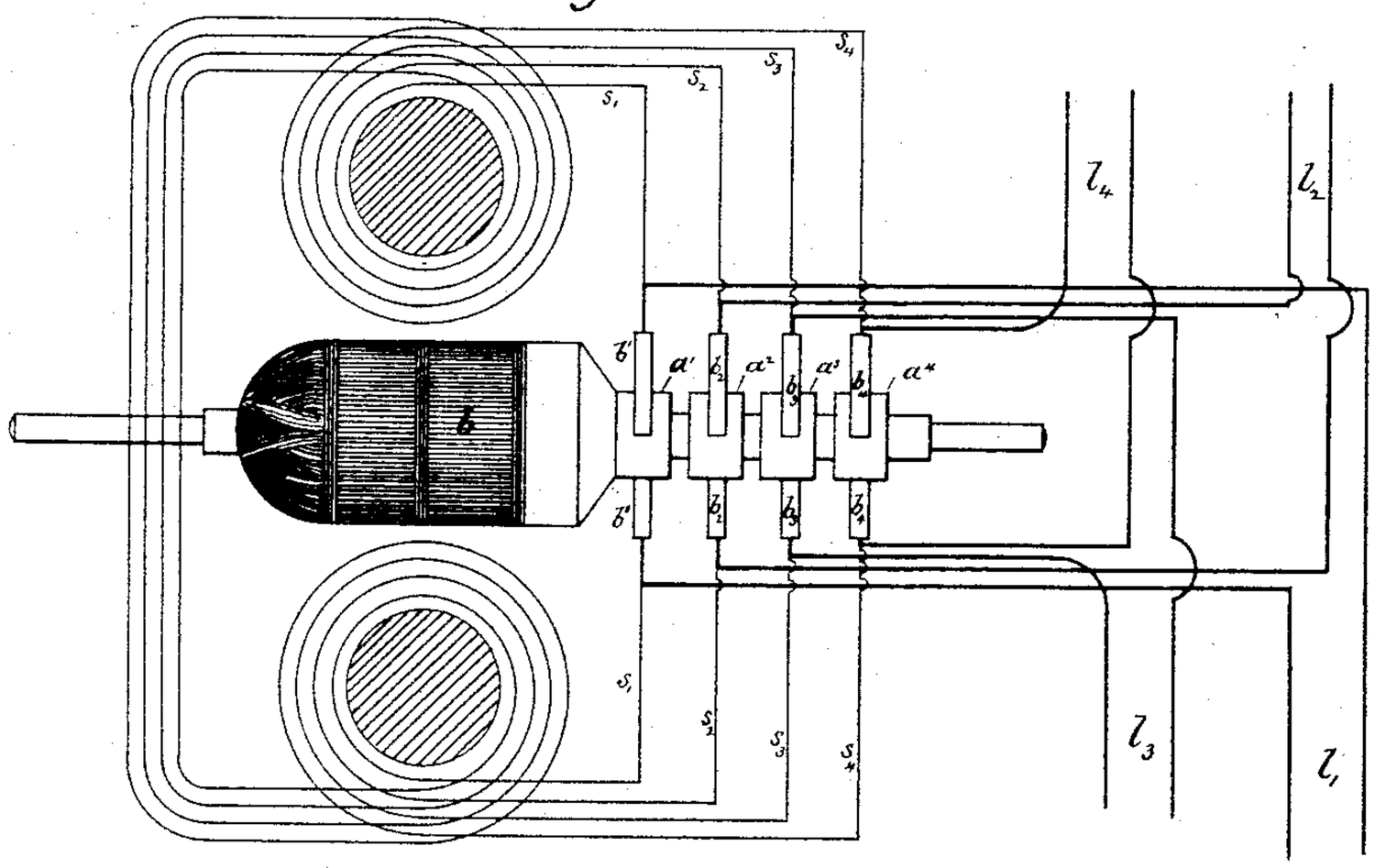
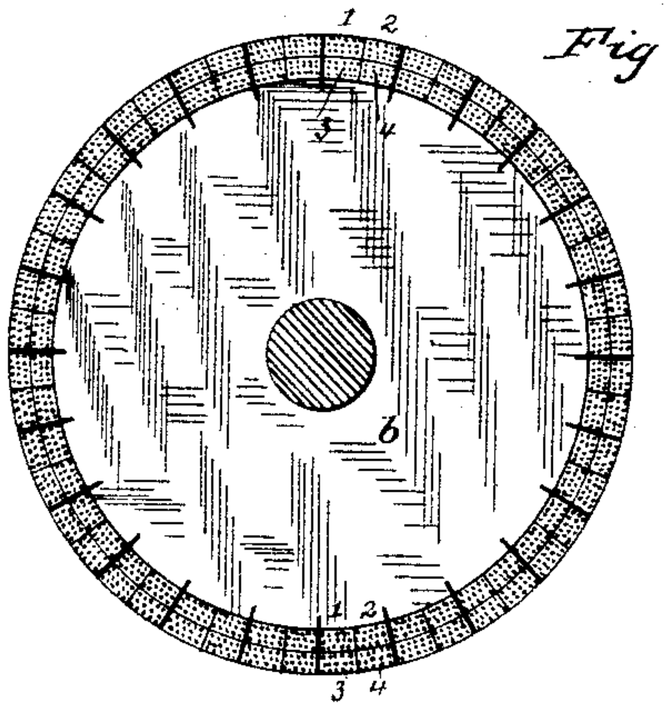


Fig. 2.



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DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 436,408, dated September 16, 1890.

Application filed April 2, 1888. Serial No. 269,264. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN DUDLEY FIELD, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Dynamo-Telegraphy; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in the construction and operation of dynamo-electric machines as generators of current for use in telegraphy, especially those systems now generally known as "quadruplex." Heretofore in the use of dynamos for this purpose where several quadruplex circuits were to be supplied with current at a single main station it has been necessary to have a separate series of dynamo-electric machines for each polarity used in said circuits. As the total amount of energy required for each circuit is generally comparatively small and within the capacity of a small machine, and as it has been found quite as cheap to construct such dynamos of larger size than absolutely essential, the use of such machines in the manner described has been more or less extravagant both in the relative proportion of cost for each of the required circuits and also in the efficiency of return from a given expenditure of power.

The object of my invention is to construct a single dynamo-electric generator of such character as will permit its use for a variety of circuits, whether the latter require the same or entirely different relative electro-motive forces. As the invention has reference to the construction and application of a dynamo-electric machine as the source of current for quadruplex or multiple telegraphy, I of course place no limitation upon its use in connection with any particular system of telegraphy or arrangement of transmitting or receiving devices, as it may be adapted to any of the known systems. I, however, design it more especially for use in connection with the system of multiple telegraphy set forth in Letters Patent No. 353,128, issued to me on November 23, 1886.

The invention comprises a single dynamo-electric machine of shunt-wound character having its armature composed of two or more independent windings, each complete winding connected with its own separate commutator on the shaft and having its own collecting-brushes, the field being composed of a number of shunt-windings forming each a proportionate part of the total field and each pair of brushes forming the terminals of one of the working-circuits of the multiplex system.

The invention further consists in the arrangement and combination of devices and circuits, all substantially as hereinafter more fully described and claimed.

In the drawings which form part of this specification, Figure 1 is a diagram illustrating the application of my invention. Fig. 2 is a transverse section of an armature of the drum-type, showing my method of disposing the multiplex windings symmetrically thereon.

In carrying my invention into effect I proceed in the following manner: I construct the machine with a considerable extension of the shaft, to permit placing thereon the required number of independent commutators *a*. The armature *b* is by preference of the well-known "drum type," and is divided off into as many spaces for windings as the constructer may desire for the particular purposes in view, each of the commutators corresponding as to number of bars therein. In each of the spaces on the armature I dispose as many separate windings as there are commutators or circuits to be supplied with current. The respective windings are numbered 1 2 3 4, which is the number of circuits selected in this case to be supplied with current. The windings 1, 2, 3, and 4 are laid so that each complete winding on the periphery of the armature will receive the same average inductive effect per revolution of the armature. This can be done in a simple manner by winding the respective coils 1, 2, 3, and 4 on formers, so as to each constitute a bunch or hank of the proper shape, and then laying them on the armature in such manner that on one side of the armature coils 1 and 2 are at the outside and nearest the pole-pieces of the machine, while at the opposite side of the arma-

ture the same coils have a position farthest from the pole-pieces, while coils 3 and 4 on this side are now nearest the pole-piece. The terminals of each of the coils all the way around the armature are connected up in any of the usual ways, and the bunch of terminals is carried through the shaft, which is made hollow for the purpose, and are brought to the respective bars of commutator a'. The terminals of the other windings 2, 3, and 4 are in like manner brought to their respective commutators a^2 a^3 a^4. The armature thus constructed really comprises four independent generating-circuits around a single core, and the connections are made so that each of the four currents so generated is taken off as a continuous current by means of the respective sets of brushes b' b^2 b^3 b^4. The respective circuits so supplied are connected to the brushes and marked l' l^2 l^3 l^4. In the case of four independent circuits in the armature and four independent collecting devices the field-magnetism is secured by four independent shunt-windings s' s^2 s^3 s^4, respectively, connected to the brushes, as illustrated, each winding contributing its portion of ampère turns to the total magnetizing effect of the field-magnets.

By such construction when the dynamo is set in operation four independent electro-motive forces are set up, and if the respective windings on the armature are alike and the respective shunts on the field are alike the potential will be the same for each of the said working-circuits, and the volume of current flowing will be of course determined by the total resistance in each complete circuit.

The machine may be constructed originally to give different potentials at each of the pairs of brushes. The various armatures and brushes may, if desired, also be coupled up in multiple for the delivery of a heavier current into a circuit of lower resistance. Again, if it should be desired at any time to greatly increase the electro-motive force in any particular circuit two or more of the pairs of brushes b b may be connected up in series, in which case the corresponding field-shunts would be also connected in series. Of course it will be understood that where two or more of the independent armature-circuits are to be connected in multiple they should be arranged for similar potentials before coupling together.

As an illustration of some of the foregoing features, the four armature-windings herein described may be arranged for a production of electro-motive force of three hundred volts in each of the four working-circuits shown. For two working-circuits at six hundred volts each the windings would be connected in series of two.

If any one of the circuits requires lower than the normal potential, the result may be obtained by shifting the position of the brushes belonging to such windings to a position of lower potential on the commutator; or, again, the circuits l' l^2 l^3 l^4 may have dead resistance inserted therein, in which case, however, precaution should be taken to have such dead resistance without self-induction.

It will be readily understood, therefore, that by the use of my invention a single dynamo may readily be arranged to supply any reasonable number of circuits independently of one another, and will work continuously in the most uniform and satisfactory manner so long as the resistance of such circuits in operation is sufficient to have the operative shunts maintain the field-magnetism above such minimum as might cause the armatures to fall off in potential.

By the foregoing invention I am able to build a dynamo of reasonably small size and utilize its entire capacity at the highest efficiency of which it is capable, and therefore have no waste energy to pay for in the running expenses.

I am aware that it is not new to construct a series-wound machine with two separate armature-circuits and two field-magnet circuits, the respective armature and field circuits being in series; but such a machine cannot serve for telegraphic purposes without material modification. My invention is entirely distinct from such a machine, in that it is shunt-wound, and hence as long as it is in motion and connected up its potential is always existent and ready for instant use. The importance of this will be well understood by those skilled in the art of telegraphy, wherein occasions are frequent when the circuit is left open for a few moments at the key. On such occasions obviously a series-wound machine would lose its magnetism, and the next closing of the circuit at the key would elicit no immediate response in current, and for the time being that particular circuit would be absolutely inoperative. With my shunt-wound machine, however, it will not matter how often or how long the transmitting-key may be left open, as the field-magnet will retain its strength, and the machine is at all times while running ready to instantly respond with the full current of which it is capable in any particular circuit.

I claim—

1. A dynamo-electric machine provided with two or more independent internal circuits, each circuit including an armature and field-magnet branch, the latter arranged in shunt relation to the line, and separate commutators and brushes for each circuit.

2. The combination of a dynamo-electric generator provided with two or more independent internal circuits, each circuit including an armature and field-magnet branch, the latter arranged in shunt relation to the line, and independent external working-circuits supplied by one or more of the generator-circuits.

3. The combination of a dynamo-electric

machine provided with two or more independent internal circuits, each circuit including an armature and field-magnet branch, the latter arranged in shunt relation to the line, and independent telegraphic circuits supplied by one or more of the generator-circuits, as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

STEPHEN DUDLEY FIELD.

Witnesses:
T. J. McTIGHE,
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