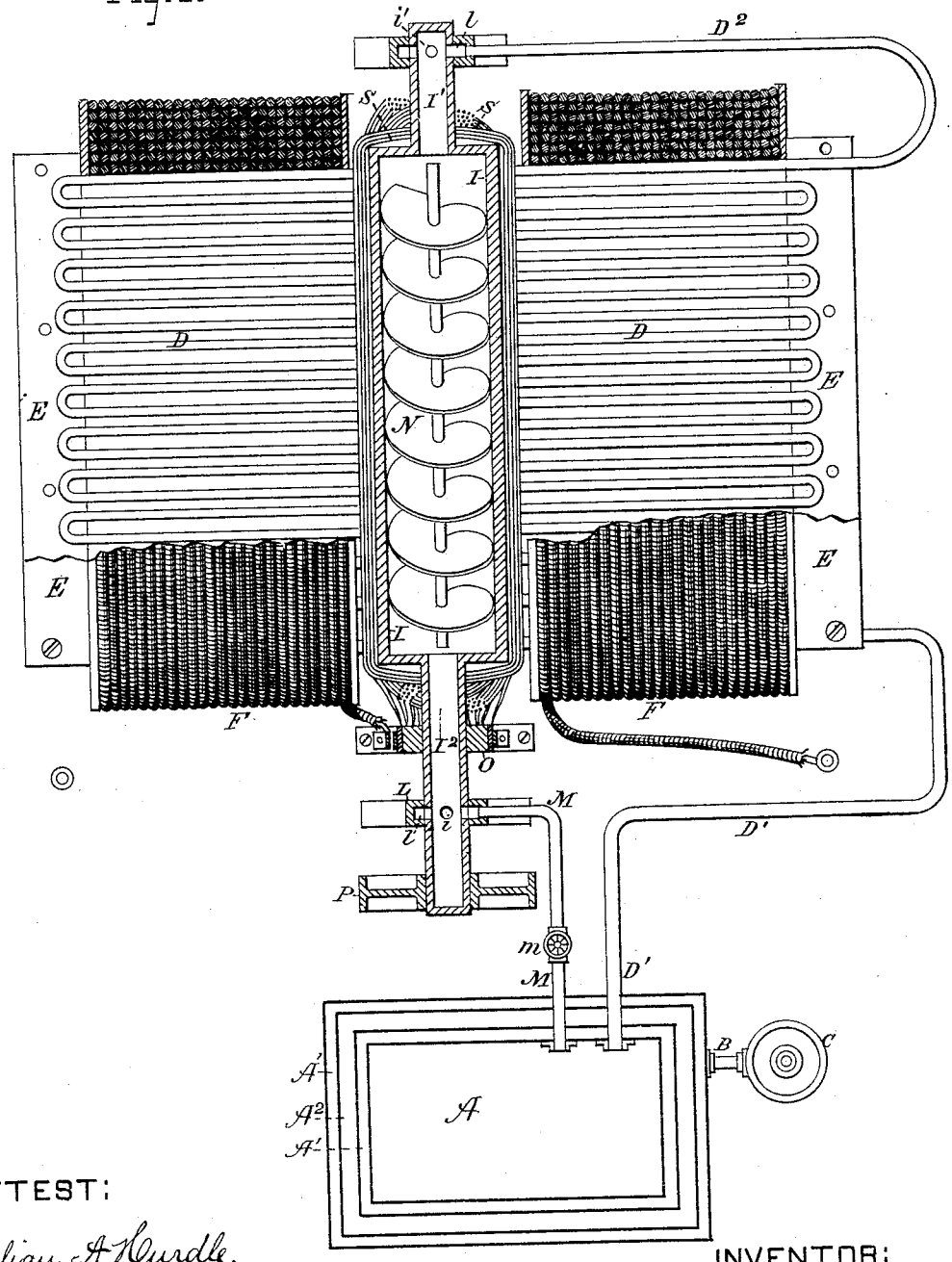
(No Model.) 2 Sheets—Sheet 1.

W. L. VOELKER.

Dynamo Electric Machine.

No. 242,400. **Patented May 31, 1881.**

Fig. 1.



ATTEST:

Julian A. Hurdle.
John J. Diffley

INVENTOR:
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(No Model.) 2 Sheets—Sheet 2.

W. L. VOELKER.

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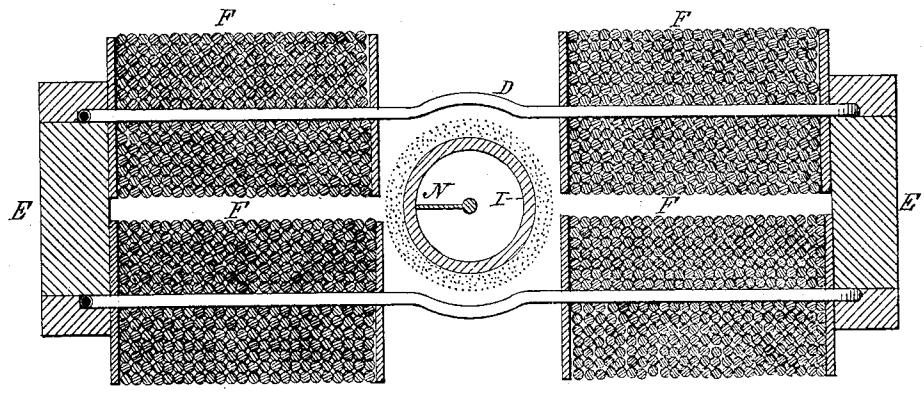


Fig. 2.

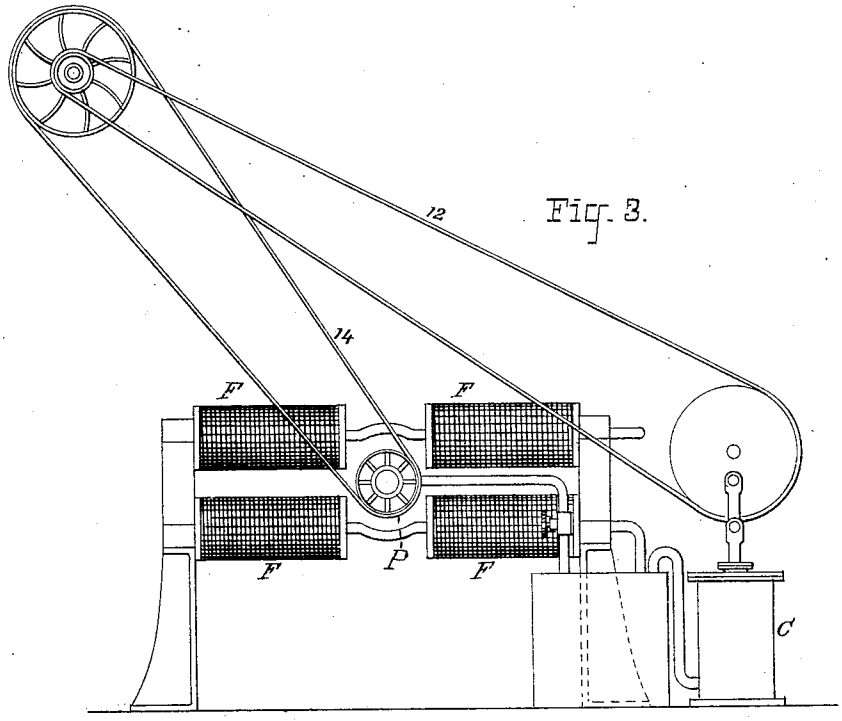


Fig. 3.

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UNITED STATES PATENT OFFICE.

WILLIAM L. VOELKER, OF MORTON, PENNSYLVANIA.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 242,400, dated May 31, 1881.

Application filed September 30, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. VOELKER, of Morton, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Dynamo-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention has special relation to that class of devices employed for generating electricity for use in illuminating and for other purposes, commonly called "dynamo-machines."

In all machines of this character as heretofore constructed great difficulty has been experienced in operating the same, for the reason that the armature cannot be rotated with sufficient rapidity to give the full power of the generated current, the rapid changes of magnetization and demagnetization, as well as the mechanical resistance exerted upon the armature produced by the magnetism, which is converted into heat very rapidly, having the effect of destroying the insulation of the bobbins of the armature, and rendering the same unfit for use.

To overcome this difficulty I employ an improved form of armature and field-magnets, so arranged as to permit a current of air, cooled by chemical or other means, to pass through channels in the interior of said armature and field-magnets, prepared for that purpose, the air continuously circulating from and to the cooling apparatus; and my invention involves certain other new and novel modes or methods of operation and peculiarities of construction, all of which will be hereinafter first fully described, and then pointed out in the claims.

In the drawings, Figure 1 is a plan and partial section, showing one of the field-magnets of my improved dynamo-machines, and one mode of connecting therewith the apparatus for cooling the air which circulates through the interior of the armature and field-magnets. Fig. 2 is a vertical section through the armature and field-of-force magnets on the line *x x* of Fig. 1.

A is a metal reservoir or chamber, constructed air-tight and of any desired size. Upon the outside of chamber A, and surrounding the same, are two other chambers, A′ and A^2. Chamber A^2 extends but half the depth of A′, and the top thereof opens into said chamber.

C is an ordinary air-pump, connected by tube B with chamber A′.

When it is desired to cool the air contained within chamber A, a quantity of strong sulphuric acid is placed in chamber A′, and chamber A^2 is filled with water. When the air is exhausted from chambers A′ and A^2 by means of pump C the water contained in chamber A^2 will begin to boil, and since the vapors are absorbed by the sulphuric acid as fast as they are formed, a rapid evaporation is produced, which quickly reduces the air contained in chamber A to a very low temperature, in accordance with well-known physical laws.

The air-pump C is connected with the power which drives the armature of the machine in such a manner as to keep the air exhausted in chamber A′.

In Fig. 3 I have shown the air-pump C driven from the shaft to which is applied the belt of the dynamo-machine. The wheels over which the belts 12 and 14 pass are preferably so proportioned as to give a comparatively slow motion to the pump. The result of driving the machine and the refrigerating apparatus from the same shaft is that the cooling effects from the refrigerating apparatus are proportionate to the heating effects in the machine. In other words, an increase of speed in the machine, and consequent tendency to increase of temperature, is accompanied by an increased fall of temperature in the refrigerating apparatus.

Instead of using sulphuric acid, there may be substituted therefor bisulphide of carbon, ammonia, or any other volatile liquid. In this case water-tank A^2 may be dispensed with, and the substance to be evaporated placed in chamber A′, and as fast as the same is evaporated it may be condensed by well-known chemical means in a receiver adapted for the purpose, and thus used a number of times; or chamber A′ may be filled with water, which is cooled by the means first above mentioned, and made to circulate through the various parts of the field-magnets and armature; or, if desired, the machine may be so arranged as to permit the evaporating liquids themselves to be forced through the parts it is desired to

keep cool, the same being kept in continuous motion by means of the screw located in the armature.

Heretofore the field-magnets of dynamo machines have been constructed of a solid bar of iron, or of a number of bars. When the machine thus constructed is operated for a short time the magnets become heated, and very materially lessen the power of the machine. To overcome this objection I construct my field-magnets D of soft-iron pipe, the whole being so arranged as to form a continuous passage through the magnets, as plainly shown in the drawings.

The magnets are bent around the armature in the usual manner, and firmly held in position by the shoes E E.

F F are the insulated wire bobbins, wound around the field-magnet D, in the method well understood by all skilled electricians.

D′ is a pipe connected with the chamber A and magnet D, and D^2 is a pipe connected with the magnet and one of the hollow bearings of the armature-shaft.

I is the hollow iron cylinder of the armature. This cylinder is closed at each end, with the exception of connections with the hollow shaft I′ I^2.

L and L′ are the two bearings in which the shaft of the armature revolves. These bearings are provided with chambers *l l*, extending around the shaft.

i i′ are perforations in the hollow shaft of the armature, which are so located therein as to leave at all times a free passage from the shaft into the chambers *l l* in the bearings. The chamber in bearing L′ communicates with pipe D^2 of the field-magnets.

M is a pipe communicating with the chamber *l* in bearing L, and extending from thence into reservoir A.

m is a valve placed in pipe M, and so arranged as to permit communication between the interior of the armature and the outer air, or between the interior of the armature and chamber A, as may be desired.

N is an Archimedean screw fitting the interior of the armature, extending the entire length thereof, and being securely fastened to the walls of the cylinder.

The bobbins S of the armature are wound in sections and connected in multiple arc, the various sections terminating on insulated pieces of copper or other suitable metal, forming the commutator O, the generated currents being collected therefrom by brushes or other preferred devices, in the usual manner.

P is a pulley attached to the end of the armature-shaft, for the purpose of giving the same the requisite rotary motion.

When constructed substantially in accordance with the foregoing description, the operation of my improved dynamo-machine is as follows: The air in reservoir A being cooled, as before explained, the armature of the machine is set in motion. The screw N, revolving therewith, draws the air from pipe D^2, connecting with the field-magnets, and the cool air from the reservoir rushes in through pipe D′ to fill up the vacuum thus created, and a current of cool air is constantly flowing through all parts of the magnets, keeping the same at such a temperature that the armature may be rotated as rapidly as desired. After performing its office in the field-magnets the cool air is drawn into the interior of the armature through the bearing L′, and serves to keep the armature from overheating.

The air may be permitted to flow back from the armature into tank A through pipe M, and be again reduced in temperature before further use; or it may be allowed to escape into the open air through valve *m*, and fresh air may be admitted to reservoir A as fast as necessary to supply the current through the field-magnets and armature.

If desired, instead of using a small machine for reducing the temperature of the air flowing through the field-magnets and armature, tank A may be made of such a size as to permit the dynamo-machine to be placed therein, thereby cooling the same upon the exterior as well as upon the interior of its various parts.

When constructed in accordance with the foregoing description my improved dynamo-machine is of such a character that the armature may be revolved at any desired speed without danger of injury by overheating to any part of the machine, thereby obtaining the full power of the device. It will thus be seen that my apparatus admirably answers the various uses and purposes for which it is intended.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a dynamo-machine of the character herein described, the field-magnets composed of iron pipe bent in such shape as to form a continuous passage therethrough, substantially as and for the purposes shown and described.

2. In a dynamo-machine of the character herein set forth, the combination, with the hollow field-magnets, of the mechanical refrigerating apparatus, the whole combined and arranged to operate substantially as and for the uses and purposes described.

3. In a dynamo-electric machine, an armature having a hollow shaft connected with the cooling-chamber of a refrigerating apparatus.

4. In a dynamo or magneto electric machine, the combination, with the hollow field-magnets, of leading and return passages connected with the cooling-chamber of a refrigerating apparatus.

5. In a dynamo-machine, an armature having a hollow shaft connected with the pipes of an air-cooling device, substantially as shown and described.

6. In combination with a dynamo-electric machine, a refrigerating apparatus whose mechanism is operated by the same power that drives the dynamo-machine.

7. In a dynamo-electric machine, the combination, with pipes or passages arranged within the machine to counteract heating effects, of a refrigerating apparatus for supplying the cooling-fluid that is conducted through said pipes, the mechanism of which is driven by the same power that is used to drive the dynamo-machine.

8. In combination with a dynamo-electric machine, mechanical refrigerating apparatus which cools the air or other fluid used in counteracting the heating effects in said machine, substantially as described.

9. The combination, in a dynamo-electric machine, of passages within said machine for conveying a cooling-fluid, a chemical refrigerating apparatus connected with said pasages, and devices for compelling a circulation of the cooling-fluid, substantially as described.

10. In a dynamo-machine of the character herein set forth, the combination, with the hollow cylinder of the armature, of the Archimedean screw, the field-magnets, and a connecting-passage constructed of iron pipe, the whole arranged to operate substantially as shown and described.

11. In a dynamo-machine, an air-cooling device consisting of tanks A, A′, and A^2, air-pump C, pipe D′, field-magnet D, pipe D^2, bearings L L′, screw N, hollow shaft I′ I^2, cylinder I, bobbins S S, pipe M, bobbins F F, and commutator O, the whole combined and arranged to operate substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of two witnesses.

WILLIAM L. VOELKER.

Witnesses:

ARTHUR M. PIERCE,

WORTH OSGOOD.