(No Model.)

2 Sheets—Sheet 1.

A. S. KIMBALL & G. L. BROWNELL.

ELECTRIC SPINNING OR TWISTING MACHINE.

No. 371,199. Patented Oct. 11, 1887.

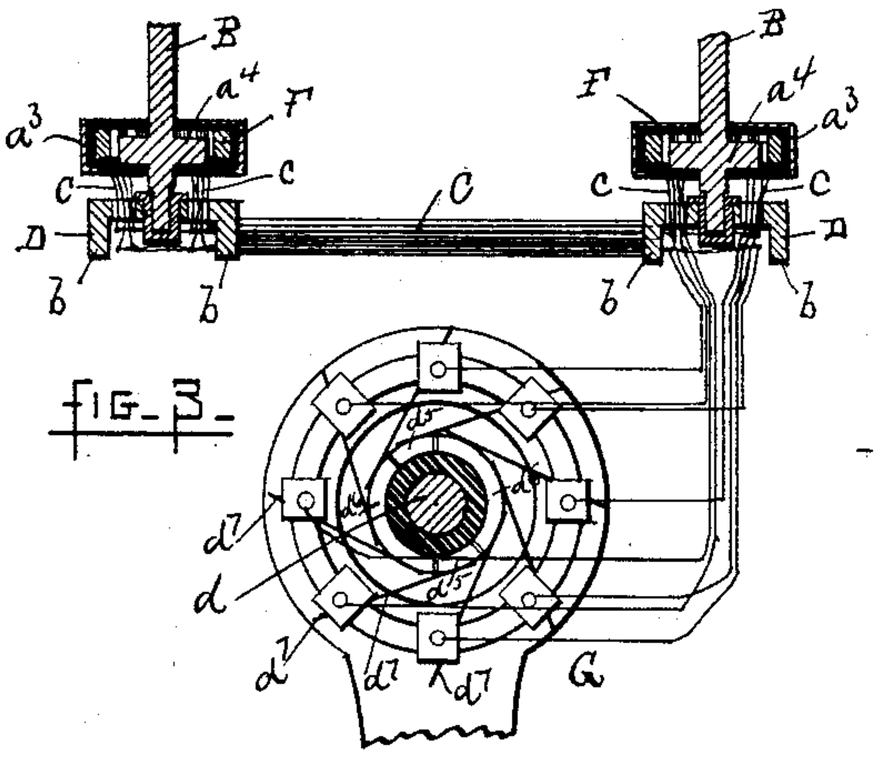

FIG. 3.

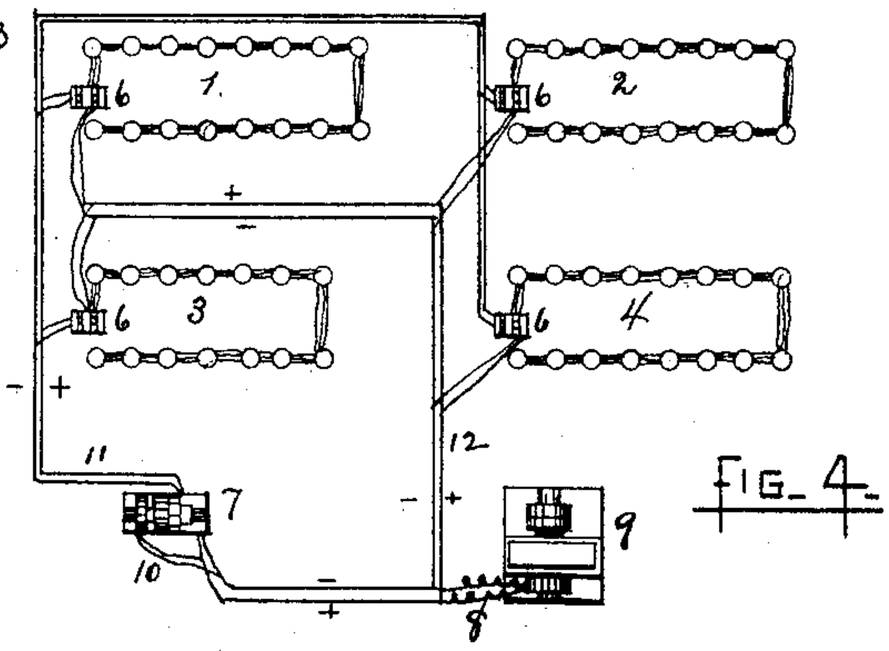

FIG. 4.

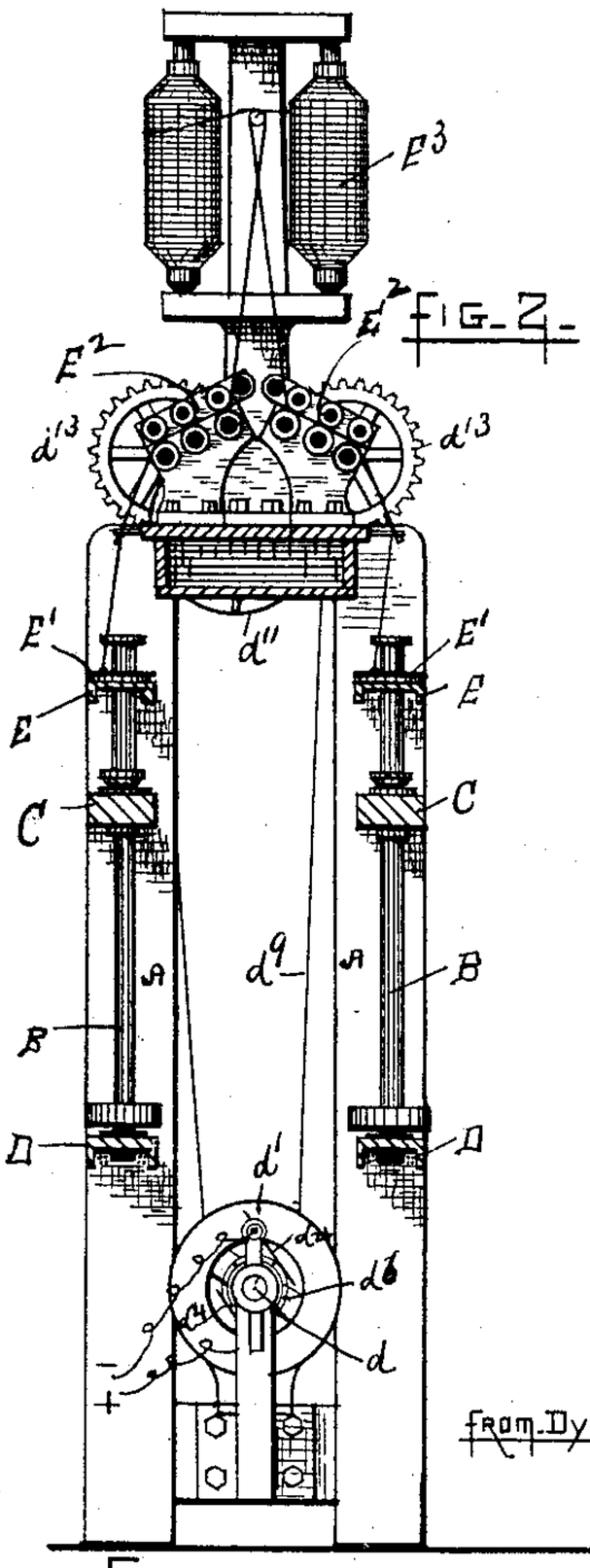

FIG. 2.

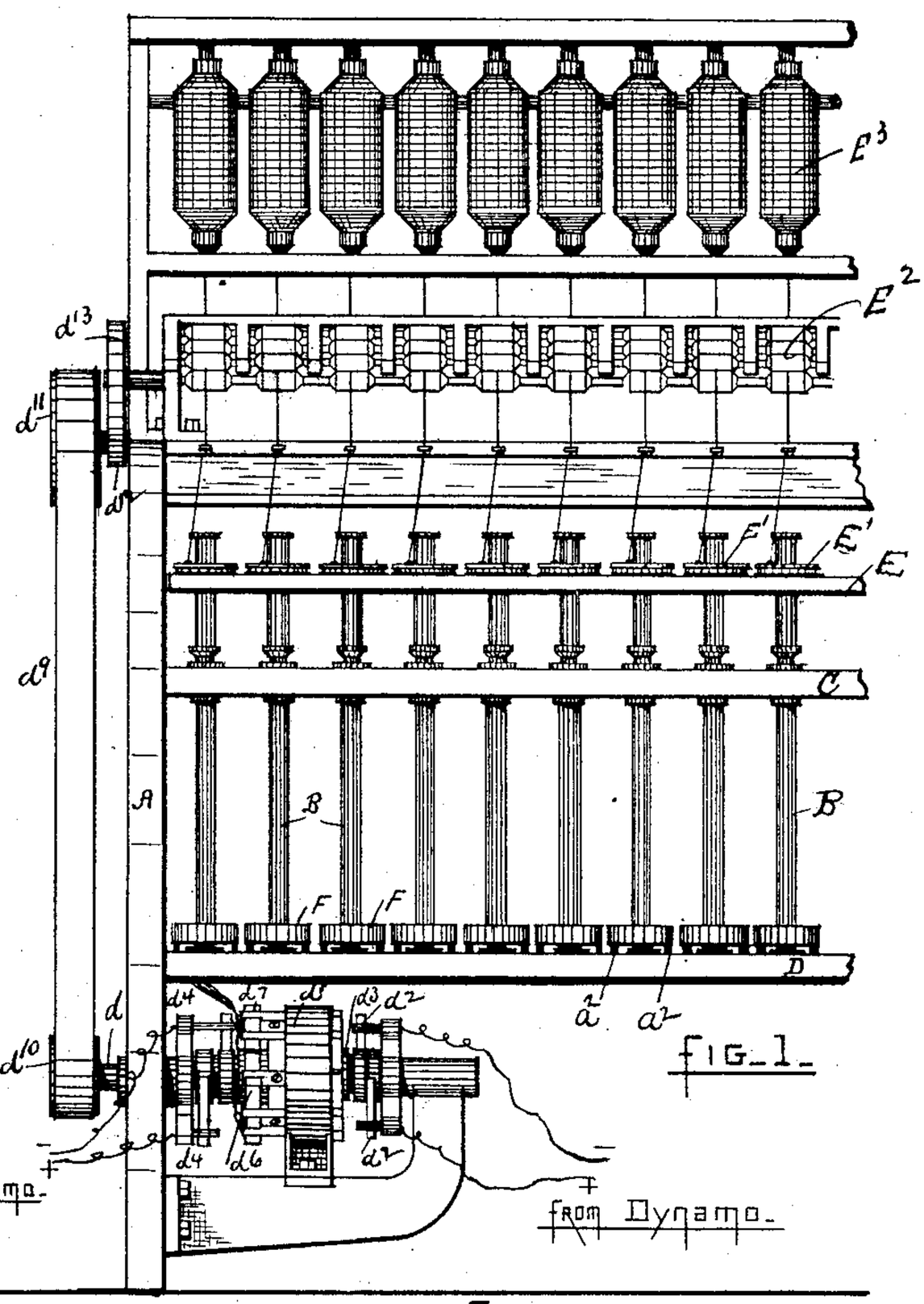

FIG. 1.

Witnesses.

Rufus B. Fowler.

H. W. Fowler.

Inventors.

A. S. Kimball.

G. L. Brownell

(No Model.) 2 Sheets—Sheet 2.

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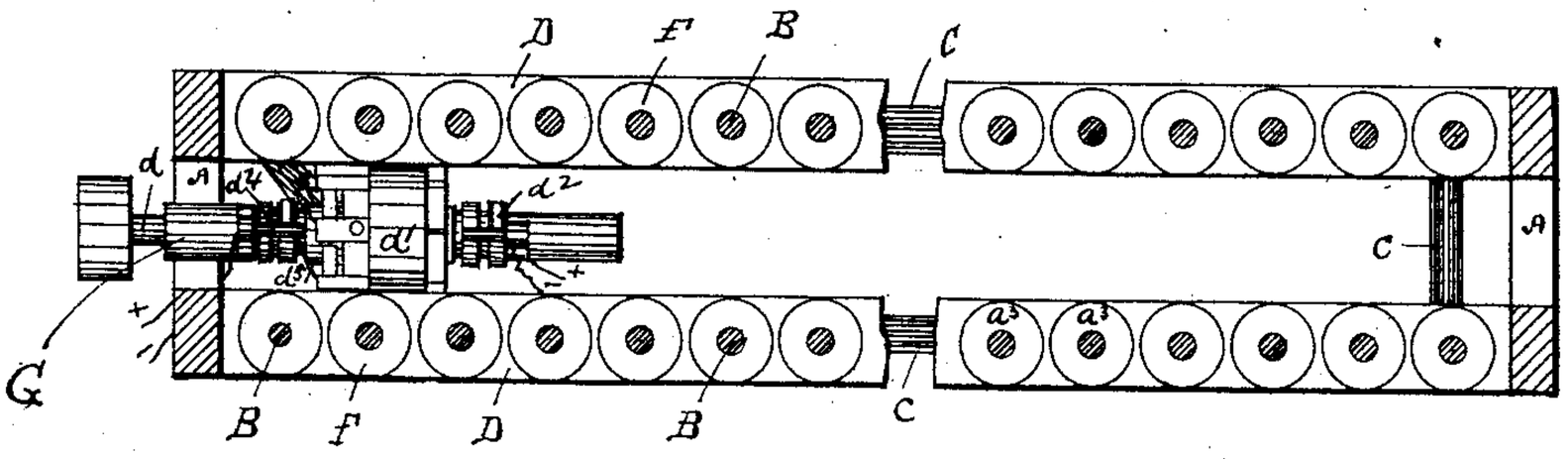

FIG. 5.

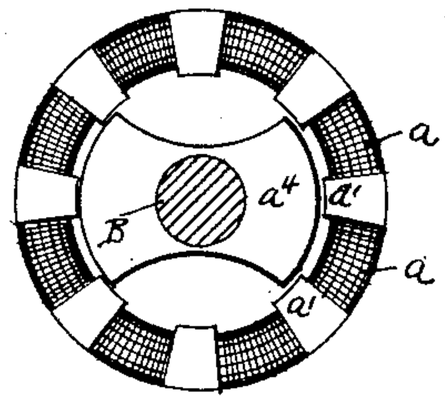

FIG. 6.

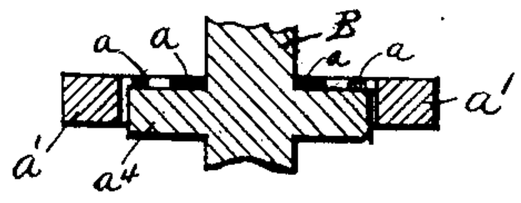

FIG. 7.

Witnesses.

H. W. Fowler
H. W. Fowler,

Inventors

A. S. Kimball
George L. Brownell
By Rufus B. Fowler
their Atty in fact.

UNITED STATES PATENT OFFICE.

ALONZO S. KIMBALL AND GEORGE L. BROWNELL, OF WORCESTER, MASSACHUSETTS.

ELECTRIC SPINNING OR TWISTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 371,199, dated October 11, 1887.

Application filed June 8, 1886. Serial No. 204,550. (No model.)

To all whom it may concern:

Be it known that we, ALONZO S. KIMBALL and GEORGE L. BROWNELL, citizens of the United States, and residents of Worcester, in the county of Worcester, in the State of Massachusetts, have invented certain new and useful Improvements in Electric Spinning or Twisting Machines, of which the following is a specification, reference being had to the accompanying drawings.

Our invention relates to that class of machines in which a series of rotating spindles are employed; and it has for its objects to provide means for rotating the spindles that shall do away with the bands usually employed, to synchronize the rotation of the spindles in each frame or in a number of frames, and to regulate their speed with reference to the speed of the drawing-rolls or other mechanism for delivering the strands to the spindles, and, further, to reduce the friction of the rotating spindles; and these objects are accomplished by means of the mechanism hereinafter described, and illustrated in the accompanying drawings, in which—

Figure 1 represents a transverse sectional view of a spinning-frame embodying our invention. Fig. 2 is a front elevation of a part of the spinning-frame, the operating parts not concerned in our present invention being for the most part omitted. Fig. 3 shows a sectional view of the commutator and of two of the motors connected with the spindles, and by an arrangement of wires it illustrates the system of distribution of the electric current to the several motors in the spinning-frame. Fig. 4 is a diagram illustrating the general plan of distributing an electric current to several spinning-frames and to the different motors in each frame, whereby the rotation of all the motors is synchronized and a uniform twist of all the strands is secured. Fig. 5 is a sectional view with the upper part of the spinning-frame removed. Fig. 6 is a plan view of one of the spindle-motors with its inclosing-case removed, and Fig. 7 is a vertical sectional view of one of the spindle-motors.

Similar letters refer to similar parts in the several views.

Referring to the drawings, A denotes the frame-work of the spinning-frame, and B the spindles journaled in bolsters held in the rails C D.

E is a rail carrying the spinning rings E′, and having a vertical traversing motion for the purpose of laying the yarn upon the spools or cops, actuated by connected mechanism, which is not shown in the drawings.

E^2 are the drawing-rolls by which the strands or rovings are delivered to the spindles from the spools E^3. These parts of the spinning-frame are not shown or described in detail, as they form no part of our present invention and their construction and operation are well understood. It is usual in machines of this class to rotate the spindles by means of a central drum or cylinder placed lengthwise the machine through cord-bands, a separate band passing around the drum and a scored pulley or whirl upon each spindle. This method of driving the spindles requires the frame to be of considerable width in order to afford sufficient length of band and cause it to inclose sufficient surface of the drum and whirl.

Continued use of the bands, as well as any change in the humidity of the atmosphere, affects their tension and tractive power. If the bands are too tight, they produce an undue strain upon the spindles, increasing their friction, and causing unequal strain and wear upon their bearings, while bands that are too loose are liable to slip and reduce the speed of the spindles, thereby varying the amount of twist in the strands.

In our improved machine we use no central drum or cylinder for driving the spindles, and we are therefore enabled to contract the frame within much narrower limits, placing the rails only such distance apart as convenience and facility in operating the machine require. To each of the spindles we connect an electric motor, F, of any known and suitable form. In the machine as shown in the accompanying drawings the motors consist of a soft-iron ring wound with insulated wire in eight equidistant helices, *a*, separated by internal radial projections, *a′*, the whole placed concentrically with the spindle and supported upon short brass or non-magnetic posts a^2, resting upon the lower rail, D, and inclosed in a shell or case, a^3. To the spindle we attach an armature, a^4, which we place in a horizontal plane slightly lower

than that occupied by the ring *a*, so the magnetic attraction exerted upon the armature a^4 will tend to raise it sufficiently to relieve the end of the spindle resting in the lower bolster from friction caused by the weight of the spindle and its load. Beneath the lower rail, D, and inclosed by its ribs *b b*, we conduct a series of wires from a commutator or distributer, G, each wire being connected with the corresponding helices of each of the motors, each pair of + and — wires being connected with opposite helices in the usual and well-known manner common with motors of this form. As the corresponding helices of each of the motors are successively brought into the circuit of the electric current, the armatures a^4 attached to each of the spindles will occupy corresponding positions during their entire rotation, thus synchronizing the rotation of the spindles and producing a uniform twist of all the strands.

The wires from the commutator G are preferably taken along one side of the spinning-frame beneath one of the rails D, and each of the motors upon that side of the frame connected by wires *c* passing through holes in the rail D beneath each of the motors. The wires are then carried across the frame to the line of motors upon the opposite side, which are similarly connected with the wires. The wires may be conducted along the machine on one side or through the center, and the several motors on both sides connected therewith by branch wires. The distributer consists of a revolving shaft, *d*, supported by the frame-work of the machine and driven by a motor, *d'*, substantially like those already described. Through the brushes d^2 d^2 and distributing-cylinder d^3 an electric current is distributed from a dynamo or other producer of an electric current to the motor *d'* in the usual manner. A current is also taken from the dynamo through the brushes d^4 and insulated rings to the insulated strips d^5 in the cylinder d^6, by which it is distributed through the brushes d^7 and wires leading along the machine to the motors connected with the spindles.

We have shown and described only one form of distributer; but other known methods of distributing an electric current may be employed. The speed of all the motors connected with the spindles B will be uniform and synchronous with the rotation of the distributer-shaft *d*, which may be driven in any convenient manner by a power which is independent of the mechanical resistance of the spindle-motors—such as a belt from a pulley on an overhead line of shafting, or by an electric current from the dynamo.

As several spinning-frames are usually employed, it becomes necessary to synchronize the rotation of all the spindles in the several frames, and we therefore prefer to drive the several distributer-motors by a current distributed to them by a common distributer or commutator. In Fig. 4 we have illustrated in diagram the plan of distribution of the electric currents to four spinning-frames, 1, 2, 3, and 4, each having a commutator by which an electric current is distributed to the several spindle-motors, as already described.

7 is a commutator by which the rotation of the several commutators 6 is synchronized. Wires 8 are taken from the dynamo 9 to the motor driving the commutator 7, and branch wires 10 conduct an electric current to the commutator 7, which is by it distributed to the motors of the commutators 6 through wires 11.

From the main wires 8 wires 12 conduct an electric current to the several commutators 6, and is by them distributed to the spindle-motors. The wires from the dynamo 9 and commutator 7 may be taken overhead or beneath the floor to any portion of the building occupied by the spinning-frame, and any of the known forms of switches may be used in the lines to the motors of the commutators 6, by which the electric current may be broken and one of the commutators stopped, thereby stopping all its connected spindle-motors.

As the commutator G is switched out of the electric circuit and ceases to revolve, the electric current which is distributed by it will hold all the armatures upon the spindles B in the same position, causing all the spindles to stop at the same time, and thereby preserving a uniformity of twist in all the strands, the magnetic attraction upon the armatures of the spindle B acting as a brake to check their rotation.

We drive the drawing-rolls E^2 by the same motor which drives the commutator employed to distribute the electric current to the spindle-motors through any suitable means, in the present instance through the belt-connection d^9 on the pulley d^{10} on the shaft *d*, and the pulley d^{11}, running loose on a stud attached to the frame-work of the machine and carrying a pinion, d^{12}, engaging gears d^{13} upon the roll-spindles.

We do not confine ourselves to any special form of the intermediate mechanism for conveying rotary motion from the commutator-shaft to the drawing-rolls; neither do we confine ourselves to the specific construction or arrangement of the operating parts, the scope of our invention embracing any organized mechanism for spinning or twisting, consisting, first, of a series of revolving spindles each with an electric motor to which a common electric current is distributed by a commutator driven independently of the mechanical resistance of the spinning or twisting mechanism, and, second, with mechanism for delivering the strands to the spinning mechanism, whose operation is controlled simultaneously with that of the revolving spindles.

We do not claim the special form or construction of distributer herein described, and shown in the drawings, the same having been described and claimed in our application for Letters Patent, Serial No. 196,727, filed March 26, 1886.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. An organized machine for spinning or twisting, consisting of a series of revolving spindles, a series of electromotors connected with and actuating said spindles, and a commutator rotated independently of the mechanical resistance of the revolving spindles for distributing an electric current to said spindle-electromotors, said commutator and electromotors having suitable electrical connections.

2. An organized machine for spinning or twisting, consisting of a series of revolving spindles, a series of electromotors connected with and actuating said spindles, a commutator for distributing an electric current to said electromotors in common, an electromotor actuating said commutator, electrical connections between the commutator and the spindle-actuating electromotors, and electrical connections, substantially as described, between said commutator and its actuating-motor, and a producer of an electric current, whereby one current is employed to actuate the motor and another current is distributed to the spindle-actuating electromotors.

3. In a machine for spinning or twisting, the combination, with a series of revolving spindles and mechanism for delivering the strands to be spun or twisted to the spindles, of an electromotor actuating a commutator and said strand-delivering mechanism, a commutator actuated by said electromotor for distributing an electric current in common to the spindle-electromotors, and a series of spindle-electromotors connected with and actuating the revolving spindles.

4. The combination, in a spinning or twisting machine having mechanism for delivering the strands to the spinning or twisting mechanism, of the spindles B, held in rails C D, actuating-motors connected with said spindles, commutator G, actuating-motor *d'*, and an electrical connection between said commutator G and the spindle-motor and between said motor *d'* and a producer of an electric current, substantially as described.

5. In a machine for spinning or twisting, the combination, with a vertical revolving spindle having an attached armature, of an electric motor, with the magnet of said motor placed above the plane of the revolving armature attached to said spindle, so as to raise the spindle and reduce the friction upon the spindle-bearings, substantially as described.

A. S. KIMBALL.
G. L. BROWNELL.

Witnesses:
RUFUS B. FOWLER,
H. W. FOWLER.