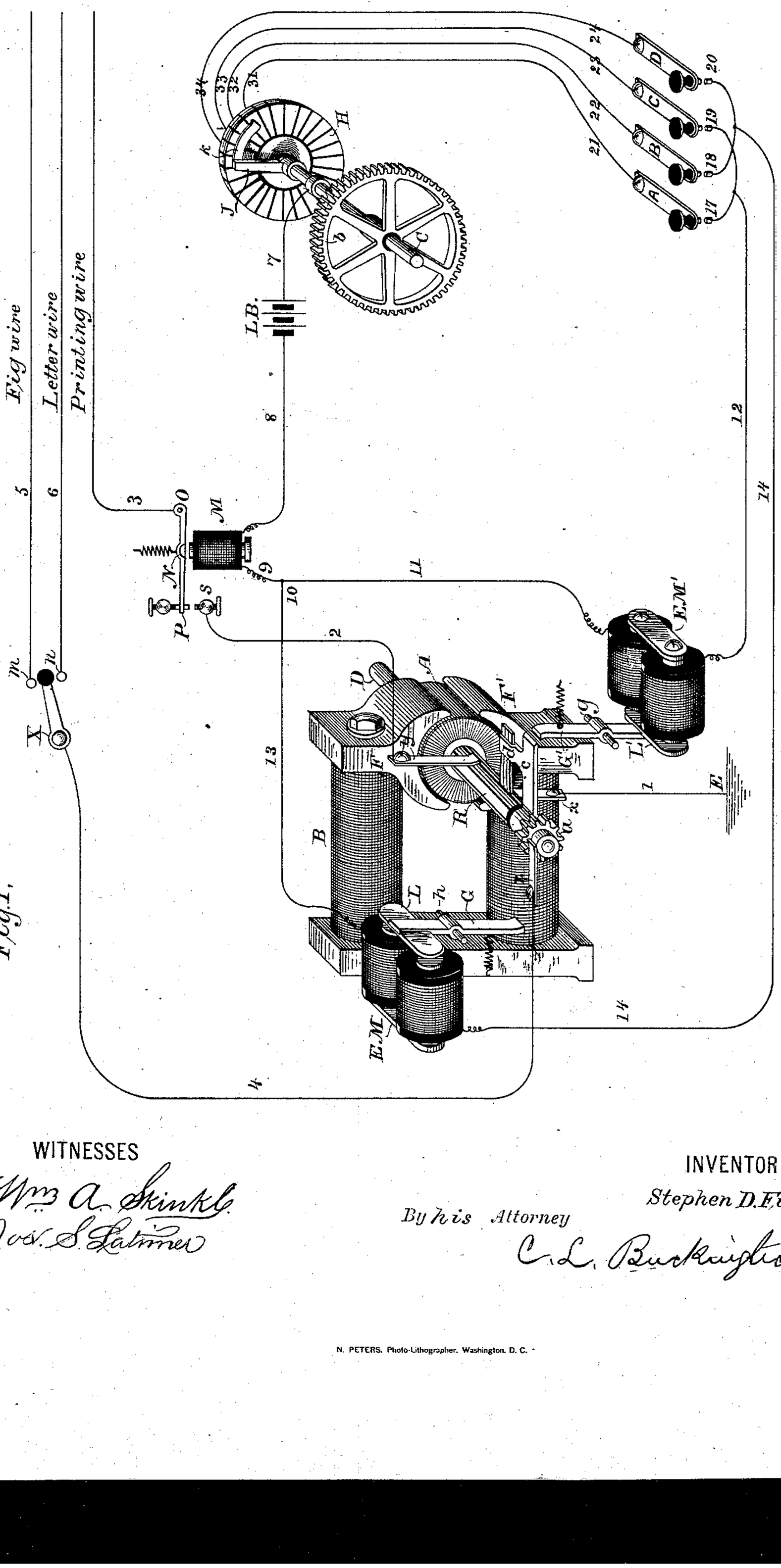
(No Model.)

2 Sheets—Sheet 1.

S. D. FIELD.

DYNAMO TELEGRAPHY.

No. 282,296. Patented July 31, 1883.



WITNESSES

Wm A. Skinkle

Jos. S. Latimer

INVENTOR

Stephen D. Field,

By his Attorney

C. L. Burlingame

(No Model.)

2 Sheets—Sheet 2.

S. D. FIELD.

DYNAMO TELEGRAPHY.

No. 282,296. Patented July 31, 1883.

Fig. 4,

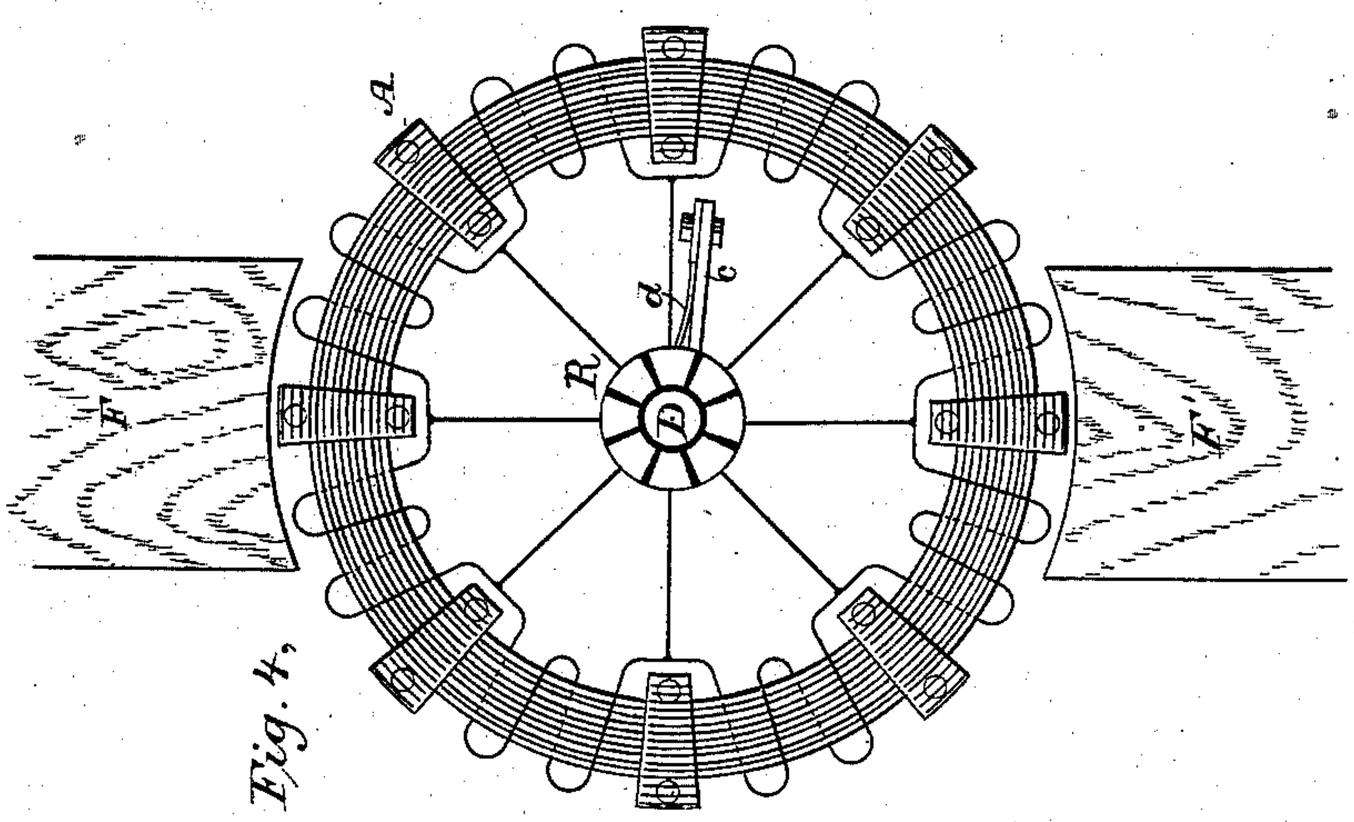


Fig. 3,

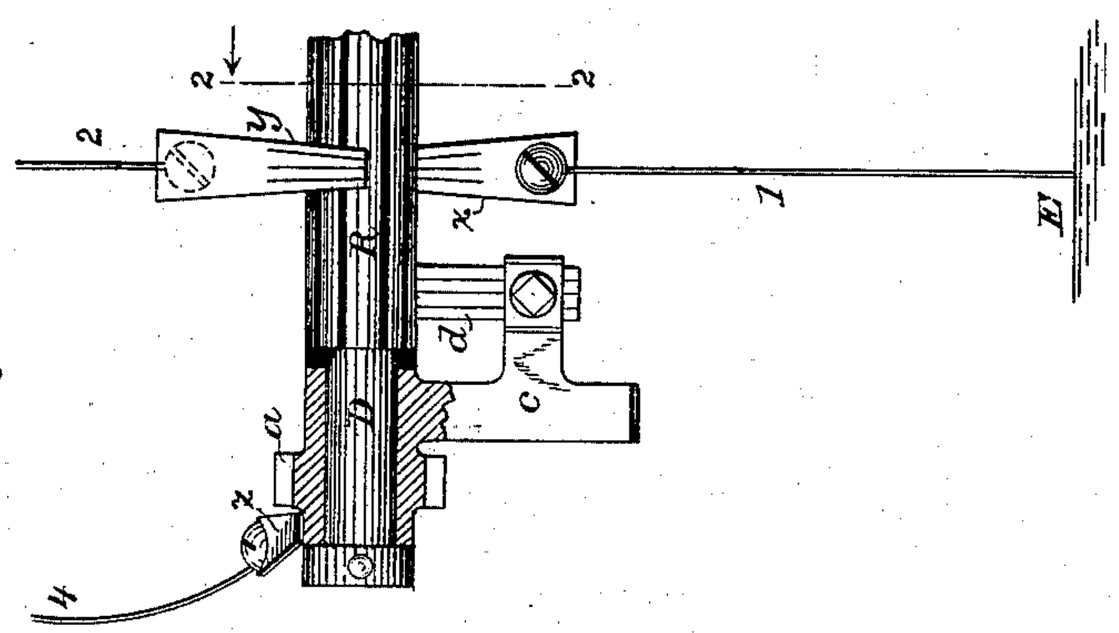
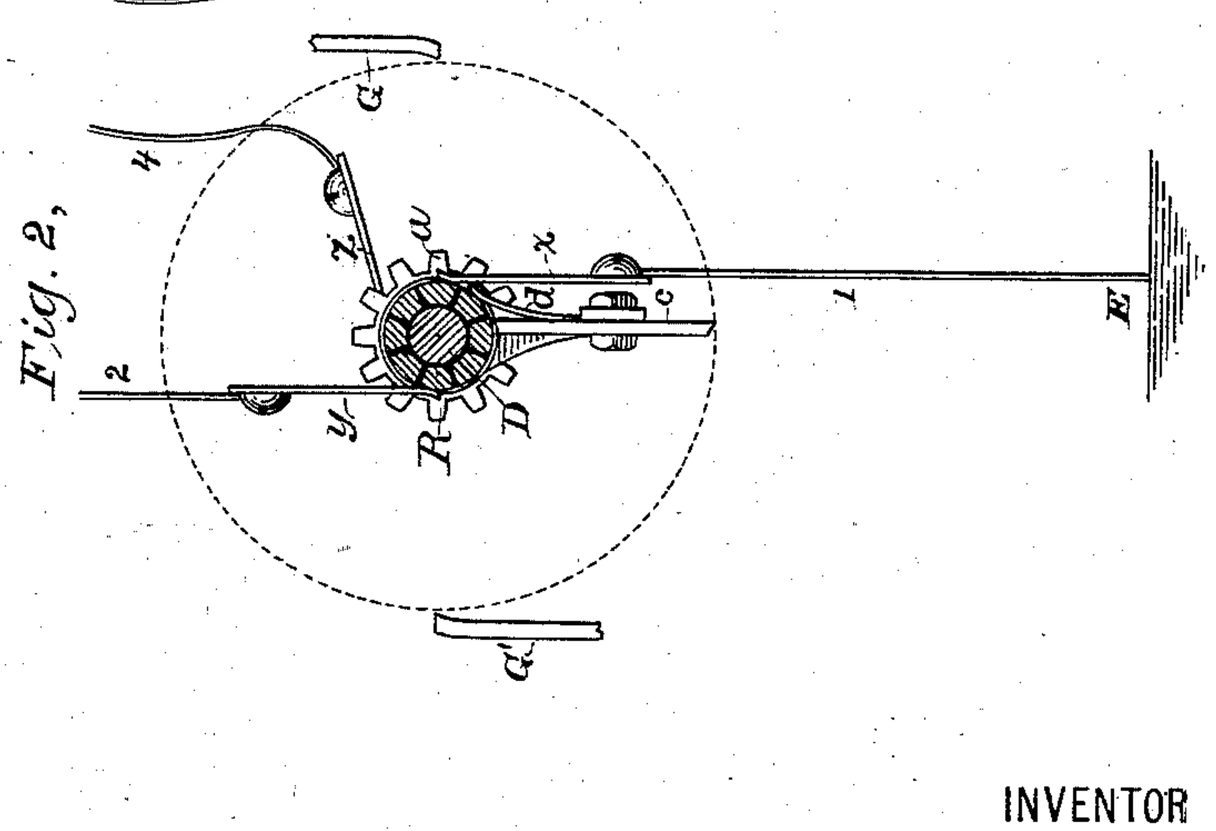


Fig. 2,



WITNESSES

Wm A. Skinkle

Jos. S. Latimer

INVENTOR

Stephen D. Field,

By his Attorney

C. L. Buckingham

UNITED STATES PATENT OFFICE.

STEPHEN D. FIELD, OF NEW YORK, N. Y., ASSIGNOR TO THE WESTERN UNION TELEGRAPH COMPANY, OF SAME PLACE.

DYNAMO-TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 282,296, dated July 31, 1883.

Application filed August 5, 1882. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN D. FIELD, of the city, county, and State of New York, have invented a new and useful Improvement relating to the Application of Dynamo-Electric Machines to Printing-Telegraph Instruments, of which the following is a specification.

The invention herein set forth relates particularly to the application of a dynamo-electric machine to a printing-telegraph system, wherein are employed three main lines, two of which lines respectively embrace the magnetizing-coils of the electro-magnets for actuating or controlling the letter and figure wheels of the receiving-instruments, while the third line embraces the magnetizing-coils of the electro-magnets for actuating the printing apparatus of said instruments.

To this end I employ a dynamo-electric machine, substantially such as is described and shown in Case A, the application for which was executed of even date herewith, in which the armature is provided with a series of sectional coils wound upon a Gramme ring, or wholly upon the exterior surface of a cylindrical armature. Upon the armature-shaft is placed a commutator consisting of a cylindrical series of metallic strips or pieces insulated from one another, and connected, respectively, to conductors joining adjacent coil-sections of the armature. In connection with the armature I employ two stationary commutator-brushes, so arranged that their ends respectively form metallic connection with diametrically-opposite commutator-strips, from which a continuous current of electricity of one polarity may be obtained, and which current, in all cases, is employed upon completing the normally-open circuit, in which are placed the magnetizing-coils of the printing electro-magnets of the receiving-instruments. In the three-wire printing-instruments now commonly in use pulsations of electricity are sent over either one of the two type-wheel lines and the electro-magnets thereon, which actuate corresponding type-wheels, and each pulsation serves to move said type-wheels a distance equal to one letter-space upon establishing said pulsation, and through a further distance of one letter-space upon the cessation of the same pulsation, thus causing the type-wheels to be rotated through a space represented by two letters for each pulsation sent to line. The type-wheels of the receiving-instrument are therefore held in position for printing one alternate series of characters when the driving or escapement armature of the type-wheel magnet is attracted, and the type-wheel is held in position for printing the other alternate series of characters when the driving or escapement armature of the type-wheel magnet is retracted. In addition to the stationary commutator-brushes, and in connection with the same commutator, I employ a single normally-rotating brush, which is rigidly connected with a driving-pinion, meshing with a spur-wheel, which is fixed upon the shaft of the sunflower-arm. Said pinion is frictionally mounted upon the armature-shaft of the dynamo-machine, and is rotated thereby. By means of suitable circuit-breakers, when it is desired to print a character the printing-line is connected through the stationary brushes and armature of the dynamo-electric machine, and a continuous current therefor is obtained. When, however, no transmitting-key is depressed, the printing-line is broken, and the rotating commutator rotates and generates a pulsation of electricity for each rotation. However, as printing may be effected both when a pulsation is upon the type-wheel line and when there is no current thereon, it is necessary that the rotating circuit-breaker should be arrested in two different positions of rotation—that is, at a point when no current is derived from said rotating commutator-brush, and also at a point where the current derived from said brush is at or near a maximum. Suitable automatic stops are arranged in connection with the rotating brush in such a manner that it may be arrested at the points abreast of both of the stationary commutator-brushes. The rotating brush is arrested in one position upon depressing any key of one alternate series, and the brush is arrested in its other position upon depressing any one of the other alternate series of transmitting-keys. When the single commutator-brush is arrested abreast of that stationary brush which is connected directly to earth, assuming the two stationary brushes to be upon a line nearly at right angles to the line joining

the poles of the field-magnets of the dynamo-machine, practically no current will be derived from said rotating brush; but as the rotating brush is rotated from abreast said stationary brush a current of electricity will be derived therefrom, which will increase in strength until the rotating brush reaches a point one hundred and eighty degrees distant from the first brush, or a point abreast of the second stationary brush, from which point of rotation the current derived from the rotating brush decreases and becomes zero upon a complete rotation of the armature, and when the rotating brush is again abreast of the stationary commutator-brush, which is connected directly with the earth at the transmitting-station. The pulsations derived from the rotating commutator-brush by means of a proper switch, which is actuated by a finger-key in a well-known manner, are directed over either of the two main lines, in which are placed, respectively, the magnetizing-coils of the figure-wheel and letter-wheel electro-magnets of the receiving-instruments.

I will now explain my invention by reference to the accompanying drawings.

Figure 1 represents a diagrammatic view of a dynamo-machine and my transmitting apparatus. Figs. 2 and 3 represent different views of the two stationary commutator-brushes and the third revolving brush. Fig. 4 represents an armature of a dynamo-machine substantially of the nature employed in carrying out my invention.

F and F′ represent the poles of the field-magnets of dynamo-electric machine B, having armature A and a shaft, D. Upon shaft D is mounted the commutator R, having as many metallic strips insulated from one another as there are bobbin-sections upon armature A. The commutator-strips of R are connected, respectively, with the conductors joining adjacent bobbin-sections of the armature.

x and *y* represent stationary commutator-brushes, whose free ends rest upon diametrically-opposite strips of the commutator.

d represents a normally-rotating commutator-brush, which is rigidly attached to a stop-arm, *c*, and to a pinion, *a*, which is frictionally mounted upon shaft D. Outside of the path of rotation of stop-arm *c* are situated armature-levers G and G′ of electro-magnets EM and EM′ when said armatures are in a retracted position; but said armature-levers G and G′ are so located that when either of them is attracted the stop-arm *c* and the brush *d* will be arrested. Upon the attraction of armature L the lever G will arrest the rotating brush abreast of stationary brush *x*. Upon attracting L′ the lever G′ will arrest the rotating commutator-brush abreast of the stationary brush *y*. When the rotating brush *d* is arrested abreast of the brush *x* no section of the armature will be in that circuit leading from brush *d*—that is, through wire 4 and switch X to either figure or letter type-wheel wires. If brush *d* is arrested so that its contact-point rests abreast of or upon the same commutator-strip as brush *y*, then all of the coil-sections of the armature will be in said circuit, and a pulsation of maximum strength will be directed from earth over wire 1, brush *x*, and through all of the coils of armature A, brush *d*, brush *z*, wire 4, switch X, and thence through the figure or type wheel wire.

z represents a brush for connecting wire 4 with pinion *a* and the rotating commutator-brush *d*. X is a switch, and *m* *n* are switch-posts, connected with the respective wires 5 and 6, embracing the magnetizing-coils of the electro-magnets, controlling or actuating the type-wheels of the receiving-instruments. For convenience of illustration, I have shown X simply as a hand-switch. However, in practice an automatic apparatus is employed which is well known in the art, and which requires no further explanation, than that it is actuated by special keys of the key-board of the transmitting-instrument whereby said switch may be thrown either upon switch-post *m* or *n*, according as it is desired to print figures or letters. When switch X is upon post *m* or *n*, and the normally-rotating commutator-brush *d* is in motion, pulsations of electricity will be generated and transmitted over line 5 or 6, thereby driving the type-wheels upon either line two steps for each rotation of the armature-shaft and for each pulsation sent to line; and it is to be observed that if the type-wheels were moved through only the space representing one character for each pulsation of electricity sent to line it would not be necessary to employ arresting devices to lock the rotating commutator-brush of the dynamo-machine in two different positions. If the type-wheels were rotated only one step for each pulsation, it would only be necessary to have a device for arresting the rotating commutator-brush once during each rotation; but as the type-wheels are moved one step during the increase in strength of current for each pulsation, and a succeeding step during the decrease of current for the same pulsation, it is necessary that devices should be employed whereby the rotating commutor-brush may be arrested both upon each increase of current and upon each decrease in strength, to enable printing to be effected after each step movement of the type-wheels. To this end devices are employed to enable the arrest of the rotating brush *d* when it is in such position that a maximum strength of current may be derived therefrom, and also when it is in such a position of rotation that a minimum or zero strength of current may be obtained therefrom.

It should be observed that positive and negative pulsations of electricity are not obtained. From the rotating commutator-brush here employed pulsations of one polarity can be and are procured, which pulsations gradually rise in strength from a zero to a maximum, and return to a zero strength at the end of a complete rotation of the armature. For example,

when the rotating brush is upon the same side of the commutator as brush *x*, and assuming the contact-points of *x* and *y* to rest upon diametrically-opposite commutator-strips, which are in a line nearly at right angles to the line joining the poles of the fixed magnets, no current will be sent over line 4; but when said brush is rotated a current of increasing strength will be produced, which will rise to a maximum when the rotating brush comes in contact with a commutator-strip diametrically opposite to that strip in contact with brush *x*, and upon a continued rotation the current will decrease until brush *d* has made a complete rotation.

C is a shaft, upon which is mounted a spur-wheel, *b*, meshing with the driving-pinion *a*. The pinion *a* and spur-wheel *b* are so proportioned in size that for one rotation of the armature of the dynamo-electric machine the shaft C and sunflower-arm J will be rotated over two sections of the sunflower H.

The keys of the key-board and the sections of the sunflower, respectively, are arranged in two alternate series, as shown in Fig. 1. The anvils of one alternate series of the transmitting-keys are connected with wire 12, and the keys of this series are connected with alternate sections of the sunflower. In the same manner the anvils of the other alternate series of transmitting-keys are connected with a wire, 14, and the corresponding transmitting-keys of the second series are connected, respectively, with the other alternate series of sunflower-sections. The branch 12 embraces the coils of electro-magnet E M′, and the local circuit is completed by way of wire 11, point 10, wire 9, electro-magnet M, wire 8, battery L B, wire 7, shaft C, sunflower J, brush *k*, sections 31 or 33, wires 21 or 23, keys A or C, and anvils 17 or 19. Branch 14 is connected through the coils of the magnet E M, and the local circuit may be completed by way of wire 13, point 10, wire 9, magnet M, wire 8, battery L B, wire 7, shaft C, sunflower J, brush *k*, sunflower-sections 32 or 34, wires 22 or 24, keys B or D, and anvils 18 or 20.

It will be observed from the foregoing arrangement that the brush *d* will be arrested abreast of the stationary brush *y* by means of electro-magnet E M′, and that this electro-magnet will attract its armature upon depressing any one of that alternate series of transmitting-keys to which A and C belong; also, the rotating commutator-brush *d* will be arrested abreast of brush *x* through the agency of electro-magnet E M and upon the depression of transmitting-keys B or D, or any key of the same alternate series. The circuit of battery L B is normally broken both through the sunflower and through the transmitting-keys, and is only completed upon depressing one of the transmitting-keys, and after the strip *k* is rotated into contact with that sunflower-section connected with the key which is depressed.

M represents an electro-magnet which is in the branch 8 9 of the local circuit, which, when completed, causes M to attract its armature N, thereby causing the armature-lever P to complete the printing-wire circuit 3 through stop *s*, wire 2, stationary commutator-brush *y*, the armature stationary brush *x*, wire 1 to earth. Upon depressing any transmitting-key the electro-magnet M will close the printing-wire 3 to earth, and at the same time either electro-magnet E M or E M′ will cause the rotating commutator-brush to be arrested, according as the anvil of the key depressed is connected with branch 12 or with branch 14. If a key is depressed whose anvil is connected with wire 14, a continuous current will be directed upon the printing-wire from stationary brush *y*, and no current will be derived from brush *d* and directed over wire 4 and switch X to a type-wheel wire. If a key is depressed whose anvil is connected with wire 12, however, a continuous current will be taken from stationary brush *y* over the printing-wire, and at the same time a continuous current will be derived from brush *d*, which will be directed over a figure or letter type-wheel wire.

From the foregoing description it is apparent that the type-wheels of the receiving-instrument are rotated in harmony with the rotating brush *d*, which is positively geared with spur-wheel *b* and the sunflower-arm, and that consequently each step or movement of the sunflower-arm must be accompanied by one step of rotation of the type-wheels upon the line, and that upon depressing a transmitting-key the sunflower-arm, when coming to the corresponding sunflower-strip, causes the arrest of the rotating commutator-brush, thereby locking the sunflower-arm against further movement, while at the same time the type-wheels upon the line are locked by a prolonged attraction or by a prolonged retraction of the armature of the type-wheel magnets.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of a dynamo-electric machine, means for deriving from said machine a continuous current of electricity, means for deriving from said machine pulsations of electricity, three telegraph-lines, one of which embraces the magnetizing-coils of the printing apparatus, while the other two embrace the magnetizing-coils of the type-wheel electro-magnets of the receiving-instruments.

2. In a printing-telegraph system whose type-wheels are moved step by step by pulsations upon one or more telegraph-lines, and whose printing apparatus is actuated by continuous currents directed over an independent line, the combination of a dynamo-electric machine which is capable of producing both pulsatory and continuous currents of electricity, a type-wheel line or lines, devices for establishing in the type-wheel line or lines from the dynamo-machine pulsatory currents, and devices for establishing in the printing line or lines from said dynamo-machine continuous currents of electricity.

3. A dynamo-electric machine substantially as described, in combination with stationary commutator-brushes *x* and *y*, connected with the printing-wire, and rotating commutator-brush *d*, connected with the type-wheel wire or wires.

4. A dynamo-electric machine substantially as described, having stationary commutator-brushes connected with the printing-wire, in combination with a normally-rotating commutator-brush connected with the type-wheel wire or wires, and arresting devices for locking said rotating commutator-brush against rotation.

5. A dynamo-electric machine substantially as described, having stationary commutator-brushes connected with a normally-open printing-wire, in combination with a local circuit and an electro-magnetic switch, which, when closed, actuates said electro-magnetic switch to close said printing-wire.

6. The combination of arresting devices for locking the frictionally-mounted commutator-brush against rotation and in two separate positions, electro-magnets whose magnetizing-coils form parts of a local circuit, a series of transmitting-keys, a sunflower-arm, and means for driving said sunflower-arm by the rotation of the armature of the dynamo-electric machine.

7. The combination of a local circuit embracing the magnetizing-coils of an electro-magnetic switch for opening and closing the circuit of the printing-wire, electro-magnetic arresting devices for arresting the frictionally-mounted and normally-rotating commutator-brush, a series of transmitting-keys, a sunflower, and sunflower-arm, which is geared to the pinion of the rotating commutator-brush.

8. The combination of local battery L B and its circuit branches, a series of transmitting-keys, a sunflower arrangement, a circuit-closer for the printing-wire, electro-magnetic stops for arresting the rotating commutator-brush, a rotating commutator-brush frictionally mounted upon the shaft of the dynamo-electric machine, and suitable gearing whereby the sunflower-arm and rotating commutator-brush have contemporaneous movements of rotation.

9. The combination, substantially as described, of an armature of a dynamo-electric machine whose bobbin-sections are electrically connected together by wires joining adjacent bobbin-sections, said series, respectively, being connected to insulated commutator-strips, two stationary commutator-brushes, and a rotating commutator-brush, and means for arresting said brush in the course of its rotation.

10. The combination of a cylindrical series of insulated commutator-strips and the armature of the dynamo-electric machine, substantially as specified, a rotating commutator-brush, and two electro-magnetic stop devices arranged to arrest said rotating commutator-brush in two diametrically-opposite positions in the path of its rotation, and at points, respectively, where a maximum and minimum strength of current may be derived from said rotating commutator-brush.

11. The combination of the stationary commutator-brushes *x* and *y*, a cylindrical series of commutator-strips R, the rotating commutator-brush *d*, rigidly connected with stop-arm *c*, and pinion *a*, said pinion being frictionally mounted upon the shaft D, and meshing with the spur-wheel *b* upon shaft C of the sunflower-arm J.

12. The combination of the stationary commutator-brushes *x* and *y*, the rotating commutator-brush *d*, means for arresting the rotating commutator-brush, means for contemporaneously actuating and arresting the rotation of the sunflower-arm.

13. The combination of the stationary commutator-brushes *x* and *y*, the single rotating commutator-brush *d*, and a cylindrical series of commutator strips or pieces, R.

14. The rotating commutator-brush of a dynamo-electric machine, in combination with electro-magnetic stop devices for arresting the same, and suitable transmitting devices whereby upon the transmission of a signal the rotating commutator-brush is arrested.

Signed by me this 6th day of July, 1882.

STEPHEN D. FIELD.

Witnesses:

WM. B. VANSIZE,

WM. ARNOUX.