(No Model.)

M. RANDOLPH.

AUTOMATIC TENSION LINE HOLDER.

No. 307,589. Patented Nov. 4, 1884.

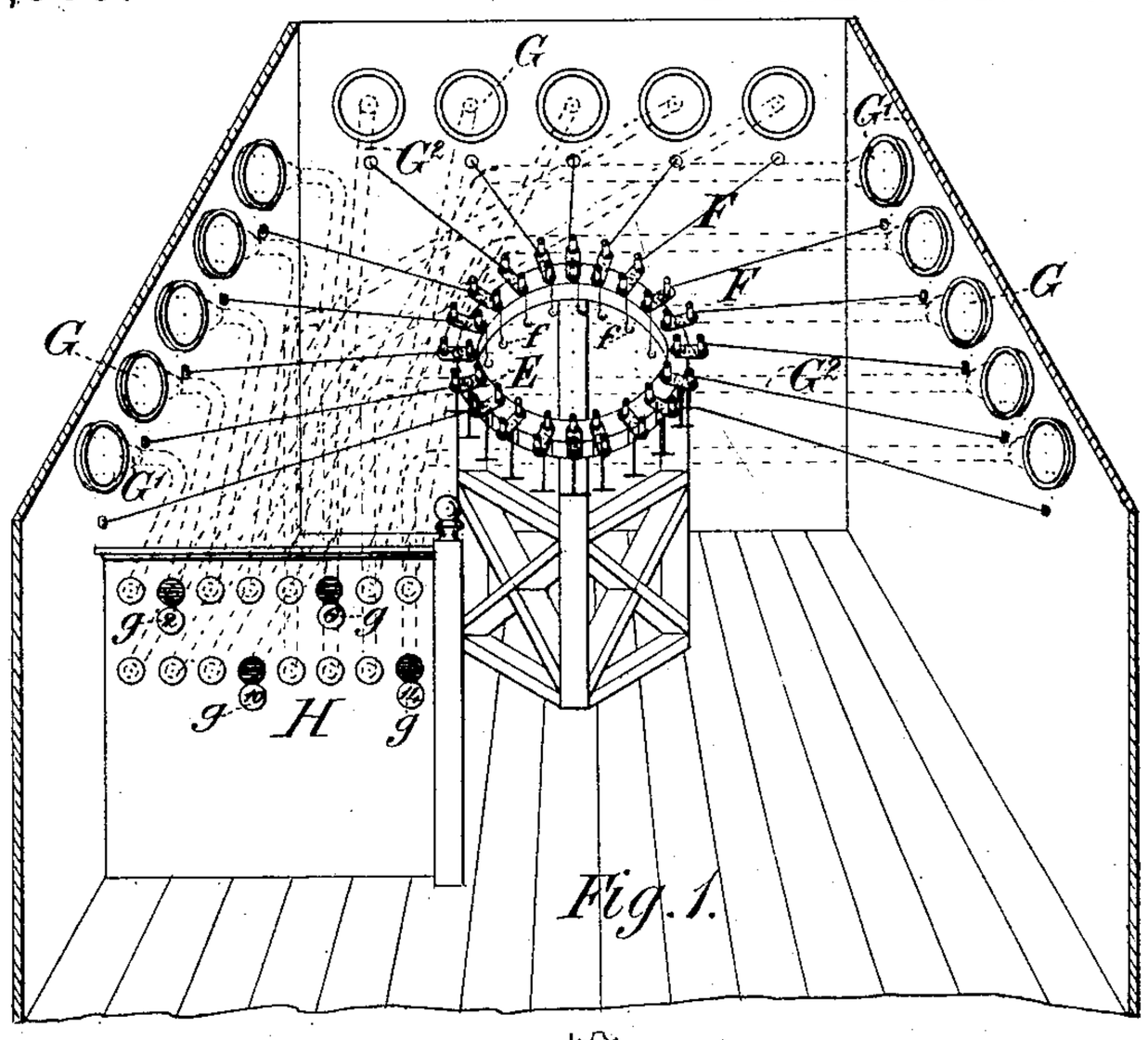

Fig. 1.

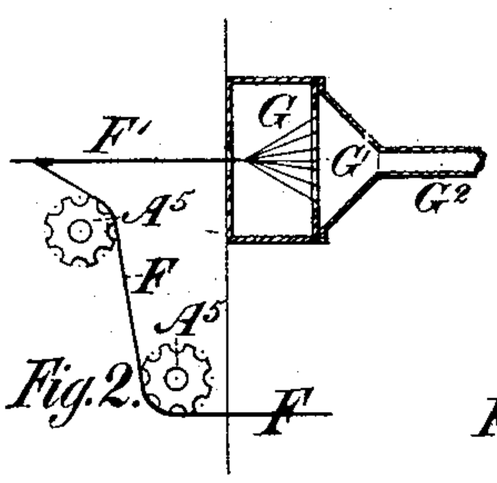

Fig. 2.

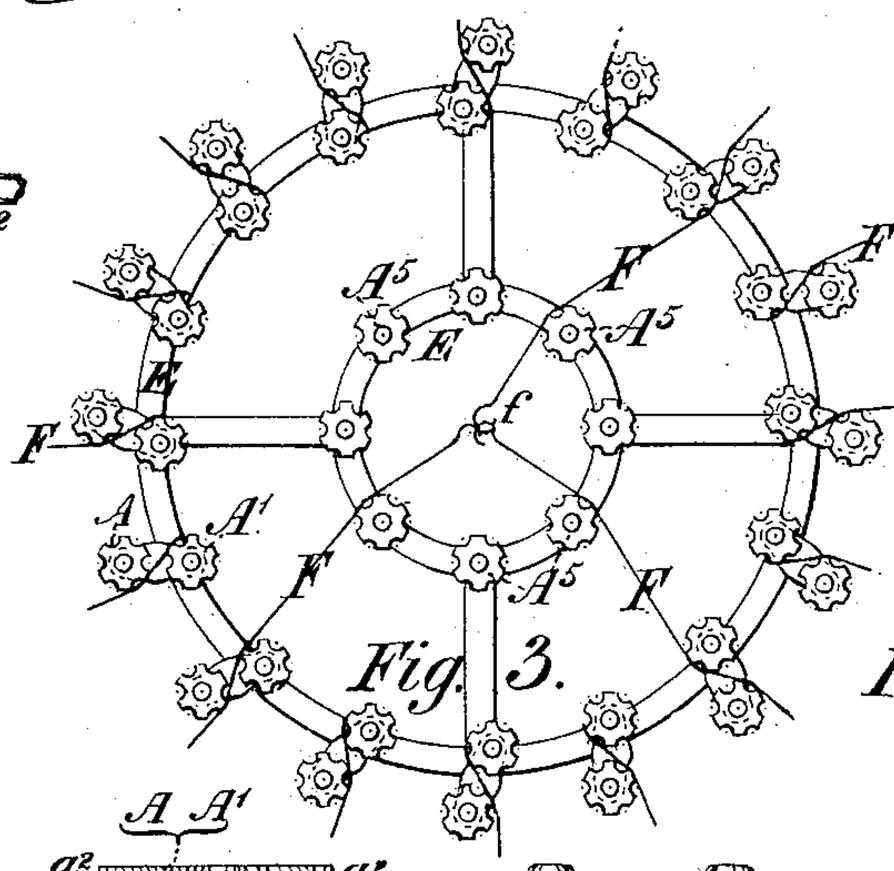

Fig. 3.

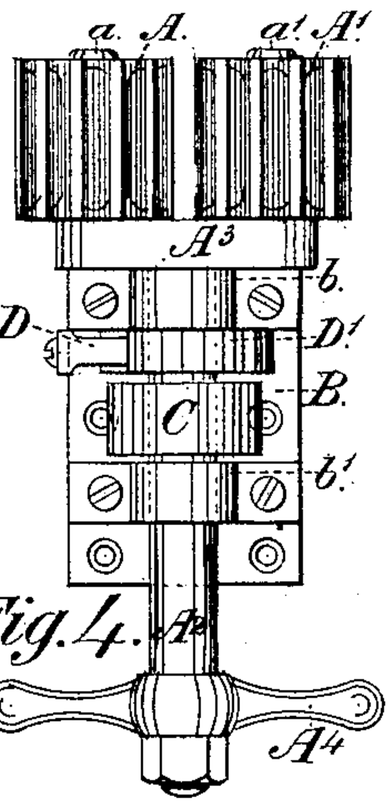

Fig. 4.

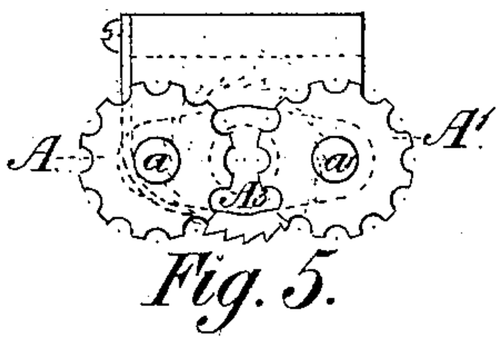

Fig. 5.

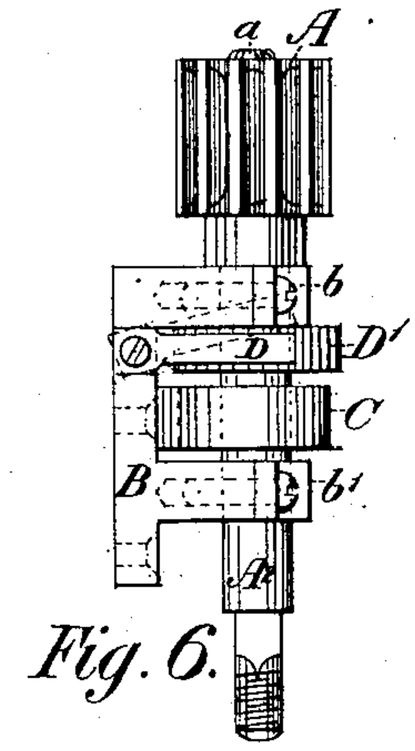

Fig. 6.

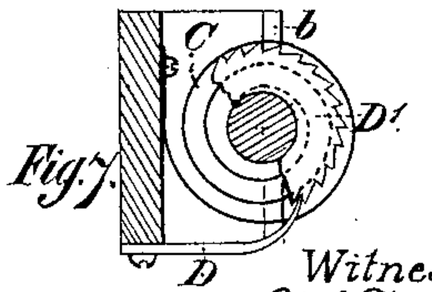

Fig. 7.

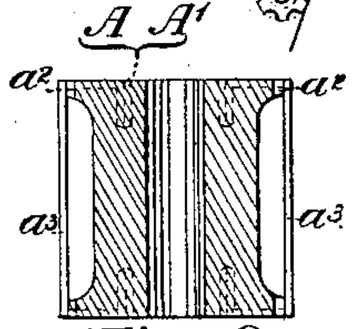

Fig. 8.

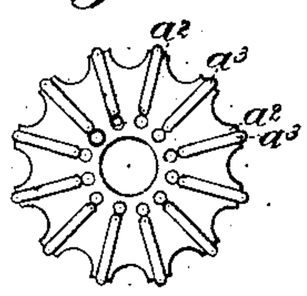

Fig. 9.

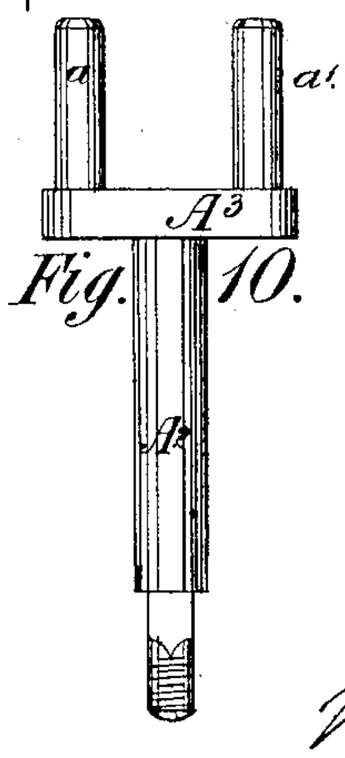

Fig. 10.

Witnesses.
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UNITED STATES PATENT OFFICE.

MAHLON RANDOLPH, OF NEW YORK, N. Y., ASSIGNOR TO WELLESLEY W. GAGE, TRUSTEE, OF SAME PLACE.

AUTOMATIC TENSION LINE-HOLDER.

SPECIFICATION forming part of Letters Patent No. 307,589, dated November 4, 1884.

Application filed December 15, 1883. (No model.)

To all whom it may concern:

Be it known that I, MAHLON RANDOLPH, of the city, county, and State of New York, have invented a new and useful Improvement in a Central-Office Exchange and Automatic Tension Line-Holder for Mechanical or Acoustic Telephones; and I hereby declare the following to be a full and clear description thereof.

The object of this invention is to construct an automatic tension-holder for mechanical telephone-wires, so that one or more wires may at all times be held in that high state of tension which is requisite for the proper working of mechanical telephones, and by the use of which said automatic tension wire-holder two or more wires may be connected together in the central exchange-office, so as to make any desirable connection of different telephones, and thereby complete and perfect a central-office exchange system for mechanical or acoustic telephones, and in such central exchange-office other appliances and details are also introduced, so as to make the system complete, operative, and practical in all its parts, as hereinafter more fully described.

The invention will be readily understood by reference to the accompanying drawings, of which Figure 1 is a perspective view of a central exchange-office fitted with my improved appliances. Fig. 2 is a detail view showing line-wire with switch-wire attached thereto, also the conical sound-receiver over front end of phone and the sound-tube proceeding therefrom. Fig. 3 is an enlarged plan of central-office switch-board and tighteners. Fig. 4 is a front elevation of a pair of the cylindrical tighteners. Fig. 5 is a top plan of a pair of the cylindrical tighteners. Fig. 6 is a side elevation of a pair of tighteners. Fig. 7 is a sectional plan of the tighteners, showing the coiled spring for automatic tension. Fig. 8 is a detailed plan of one spool or cylinder. Fig. 9 is a vertical sectional elevation of one spool or cylinder. Fig. 10 is a front elevation of one of the bifurcated axles for carrying the fluted spools or cylindrical tighteners.

The automatic tension-holder consists of two fluted cylinders or spools, A A′, mounted, respectively, on the short axles or shafts *a a′* of the bifurcated tightener A^2 A^3. The axle or shaft A^2 of this tightener is a short metallic piece of cylindrical form, except the rectangular part at its projecting end, which is made square or angular, so as to provide a suitable seat or hold for the handle A^4, or a wrench to turn it by. The transverse piece A^3 forms a T-head on this axle part, and at either end of the said transverse T-head is attached an axle or shaft, *a a′*. The parts A^2 A^3 *a a′* are best made in one piece, as shown clearly in Fig. 10. A base-plate, B, has two bearing-seats, *b* and *b′*, into which the shaft or axle part A^2 is fitted, so it may easily rotate in its said bearings. A spring, C, is coiled around the axle A^2, to which one end of the spring is attached, and the other end of the spring is attached to the base-plate B, so that if the axle were turned around by its handle A^4, or by a wrench, the spring C would be coiled up around its axle A^2, and act upon the said axle so as to rotate it in an opposite direction as soon as the handle or wrench were released from it, were it not for the pawl D, which is provided to engage in the ratchet D′ and hold the axle with its coiled spring when the hold is released upon the handle or wrench. The ratchet D′ is placed upon the axle A^2 and attached to it, while the pawl D is hinged or journaled to suitable lugs on the base-plate B. The hinges or journals of the pawl must be so constructed as to allow the pawl to be thrown out of gear with its ratchet-wheel when required, so as to allow the spring C to rotate the axle A^2 in its bearings as soon as the wire is placed between the spools or the said spools or tighteners are required to act upon the wire to tighten it, thus making the action of the tightener automatic when desirable. The base-plate B is attached by suitable screws or fastenings to the central frame, E, when the tightener is used for a central or exchange office tightener, or to any suitable bearing when the tightener is simply used for a line-holder. The wire F or F′ to be held by and tightened in this holder may be either the line-wire or a switch-wire. In either case the wire to be held or tightened is placed between the spools A A′ and the axle A^2 turned around until the said wire is properly tightened; or the spools are first turned or rotated around their axle A^2 until the spring

C is wound up, and then the wire F forced down between the spools A A′ in such a manner as to allow the spring to continue to pull on the wire to tighten it, thus constituting an automatic tension-holder which will at all times keep the wire taut and still allow it to contract or expand with changing atmospheric temperatures. When used as an automatic tightener, the pawl is to be disengaged as soon as the wire is adjusted between the spools A A′. In the use of the tightener for central transfer-office switching the pawl may be kept on the ratchet until the wire connected is no longer needed. In this case the spring C may be dispensed with. The spools A A′ are fluted longitudinally, so as to form bearing-ribs a^2, and these bearing-ribs are chambered longitudinally, as shown in Fig. 9. Bearing-strips a^3 are securely fastened on the spools, so as to rest on the peripheral lugs a^2 and stretch tightly lengthwise on the said spools between the said bearing-lugs a^2, as shown in Figs. 4, 6, and 9. These bearing-strips are made either round or flat and of any suitable material, such as silk or other fabric, leather, skin, or any material that will hold the wire properly in position without deadening or interfering unduly with the sound-waves passing over or through the wire. As these bearing-strips hold the wire suspended between the solid lugs a^2, they offer no more resistance to the operation of the telephones than do the best tension wire-holders now in use, and they permit the rotation of the spools A A′ to secure just the amount of tension required.

In applying the tightener above described to a central or exchange office, an exchange or switch frame, E, is erected in some suitable position in the central or exchange office, as is shown in Fig. 1, with the central-office phones G conveniently surrounding the same. The wire F, attached to the line-wire F′ at or near the phones G, lead over angle-turners A^5 (which are formed of single spools constructed like the spools A A′, above described) to the tighteners A A′ of the central frame, and each of the said wires terminates in a hook, *f*, which is made to reach as near the center of the frame E as possible. Angle turning spools or bearings A^5 are also arranged within the frame E, and in positions concentric therewith, so as to guide the wires F as nearly as possible to the center of said frame, so that any two or more of the said wires may be coupled by means of their hooks *f*, so as to unite any two or more of the line-wires, as may be desired. The center guides are required in cases where the wires to be connected happen to be upon sides of the frame not diametrically opposite. The wires F, leading to this switch, may be simply extensions of the line-wires extending through the centers of the diaphragms of the phones G; but I prefer to attach them to the line-wires F′ just behind the phones G, as shown in Fig. 2, thereby permitting the wires F to be drawn up tight without loosening the tension of the line-wires upon the phones G. Each of the phones G has a cone sound-collector, G′, over the front face of its diaphragm, as shown by dotted lines in Fig. 1 and by full lines in the detail, Fig. 2. The small ends of these cones are connected by tubes G^2 with the annunciator H, at which point the central-office clerk or manager can receive from or communicate through any phone in the office. The end of the tube G^2, which terminates at the annunciator H, has a small hinged cap, *g*, which is hinged at the bottom side and arranged to close the end of the tube G by fitting lightly therein, and is held in place in the end of the tube by simple frictional resistance, the parts being very nicely fitted for this purpose, so that the caps *g* will very easily move into or out of their seats in the tubes G^2, and remain there until displaced, as required, by the movement of the air in the tubes G^2 and cones G′, which movement of air in the said tubes and cones is caused by the vibrations or movements of the diaphragms of the phones G when the said phones are placed in use. For this pneumatic effect the phones G in the central office should be somewhat larger than those in common use. The hinged caps *g* are all numbered with numbers corresponding with the number of the phone they are connected with. With a central office fitted up as above described the person at the annunciator receives the orders to connect any phone with any other of the line, and then the person at the switch connects the proper wires by means of their hooks *f*, and then tightens the holders A A′, and the connection and communication is complete.

I do not herein claim the annunciator device or devices herein shown and described, nor the devices and arrangement for connecting said annunciator with the receiving or transmitting telephones, but reserve to myself the right to make separate application therefor.

The bearing spools or cylinders may simply be chambered or grooved circumferentially so as to leave annular lugs or bearing-flanges at each end of them, and the bearing-strips or material so disposed around the peripheries of these flanges or lugs as to place spaces between them corresponding with the longitudinal flutings before described. Of course it is possible to use the circumferentially-chambered spools or cylinders with their entire peripheries covered with the bearing material, in lieu of the peripheral strips, as this arrangement would simply be a continuation of such bearing-strips; but a separation between the bearing-strips corresponding with the longitudinal flutings is preferable as producing less deadening effect upon the wires.

I am well aware that in a telephone invented and used by J. B. Cleaver, of New York, a sound-tube is used in connection with a sound-chamber formed at the rear of the diaphragm, and between it and a conical or concave re-

flector, the tube in that case being intended to convey the sounds coming through the telephone to the ear of the person using it, while the front of the diaphragm is left free for the person using the said ear-tube to speak through to the other end of the line. Such a use of the sound-tube or the cone-reflector connected with it is obviously not within the scope or possibilities of the present invention.

Having described my invention, I claim—

1. An automatic tension line-holder for the wires of mechanical telephones, said holder consisting of two fluted cylinders or spools mounted on the bifurcated end of a revolving axle, by which they are revolved around the axis of said axle, so as to wind the wire upon the said spools, and thereby tighten it as required, the wire being placed between the said spools, and thereby tightened by said spools as they rotate about the axial center.

2. An automatic tension line-holder for mechanical or acoustic telephones, consisting of a bifurcated axle or spindle mounted in suitable bearings, a spring arranged to rotate the said axle in a direction to tighten the wire held between the bifurcated ends of the axle, and fluted cylinders or spools on the bifurcated ends of the axle to receive and hold between them the wire.

3. The bifurcated spindle A^2 *a a'*, carrying two fluted spools or cylinders, and provided with a tension-spring, C, and a pawl and ratchet, D D', for tightening the spools and holders on the wire.

4. The combination, in a wire or cord tightening device for acoustic or mechanical telephones, of a bifurcated spindle suitably supported, and a spool or spools mounted on said spindle, and around which the wire is carried and against which it is held, each spool or cylinder being provided with longitudinal grooves, so as to make bearing-ridges between the grooves at intervals around the entire periphery of the spools or cylinders.

5. The spools or cylinders having the bearing-ridges formed on their peripheries, separated by intervening longitudinal grooves or flutings chambered out in the central part of their exterior sides, and tension straps or suspenders drawn tightly over the chambered part of the ridges, and secured to the ends of the spools or cylinders.

6. A bearing or holder for sustaining or tightening the wires of an acoustic or mechanical telephone, consisting of a spool or cylinder chambered or grooved circumferentially, so as to form bearing-flanges or circumferential lugs at each end of the spool or cylinder, and bearing-strips of any suitable textile fabric, skin, leather, or like material, which will not interrupt the sound-waves in a wire stretched over said bearing-strips, the said bearing-strips secured to the ends of the spools or cylinders on their bearing-flanges and extending across the recessed part of the spool, so as to keep the wire off of any solid bearing-surface.

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