(No Model.) 2 Sheets—Sheet 1.

C. A. LIEB.

OVERHEAD ELECTRIC SYSTEM.

No. 454,486. Patented June 23, 1891.

Fig. 1.

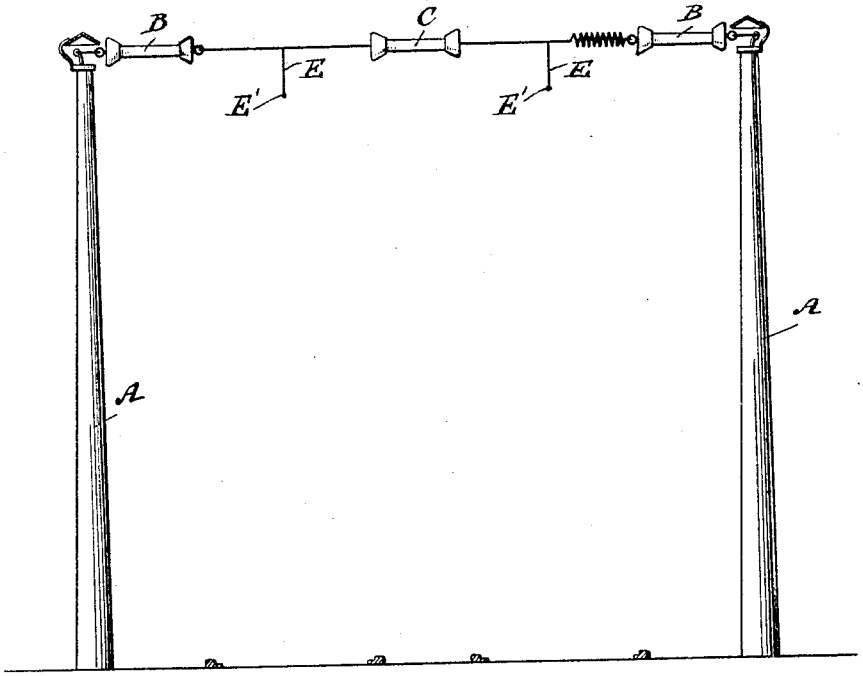


Fig. 2.

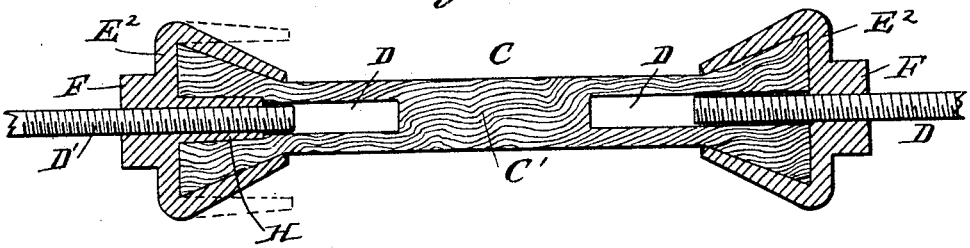
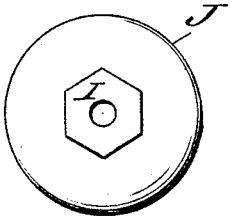


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

C. A. LIEB.

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Fig. 4.

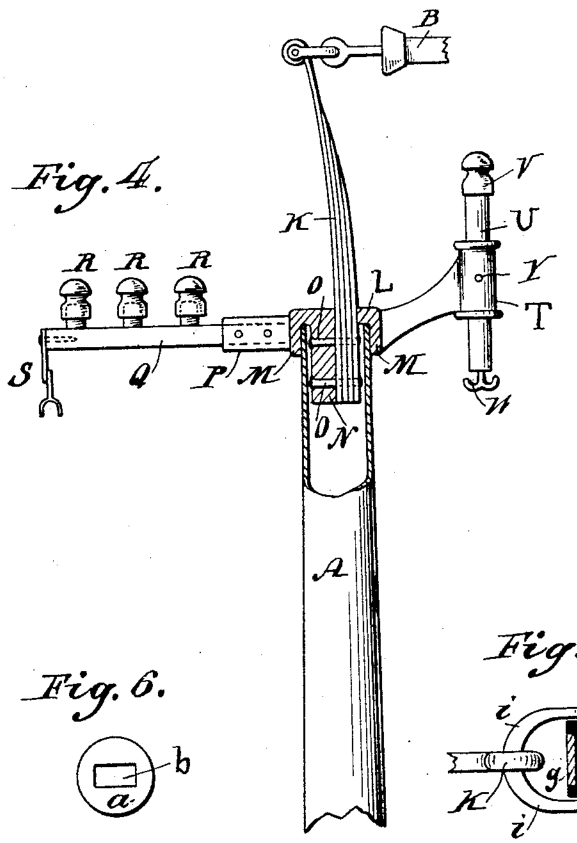


Fig. 5.

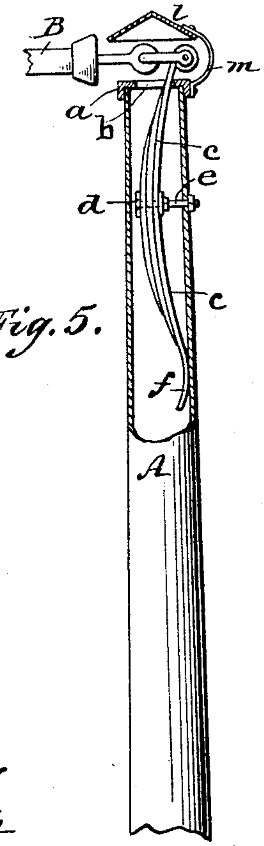


Fig. 6.

Fig. 7.

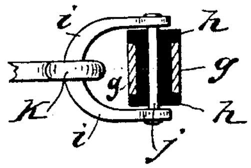


Fig. 8.

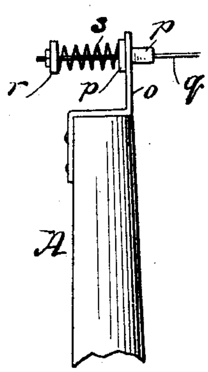
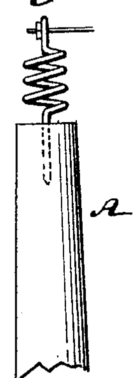


Fig. 9.



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UNITED STATES PATENT OFFICE.

CHARLES A. LIEB, OF NEW YORK, N. Y.

OVERHEAD ELECTRIC SYSTEM.

SPECIFICATION forming part of Letters Patent No. 454,486, dated June 23, 1891.

Application filed November 6, 1890. Serial No. 370,578. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. LIEB, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Overhead Electric Systems, of which the following is a specification.

My invention relates to improvements in overhead electric-railway systems; and it consists in the use of springs in connection with the poles and the span-wires, whereby the wires are automatically kept at the proper tension and fracture thereof from overstrain avoided; also in an improved turn-buckle and insulator, whereby the span-wires may be tightened or slackened; also in improved means for attaching an insulated cross-head to the top of the poles for the support of feeder-wires, telegraph or telephone wires, and the like; also in means whereby if the spring for the support of the span-wire should break the span-wire will not fall into the street; and by my invention I not only avoid fracture of the lines, which necessitates great expense, but also the danger of charged wires dropping into the street, liable to kill or injure individuals, horses, &c., is avoided, also great saving is effected in the running expenses of a line, because, being automatic or self-adjusting, breakage or derangement is largely avoided and a much smaller force of linemen is required than under the old system.

Figure 1 illustrates an elevation of two poles with my improvements attached. Fig. 2 illustrates a longitudinal section of the insulated turn-buckle. Fig. 3 illustrates an end view of the turn-buckle shown in Fig. 2. Fig. 4 illustrates a side elevation of one of the poles, showing one form of the span-wire spring, also the cross-head casting and its attachments at the top of the pole. Fig. 5 illustrates a partial section of the upper end of a pole, showing one method of attaching the spring, the hood, and insulated hanger. Fig. 6 illustrates a top view of the cap for the pole used in the construction shown in Fig. 5. Fig. 7 illustrates a top view, partly in section, of one method of attaching the span-wire to the spring when made as shown in Fig. 5, employing insulation. Fig. 8 illustrates an elevation of another method of employing the spring for automatic adjustment of the wires, showing also a safety-catch to prevent dropping of the wire should the spring break. Fig. 9 illustrates an elevation of still another form of spring attachment.

A A are the poles. They may be of wood; but I prefer the metal poles for which I have recently filed applications for Letters Patent.

B B are two wire-suspenders, which are preferably of the insulating kind for which I obtained Letters Patent dated September 2, 1890, and numbered 534,505.

C is the insulating turn-buckle. It is made as shown in section in Fig. 2.

The body C′ of the suspender is made of wood or other non-conducting material, which may be the same as the suspenders B B. In each end of the non-conducting body part, however, are bored two holes D D, adapted to receive the ends of the span-wires D′ or other devices to which the span-wires may be attached.

E E are the suspending-wires for the trolley-wires E′ E′.

E^2 E^2 are the two metallic end pieces or caps, which are or may be placed over the conical ends of the body-piece, while the flanges or cup-shaped parts thereof are straight, as shown in dotted lines at the left in Fig. 2. They are then swaged down solid upon the conical ends of the non-conducting part.

F F are bosses, which are made on the ends of the caps E^2, in which the threads are cut, so as to give greater strength than if they were cut simply in the thickness of the metal composing the caps.

G (seen at the right in Fig. 2) is a section of metal tubing, which is placed in the hole in the body-piece to prevent the strain from crushing the material in and closing the hole. At the left-hand end of this figure I show another method of accomplishing the same result. It consists in making on the cap E^2 itself an inwardly-extending ferrule-like part H, which, when the cap is adjusted, enters the hole in the end of the body C′ and prevents its crushing the body-piece. The bore of this ferrule may be threaded to engage with the span-wire, in which event there will be no necessity for the bosses. The ends of

the bosses may be squared or hexagonal, as shown at I, Fig. 3, or the periphery of the cap may be so made whereby the turn-buckle may be operated by a wrench, if desired. Of course the threads on the wires and also in the two caps D D are right and left.

In Fig. 4 I show one method of attaching the spring for automatically adjusting the span-wires. K is a spring. (Shown in this instance as being a leaf-spring similar to half of a spring used on wagons.) L is a cap for the hole. It is preferably a metallic casting and has an exterior flange M, which fits over the outside of the end of the pole and an interior semicircular plug-like part N, which fits inside the pole, and the base of the spring is bolted to it by bolts O. P is a hollow socket, preferably made integral with the cap L, into which a wooden yard-arm Q is fitted and held by a screw, upon which are arranged the insulated-wire supporters R R R, more or less, as desired. These may be used for telegraph, telephone, or other wires, and at its end there may be a hanger S for the wire for a side track, if desired. At the opposite side of the casting or cap L there is or may be another socket T, (shown as vertically arranged,) in which is placed another vertical wooden arm U, upon the upper end whereof I may arrange a feeder-wire, as at V, and at its lower end switch or signal wires may be attached at a hanger W or otherwise, as preferred. This vertical wooden support will be prevented from dropping through the socket T by being made tapering or shouldered or by a pin Y, driven into it through the socket.

In Figs. 5 and 6 I show another method of attaching the spring. This is the method shown in Fig. 1. *a* is a cap for the top of the pole, having a slot *b* in it. *c* is or may be an ordinary wagon-spring attached by bands *d* and bolt *e* to the pole or otherwise secured thereto. One end *f* of the spring *c* rests against the inside of the pole and the other end projects upwardly through the slot in the cap and to which the span-wire is attached, preferably by an insulated connection, (shown in Fig. 7,) in which *g* is the top of the spring. *h h* are flanged thimbles of insulating material, which are placed in the eye of the spring from opposite side. *i* is a yoke, which is attached by means of a bolt *j*, which passes through the insulating-thimbles. *k* is a link or other suitable device whereby the yoke is attached to the span-wire or to a hanger, as before stated. In Fig. 5 I show also a hood *l*, supported on an arm *m* from the cap *a* or from the pole, as preferred. The hood will keep rain, snow, and ice from breaking the insulation, and will also prevent them from entering the slot in the cap.

The form shown in Fig. 4 has the advantage over that shown in Fig. 5 that the pole may be shorter, thus effecting a saving of several feet in the length of the pole; and on the other hand the form shown in Fig. 5 has an advantage that the spring is protected from the elements and is perhaps somewhat handsomer. Of course both forms and all the forms which I show may be readily attached to wooden poles by clamps, caps, or other well-known means.

In Figs. 8 and 9 I show two other means of employing springs for the automatic adjustment of the wires. In Fig. 8, *o* is a stiff arm, preferably of metal, which projects upwardly from the end of the pole, (which is shown as of metal,) in the end of which arm is a hole in which a flanged thimble *p* of insulating material is placed, which is centrally bored, and through it the span-wire *q* passes, at the end whereof is a washer *r*, and between the washer and the flanged end of the insulating-thimble is placed a spring *s*. It will be seen that if the spring becomes broken for any reason the wires will not drop in the street, because the washer will hold them. If the pole be of wood, there will be no necessity for insulation, and the wire or rod may pass through a hole made in the pole and the spring be placed on the back side thereof. This is also true of an iron pole if the hole be insulated. The device shown in Fig. 9 does not require explanation. It is simply a heavy spiral or volute spring, one end whereof is attached to the pole and the other end to the span-wire.

In Fig. 1 I show at *t* a spring set in the span-wire. This may be used as a means of giving the automatic adjustment and, if used, the springs on the poles need not be used; but I do not favor this form for many reasons, among them that the spring must, to accomplish its object, be quite heavy. This deflects the span-wire; also when it expands it shifts the trolley-wires away from the medial line of the track. It may be used, however, in certain structures and give satisfaction.

It will be seen that by my improvements the wires are capable of the most accurate adjustment and that contraction and expansion are compensated for; also, that the springs will hold the wires in proper position and at proper tensions, irrespective of contraction and expansion and irrespective of stretching of the wires, sagging or bending of the poles, &c.; also, that by reason of the elasticity of the springs any shock, such as a blow from a trolley which has escaped from the trolley-wire, will not break the span-wires, but that they will yield thereto because of the cushioning action of the springs.

It will be also seen that by my improvement the line is very much more perfectly insulated than by other methods, and that I do away with the objectionable and expensive "bell-insulator" and with the old wire-tightening ratchet or bolt, which were expensive, clumsy, and easily disarranged; also, that by the employment of my spring-cushions for the span-wires (which also have an effect upon the trolley-wires) and by my safety device (shown in Fig. 8) I greatly reduce the liability of the wires falling into the street, thus avoiding danger to passers-by,

horses, &c.; also, that the same reason—*i. e.*, the cushioned or flexible connections between the span-wires and the poles—materially lessens the liability of fracture of the poles themselves, and that I also secure the advantages hereinbefore recited.

In order that the trolley-wire may be insulated from the span-wire, if desired, I prefer to suspend the same thereto by a suitably-constructed and insulated suspending device.

I do not limit myself to the details of construction and arrangement shown and described, because it will be apparent to those who are familiar with this art that changes may be made therein and still the essentials of my invention be employed.

I claim—

1. An insulating turn-buckle for electric wires, having a body part made of a single piece of insulating material recessed from the ends inwardly and threaded metallic end pieces, substantially as set forth.

2. An insulating turn-buckle for electric wires, having a body part made of a single piece of insulating material, the ends whereof are enlarged, recesses extending from the ends inwardly, and threaded metallic end pieces which conform interiorly to the said enlarged ends, substantially as set forth.

3. An insulating turn-buckle for electric wires, having a hollow body part of insulating material open at the ends only, into which enter the threaded ends of the wire or its supporting means, and threaded metallic end pieces for the said body-piece, substantially as set forth.

4. The combination, in an overhead electric-railway system, of supporting-poles, a span-wire connected to the poles by an elastic connection, insulation between each pole and the span-wire, and an insulating turn-buckle located intermediate the insulated ends of the span-wire, substantially as set forth.

5. A pole having a casting adapted to rest upon the top of the pole, provided with sockets for the reception of a wooden yard-arm or support for the wires and said yard-arm or support, means whereby a spring may be attached to the casting, and such spring, substantially as set forth.

6. A pole for electric wires or similar uses, having a spring at its upper end located within the pole, and a hood attached to the pole, which covers the open end thereof, through which the spring projects, substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 5th day of November, A. D. 1890.

CHARLES A. LIEB.

Witnesses:
PHILLIPS ABBOTT,
FREDERICK SMITH.