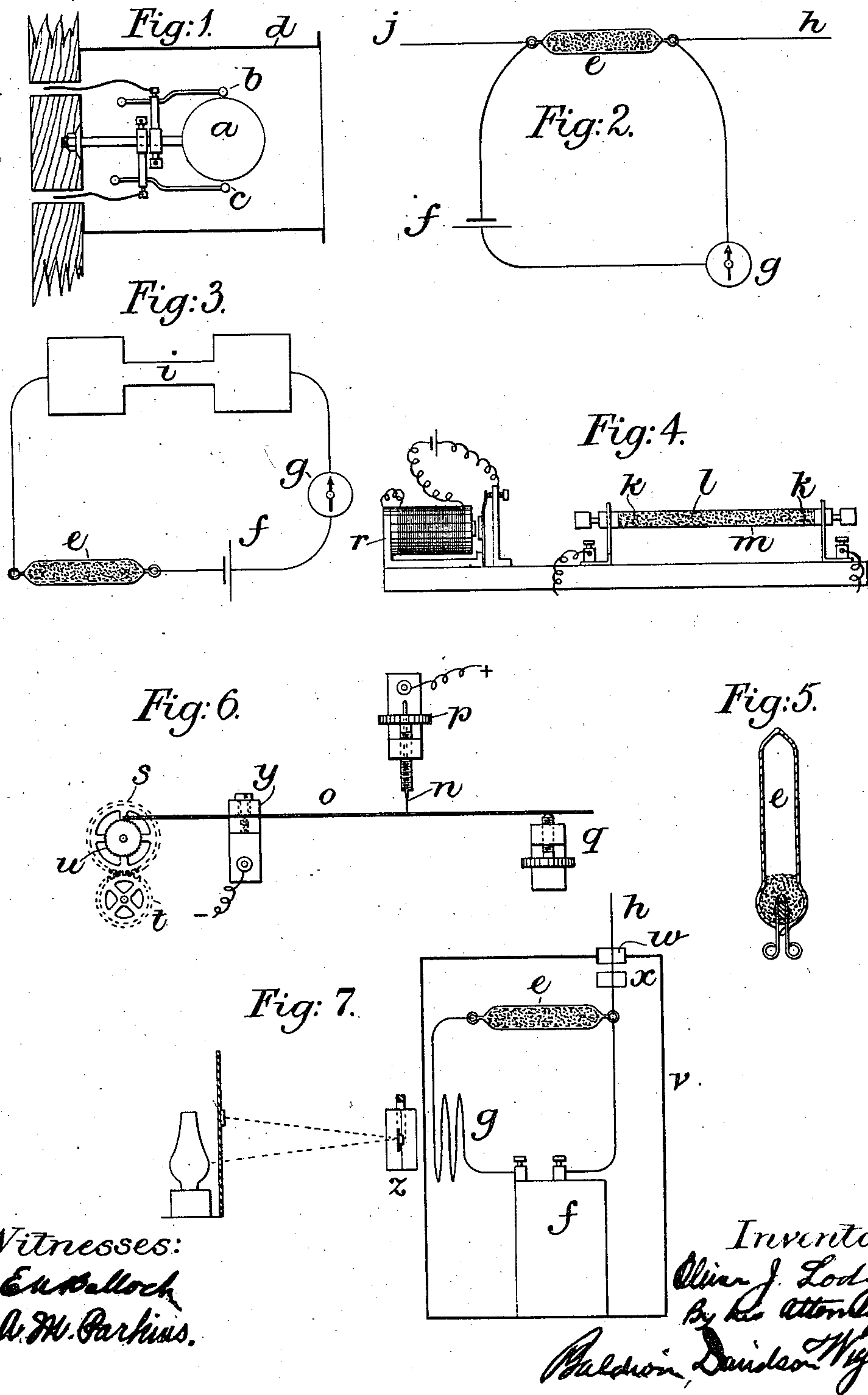


No. 674,846.

Patented May 21, 1901.

O. J. LODGE.  
ELECTRIC TELEGRAPHY.  
(Application filed Dec. 20, 1897.)

(No Model.)





# UNITED STATES PATENT OFFICE.

OLIVER JOSEPH LODGE, OF LIVERPOOL, ENGLAND.

## ELECTRIC TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 674,846, dated May 21, 1901.

Application filed December 20, 1897. Serial No. 662,688. (No model.)

*To all whom it may concern:*

Be it known that I, OLIVER JOSEPH LODGE, a subject of the Queen of Great Britain, residing at Liverpool, in the county of Lancaster, England, have invented certain new and useful Improvements in Electric Telegraphy, of which the following is a specification.

My invention relates to electric telegraphy; and it consists mainly in utilizing certain processes and combinations of apparatus whereby I am enabled to demonstrate the presence of, and to indicate in a receiving-circuit the reception of, what are known as "Hertzian waves" emitted from any suitable apparatus at a distance from the receiving-circuit and propagated through space. Thus after a succession of electrical surgings of predetermined duration have been caused to emanate from the emitter in accordance with the Morse or other code of telegraphic signaling the same are taken up in the receiver-circuit and so rendered intelligible, and a telegraphic system is thus obtained.

My invention relates, further, to certain improvements in connection with the emitting apparatus, and comprises the other improvements hereinafter more particularly described and claimed.

The annexed drawings, which are diagrammatic representations, illustrate my invention.

Figure 1 shows the essential parts of one form of emitting apparatus. Fig. 2 illustrates one form, and Fig. 3 an alternative arrangement, of the apparatus and assembly of parts which constitute my receiving-circuit. Fig. 4 shows a form of "coherer" and likewise serves to illustrate a means for the automatic breaking down of the cohesion resulting from the reception of waves by the coherer, as hereinafter fully described. Fig. 5 illustrates an alternative form of coherer, and Fig. 6 a still further modified form thereof and an alternative means of breaking down cohesion. Fig. 7 shows the coherer and other parts incased within a metallic covering, as hereinafter described.

As emitter of the Hertzian waves for the purpose of this invention I may employ any known or suitable device in which a condenser or Leyden jar or other electric capac-

ity consisting either of a pair of insulated plates or of a single plate and the earth is charged by an electrical machine, (such as Wimshurst's,) or a Ruhmkorff induction-coil, or a battery, or any other well-known means, to a high potential and then discharged suddenly with a spark between suitably arranged and prepared surfaces in air or in any medium, such as oil.

In Fig. 1 I have shown a form of emitter in which electricity is supplied to a single conductor *a* (shown as a sphere, but which may be of dumb-bell or any other shape) suddenly or disruptively by a couple of positive and negative sparks from knobs *b* and *c* and there left to oscillate and emit waves. A partial metallic inclosure *d* may be used to diminish waves in undesired directions. Both of these arrangements are my invention. The more usual plan hitherto has been to charge two conductors by a pair of leading-wires and let them spark into each other.

Referring now to Figs. 2 and 3, my receiving-circuit consists, essentially, of a coherer *e*, a battery *f* or other suitable source of electrical energy, and a telegraphic receiving instrument *g*, all in electrical connection, as shown. There is added to these latter a collecting-wire *h*, of any desired length, as shown in Fig. 2, or else a form of Hertzian resonator, as shown at *i* in Fig. 3, the function of either of which is to collect and to convey to the coherer the Hertzian waves produced at a distance, as aforesaid. In some cases I find that any bare wire or a connection to earth direct or through the system of gas or water pipes, as shown at *j* in Fig. 2, will serve sufficiently well as a collector or as an assistance to the insulated collector.

The coherer consists, essentially, of an organism whose electrical resistance diminishes under the influence of Hertzian waves, but which returns to its former amount when the cohered condition brought about by the electrical influence is broken down by mechanical tremor.

One suitable form of coherer is illustrated in Fig. 4, which was introduced (for other purposes) by Branly previous to the year 1894. This arrangement consists of a pair of metallic points *k*, embedded in metallic grains



or powder *l* within a glass tube *m*; but it will be understood that I may employ any other equivalent device. For example, I may seal the filings up in vacuum, as indicated in Fig. 5, which I have discovered increases and prolongs its sensitiveness; or I may, as illustrated in Fig. 6, use a coherer consisting of a needle-point *n*, resting lightly on a flat plate or spring *o*, fixed in a clamp *y*, the degree of pressure being obtained by the adjustment-screws *p* and *q*. On the arrival of Hertzian waves more complete contact or cohesion is set up between the particles of powder *l* or between the point *n* and spring or other light metallic contact *o*, and so allows more current from the battery *f* to flow through the telegraphic receiving instrument, (indicated at *g*, Figs. 2, 3, and 7;) but then before the coherer is again in a fit state to receive fresh impulses the said cohesion must be destroyed. Now according to my invention I provide for this being effected by an automatic vibrator. This mechanical vibration may consist of a succession of jars or knocks or taps, which may be produced by electrical means, as in an electric trembling bell, (see *r* in Fig. 4,) or by clockwork. (See Fig. 6.) In the last-mentioned figure, *s* and *t* represent two wheels of a clockwork-train. Upon the arbor (or on a disk mounted thereon) of the wheel *s* is a series of serrations or the like *u*, (shown exaggerated in the drawings,) which as the wheel rotates effects the vibration of the lever or spring *o* either directly or indirectly through the stand. Such a tapper as is used in dentistry also serves very well for my purpose.

A coherer is sensitive not only to the desired impulse arriving from a distance and conveyed to it by the collectors, but it is also liable to respond to any local sparks or electric surgings in its neighborhood, especially to oscillations in an adjacent emitter. It may be protected from all these by complete inclosure in a flawless metallic box.

For the purpose of protecting the coherer from undesired disturbance, therefore, I inclose it (sometimes with all coils, wires, batteries, and the like connected to it) in a metallic covering or case, as shown at *v* in Fig. 7, leaving only one or more round holes or short tubes *w* for the collector terminal or terminals to enter by and for vision or other needful purpose requiring an aperture, for through round holes of moderate size large electric waves do not readily pass, whereas through chinks or long slits, no matter how infinitely narrow, they can pass with ease. They likewise pass in by means of any insulated wire which enters the box; but through any wire which is thoroughly joined to the metal wall of the box where it enters the waves cannot pass.

In the particular arrangement shown in Fig. 7 a single terminal *h* is employed which is insulated from the casing by tube *w* and

is connected to one terminal only of the coherer. This construction is effective and desirable in certain cases, and it is found that the Hertzian waves pass in as readily through the single wire, affecting the coherer in the same way as in the case of the earthed circuit through *j* in Fig. 2. Hence it is not absolutely necessary to remove the terminal *h* from its aperture when it is not being used for the purpose of establishing communication and enabling waves from the collector to enter the box and reach the coherer, for these same terminals *h* or *j* may when they are raised completely plug with metallic continuity, as shown at *x*, the small holes through which they can freely afterward be lowered.

The only part of the coherer or detector portion outside the box (shown in Fig. 7) is the index or needle mirror *z* of the telegraphic receiving instrument employed, which is acted upon and deflected by its coil *g* inside acting magnetically through the metal wall.

When the plan of withdrawing the terminals of the box is adopted, it is sufficient to put the coherer above mentioned alone in the box.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a system of Hertzian-wave telegraphy, an emitter consisting of a single conducting body and means for suddenly and disruptively communicating opposite electric charges thereto, whereby oscillations are set up in said body, and waves are emitted; substantially as described.

2. In a system of Hertzian-wave telegraphy an emitter comprising a single conductor supplied with opposite electricities by a pair of knobs connected to the terminals of a high-potential source.

3. In a system of Hertzian-wave telegraphy, the combination with an emitter, of a partial metallic inclosure serving to lessen the emission of Hertzian waves in undesired directions.

4. A coherer comprising a variable electrical contact sealed in vacuum.

5. In a receiver for Hertzian-wave signaling systems, the combination of the following instrumentalities: a coherer, a base or support upon which it is mounted, and a vibrator mounted in proximity to the coherer, and adapted to agitate its elements.

6. In the receiving-circuit of a system of Hertzian-wave telegraphy, the combination with a coherer, of automatic means to successively break down the cohesion caused in said coherer by such Hertzian waves.

7. In combination, in the receiving-circuit of a system of Hertzian-wave telegraphy, a coherer, a battery, a telegraphic receiving instrument, and automatic means to successively break down the cohesion caused in said coherer by such Hertzian waves.

8. In combination, in the receiving-circuit



of a system of Hertzian-wave telegraphy, a  
coherer, a battery, a telegraphic receiving in-  
strument, automatic means to successively  
break down the cohesion caused in said co-  
herer by such Hertzian waves, and means  
5 serving to collect and convey to the coherer  
Hertzian waves produced at a distance.

In testimony whereof I have hereunto sub-  
scribed my name.

OLIVER JOSEPH LODGE.

Witnesses:

WM. PIERCE,

WM. G. MURRAY.