

(No Model.)

W. BURNLEY.
TELEGRAPH SYSTEM.

No. 399,314.

Patented Mar. 12, 1889.

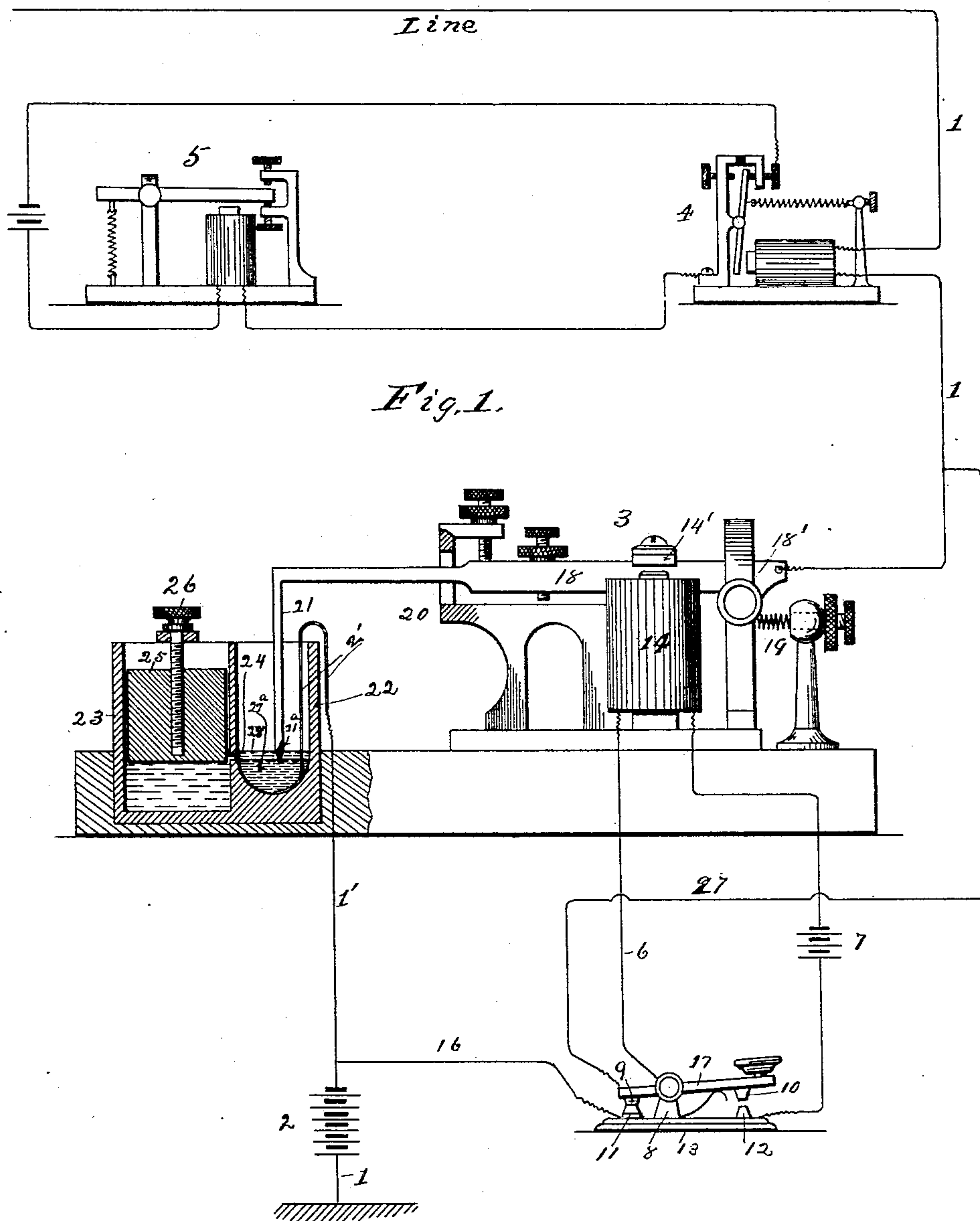


Fig. 1.

Fig. 2.

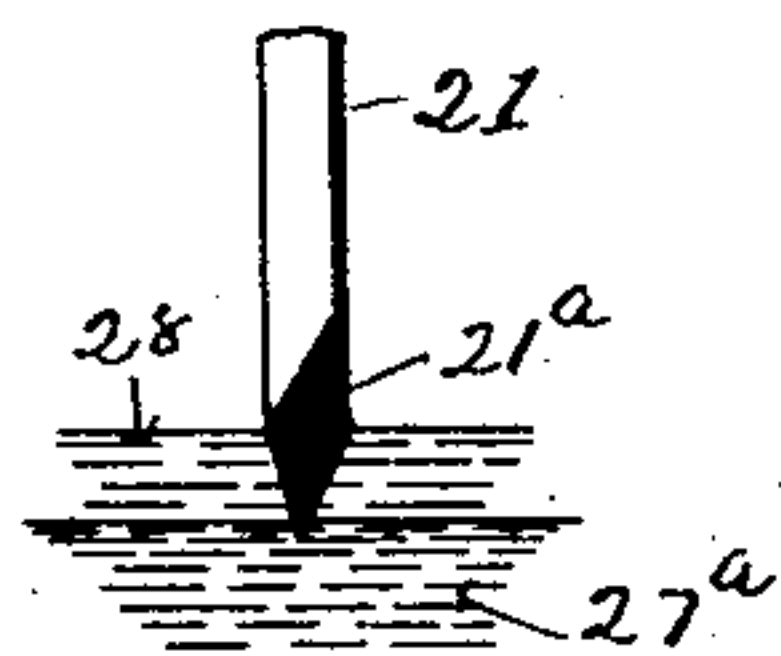
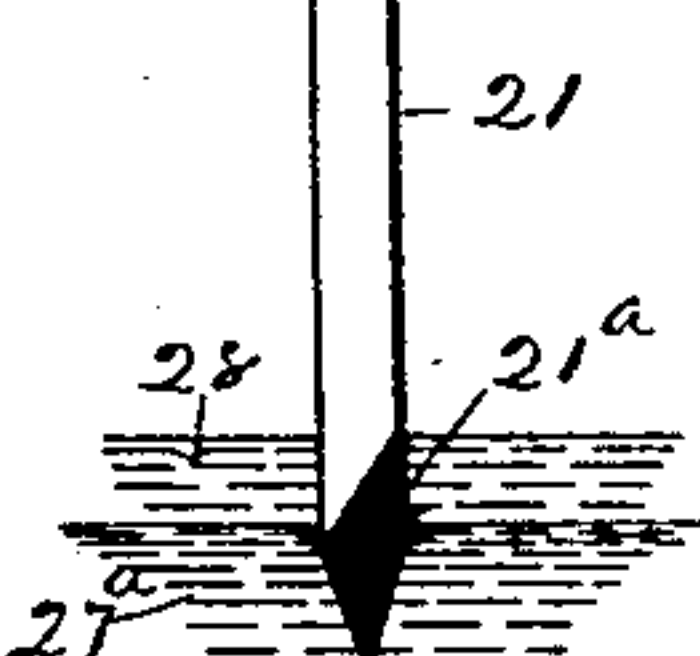


Fig. 3.



Witnesses.

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TELEGRAPH SYSTEM.

SPECIFICATION forming part of Letters Patent No. 399,314, dated March 12, 1889.

Application filed July 9, 1888. Serial No. 279,448. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BURNLEY, a citizen of the United States, residing at North East, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Telegraph Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

My invention relates to a system of telegraphy operated by a continuous current of electricity over the main line controlled by a novel telegraphic transmitting device adapted to maintain a continuous current over the line, and to so increase it to such high potential and so decrease it to such low potential as to adapt it to the operation of telegraphic relays and sounders on the main line without damaging interference with the simultaneous operation of telephone-instruments on the same main line or over contiguous main lines.

In order to practically carry out my invention, I employ ordinary relays and receiving-instruments and a novel telegraphic transmitting-instrument, which maintains a constant and unbroken current of electricity over the main line and operates to raise and lower the potential of the current over the line, so as to cause the relays and sounders to operate in unison with the operation of the transmitting-instrument and with the rise and fall of the potential of the current controlled thereby.

Having thus briefly referred to the features of my invention, I will now describe the construction and operation of the mechanism thereof.

In the construction of my invention shown in the accompanying drawings, Figure 1 represents a telegraph system equipped with my improved telegraphic transmitting-instruments for sending continuous currents to line. Figs. 2 and 3 are detail views representing a portion of the telegraphic transmitter in raised and lowered positions.

The reference-numeral 1 designates a line-

wire, forming, in connection with the wire 1' 50 and the voltaic battery 2 and ground-connections, a main-line circuit, in which may be inserted any desired number of my transmitting-instruments and of receiving-instruments. In the present instance I have shown a transmitter, 3, a relay, 4, and a sounder, 5, in a local circuit operated by said relay. The magnet 14 of the transmitter 3 is included in the circuit 6 of a local battery, 7, said circuit being opened and closed by the transmitter-key 17, adapted to magnetize and demagnetize the electro-magnet 14. The transmitter-key 17 is pivoted to a post, 8, on the base-board 13, and has contact-points 9 and 10, adapted to contact with the front and rear contact-stops, 11 and 12. When the key is open, as is shown in the drawings, the contacts 9 and 11 are together and the battery-circuit 6 is broken. The main-line current in this position of the key flows through a shunt-circuit 70 formed by the wire 16, which extends from the line-wire 1 to the stop 11 on the base-board, and another wire, 27, connected with the lever, runs to the line-wire at a point beyond the transmitter. In this manner the continuity of the line through this channel is never broken when the key is not in use, and transmitters and instruments at distant stations are free to operate.

The portion of the transmitter 3 in the main-line circuit consists of an armature-lever, 18, pivoted at the end 18' thereof, where it is also provided with an ordinary retracting-spring, 19. The main line is also preferably attached to the end 18' of the armature-lever. The lever 18 is also provided with an armature, 14', located over the magnet 14, so that the armature-lever 18 is operated thereby. The lever 18 also extends beyond the armature 14' between and beyond the guide and stop bracket 20, and has on the outer end thereof a pendent arm or finger, 21, which constitutes a metallic electrode. This electrode is provided at its lower extremity with a tip, 21^a, made of vulcanized india-rubber, ebonite, wood, or other non-conductor of electricity.

As shown in Figs. 2 and 3, the lower end of the metal electrode is preferably beveled to

a point or edge, and the correspondingly-beveled non-conducting tip is connected or otherwise secured to the metal point. A cup, 22, preferably made of porcelain, vulcanized india-rubber, ebonite, or other suitable material, is located beneath the electrode 21, and is made sufficiently deep to receive and retain a conductive fluid. At the side of the cup 22 is a reservoir or feed-cup, 23, which connects with the cup 22 by a hole, 24, and serves to supply the same with the liquid as it evaporates or is decomposed. A plunger, 25, operated by a screw, 26, is employed to force the fluid from the reservoir into the cup 22. In practice I prefer to pour into the cup 22 a suitable quantity of mercury, 27^a, and on the top of the latter a layer, 28, of a solution of salt and water, caustic soda, or other thin conductive fluid. The mercury 27^a constitutes a fluid-electrode, and when the metallic electrode 21 dips into the same forms part of the metallic continuity of the main line through the wire 2', which dips into the mercury and connects with wire 1' to battery 2 and ground, and so constitutes part of the main line; but when cup 22 is itself a conductor of electricity and the wire 1' is connected thereto the wire 2 will not be needed.

When it is desired to send signals to line for operating a distant relay, and through it a local sounder, the transmitter-key 17 is properly manipulated in accordance with any known signal-code. This will cause the magnet 14 to act upon the armature 18 and vibrate it and the attached electrode 21. When the latter is in its lowest position, its metallic point will dip into the mercury 27^a, making a perfect electric connection between the metallic portion of the electrode 21 and the wire 2' and 1' through the mercury 27^a, forming a complete metallic connection from the battery 2 through line 1' and wire 2', mercury 27^a, electrode 21, and armature 18 to main line 1. When, however, the electrode 21 is raised by the action of the armature-lever 18 to its highest position, the metallic portion thereof is entirely withdrawn from the mercury and the conducting-fluid 28, leaving only the non-conducting tip 21^a partially immersed in the conducting-fluid 28, and consequently the resistance of the circuit will be increased as the electrode rises to its highest position, the upper portion of the non-conducting tip being thereby withdrawn from the fluid and carrying with it an adhering film of said conducting-fluid, through which the current continuously passes. The film of fluid on the lower portion of the electrode 21 is then alone the surface or body through which the current flows from the line-battery 2 to the electrode 21, and through the lever 18 and main line 1 to the distant instruments. It will thus be understood that by using such transmitting mechanism as is shown and described the main-line current is never broken or interrupted, and telegraphic signals or messages are transmitted solely by

continuous currents, the potentials of which are varied by the operation of the transmitter mechanism, hereinbefore described. 70

Instead of using mercury, which is a perfect conductor of electricity, in the cup 22 and a liquid which is not so good a conductor, but has the property of producing an adhering film on the electrode, I may use altogether a conductive fluid and dispense with the mercury. In either event the full potential is obtained when the armature-lever is down and the metallic portion of the electrode immersed in the liquid, and as the lever is raised the potential lowers and reaches the minimum when the lever is fully raised, and the metallic portion of the electrode entirely withdrawn from the liquid, leaving only the non-conducting tip of the electrode therein, and as the non-conducting tip never leaves the liquid, it is evident that the conductivity of the electrode does not cease, but is maintained by the thin film of liquid adhering to the electrode. As the lever descends again, the conductivity will increase until the lever is down, when a maximum potential is gained. It will be understood that the instruments above described as a part of my system—such as the relay 14 and the sounder 5 in a local battery—are of the ordinary construction, but that in my system I use a transmitter operating to send continuous currents to line, instead of the ordinary intermittent current-transmitting key, and that the instruments shown are only the equipment of a single station or office of my system, it being understood that other stations along the line operated by my system are similarly equipped. 95

I am aware that contact-points operating within a liquid have heretofore been employed in telegraphy. Edison's patent, No. 141,777, dated August 12, 1873, shows a device of this character; but there is an essential element of difference between this invention and the one I have hereinbefore described, in that in the Edison device the pendent electrode is a continuous metallic electrode which forms a metallic contact with a metallic electrode within, and is never withdrawn from the conductive fluid, while in my device the pendent electrode is provided with a non-conductive tip, which alone remains in the liquid when the pendent electrode is raised to its highest point, and this non-conducting tip is absolutely essential to the results produced; hence I do not claim, broadly, a telegraphic system operated by the rise and fall of the tension of a continuous electrical current; but 125

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

1. The combination, in a system of telegraphy, of a main-line circuit and ordinary relays and sounders with continuous-current telegraphic transmitting mechanism consisting of a circuit making and breaking device, an oscillating lever in the main-line circuit supporting and operating a movable metallic 130

electrode tipped with non-conducting material and operating in a conductive fluid in the main-line circuit in unison with the circuit making and breaking device, so that when the
5 electrode is down the metallic portion thereof is immersed in said fluid, and when up the metallic portion of the electrode is withdrawn from the fluid, leaving only its non-conductive tip therein, substantially as and for the
10 purpose set forth.

2. In a system of telegraphy, the combination, with a main-line circuit and ordinary relays and sounders, of a transmitter for sending continuous currents to line, consisting of
15 a finger-key, local battery-circuit, electro-magnet armature having a pendent metallic electrode with a tip of non-conducting material, and a cup containing a conductive fluid forming part of the main-line circuit, substantially as herein set forth.
20

3. The combination, in telegraphic transmitting mechanism, of a circuit making and breaking device with a movable metallic elec-

trode tipped with non-conducting material and a cup of conductive fluid in a main-line
25 circuit in which said electrode operates so as to immerse the metallic portion thereof in the fluid and withdraw the same therefrom (leaving only the non-conducting tip thereof in
30 said fluid) in unison with the circuit making and breaking key, substantially as and for the purpose set forth.

4. The combination of the cup containing a conductive fluid, the reservoir or feed-cup communicating therewith, and the plunger
35 with the armature-lever, the metallic electrode having a non-conductive tip, and the electro-magnet co-operating with the armature-lever, substantially as and for the purpose set forth.
40

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM BURNLEY.

Witnesses:

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WM. P. HAYES.