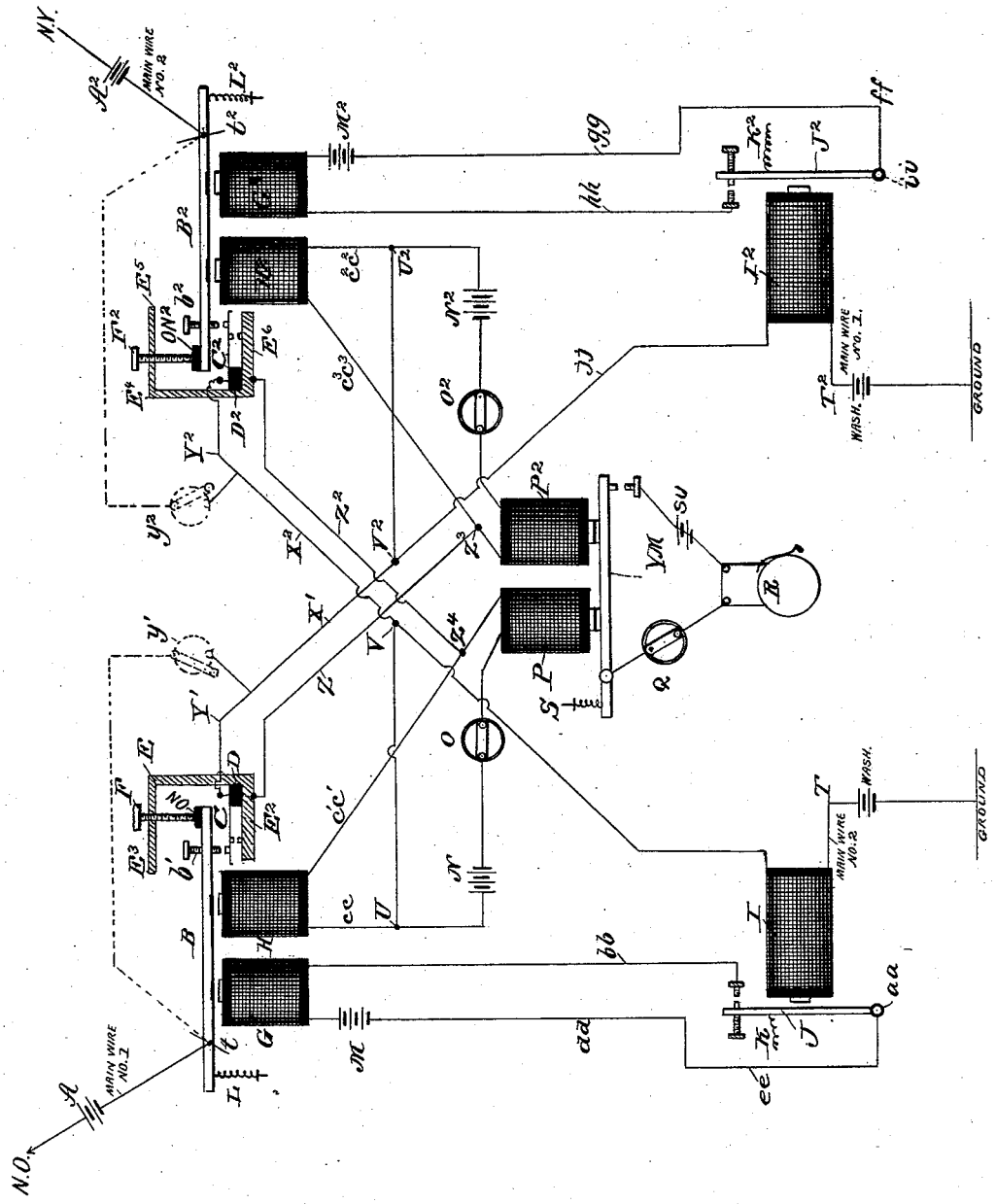
(No Model.)

A. D. P. WEAVER.

TELEGRAPH REPEATER.

No. 522,500. Patented July 3, 1894.



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TELEGRAPH-REPEATER.

SPECIFICATION forming part of Letters Patent No. 522,500, dated July 3, 1894.

Application filed December 26, 1893. Serial No. 494,923. (No model.)

To all whom it may concern:

Be it known that I, ALFRED DEE PINCKNEY WEAVER, of Jackson, in the county of Hinds and State of Mississippi, have invented a new and useful Improvement in Telegraphic Repeaters, of which the following is a specification.

My invention relates to telegraphic repeaters, or instruments used to cause a message coming over one line to be repeated or transmitted over another line without the aid of an intermediate operator.

The object is to cheapen and simplify the instrument, to reduce the number of connections, to enable it to be more easily understood by inexperienced operators, to economize the local batteries, to reduce its liability to fail in operation, and to avoid the mutilation of signals.

To these ends it consists in the peculiar construction and arrangement of the parts of the instrument, and of the circuits, and their connections, which I will now proceed to more fully describe with reference to the drawing, in which the figure shows a diagrammatic illustration of the instrument, its circuits, and alarm bell, at the intermediate station.

Assuming that this instrument is located at Washington, and is designed to take messages coming from New Orleans, and to repeat them over the line extending from Washington to New York, the main wire coming from New Orleans enters the instrument at the upper left hand corner, and is grounded at Washington at the lower right hand corner of the diagram, and the connection for New York is made at the upper right hand corner of the instrument, and is grounded at Washington at the lower left hand corner of the diagram.

The two instruments shown at the upper corners of the diagram are exactly alike, and are located at Washington. The two instruments at the lower corners are also exactly alike and are also located at Washington, while the instrument in the middle is the bell alarm, which is also located at Washington. This bell alarm and its circuits, while an important adjunct to my system, may be dispensed with without affecting the main or fundamental principle of my system, as will be explained farther along.

The main battery which works the line between New Orleans and Washington is shown in two sections, one half of which is in New Orleans shown at A at the upper left hand corner, and the other half of which is shown at T^2 at the lower right hand corner at the Washington end. The main line battery which works the line from Washington to New York is also in two sections, one half of which is shown at the upper right hand corner at A^2, which is in New York, and the other half at the lower left hand corner at T which is in Washington.

For the present the description of the central apparatus or bell alarm will be held in abeyance, and as the two sides of the instrument are symmetrically constructed and arranged, the description of one side will suffice for both.

B is an armature lever fulcrumed at *t* and bearing armatures that play upon the poles of magnets G and H. These armatures are drawn up or away from the magnets by a spiral spring L, and a non-conducting block O N on its opposite end strikes against the bottom of a set screw F held in the part E^3 of the frame E, which frame also has a lower leg E^2. C is a flat spring held on the frame E in insulated relation thereto and parallel to leg E^2 by a non-conducting block D, and having a contact face on top that makes connection with the screw *b'*, and another on its bottom that makes connection with the lower leg E^2 of the frame. The lower part of the instrument consists of a magnet I in the main line circuit between Washington and New York, and another I^2 in the main line circuit between Washington and New Orleans. One of these magnets acts upon armature J to close the circuit of local battery M through magnet G, and the other I^2 acts upon armature J^2 to close the circuit of local battery M^2 through magnet G^2. N. and N^2 are other local batteries, the former of which controls the magnet H and the alarm bell magnet P, and the other N^2 of which controls the magnet H^2 and alarm bell magnet P^2. O and O^2 are switches in the local circuits of batteries N and N^2 which do not form an essential part of the apparatus as a repeater, but are merely to open battery circuits to prevent these local batteries from running down when the instrument is not in use, or when one half only is used and repeating is not desired. When the instrument is in use as a repeater these switches are always closed.

When the main lines from New Orleans to Washington, and Washington to New York are in condition for operation they are normally closed, and the armature levers B and B^2 are not up, as shown, but are held down by their subjacent magnets, and the screws b' and b^2 rest respectively upon their springs C and C^2. The main line current from New Orleans to Washington then flows from A to T^2 and the earth at Washington, over the following path A B b' C Y' X' j j I^2 T^2. This energizes magnet I^2, and through armature J^2 closes the circuit of local battery M^2 through f f, g g M^2 magnet G^2 and h h, causing the magnet G^2 to attract armature lever B^2. So also the current from Washington to New York passes from A^2 to T and the earth at Washington, through B^2, b^2, C^2, Y^2, X^2, I, and T, and this energizing magnet I causes it to attract armature J and close the local circuit of battery M through a, a, b b, magnet G, battery M, and wires d d, e e, causing magnet G to attract armature B.

The magnets H and H^2 which are operated by the local batteries N and N^2, have their circuits completed through wires c c, c' c', and bell magnet P on one side, and through c^2 c^2, c^3 c^3, and bell magnet P^2 on the other side. The magnet H of one side is, however, cut out by a shunt circuit U, V, X^2, Y^2, C^2, E^6, Z^2, Z^4 P and O controlled by the other instrument, while magnet H^2 is cut out by a shunt circuit U^2, V^2, X', Y', C, E^2, Z, Z^3, P^2 and O^2 controlled by the first instrument.

When the armature lever B or B^2 of either instrument is attracted, its screw b' or b^2, first establishes the main line circuit to the earth, and then when either spring C or C^2 descends farther in the last part of the movement it establishes the shunt circuit for the other instrument, cutting out its magnet H or H^2.

Now assuming that both main lines are closed, and an operator at New Orleans should open his key the following is the action of the repeater. The main circuit from A to T^2 is closed through the screw b', and the first action is to release armature J^2 of relay I^2 thus opening the local circuit i i, f, f, g g, M^2, G^2, h h. This releases armature B^2, which is raised by the force of spring L^2. The first thing done by the ascent of this armature is to remove the shunt or short circuit U V X^2 Y^2 from battery N, by the opening of the shunt circuit between C^2 and E^6, thus allowing the current from battery N to flow through c c and c' c' and the coil H of the opposite sounder, and keeping the armature B closed, so it will not repeat back the signal on the wire to New Orleans. As the armature lever B^2 continues on its upward course the main wire to New York is finally opened at b^2 between B^2 and C^2, thus opening relay I and demagnetizing coil G of the other instrument. Were the armature B not held closed by the coil H (by the removal of the shunt from the battery N) that armature would be released also and the result would be a false kick back into the line to New Orleans. Hence the signal on the wire from New Orleans is transmitted to the other line to New York automatically.

If now the operator at New Orleans should close the key, which has just been opened, the action is as follows. The main line from New Orleans to Washington (or from A to T^2) is closed, and this closes relay I^2 and energizes coil G^2 and the armature B^2 is attracted by said coil. The first thing done as the armature B^2 descends is to close the main wire between New York and Washington at b^2, C^2, Y^2, which closes relay I and causes coil G to attract armature B, which is already held closed by the current from battery N flowing through coil H. The next thing done by the descending armature B^2 is to short circuit the battery N out of coil H by closing the circuit between C^2 E^6 thereby leaving armature B in a condition to be worked by relay I and battery M through coil G.

It will be seen that the action of the transmitting device on the sounders is such that when armature B^2 ascends it allows battery N to flow through coil H of the opposite sounder before it opens the coil G and battery M by the main line releasing armature J of relay I; and when the armature B^2 desends it closes coil G and battery M of the opposite sounder by the main line closing relay I before it shunts battery N out of coil H. The effect of all this is to keep sounder armature B closed no matter what may be the position of armature B^2.

It will be seen that both magnets G and H are sounder magnets, both are worked by local batteries, and both are arranged upon the same side of the armature lever B, and also upon the same side of the fulcrum of said lever. This enables me to construct the instrument much more cheaply and compactly, being but little more in height than that of the magnets themselves, and gives such exposure of the working parts of the instrument as to make them easy of access for inspection and adjustment.

I will now describe the action of the alarm attachment shown in the central part of the figure.

As the extra local batteries N and N^2 are never opened when the apparatus is used as a repeater, an alarm apparatus is provided to give notice by ringing an electric bell whenever either of the batteries N N^2 is opened, or when either or both are weakened to a degree that would impair their efficiency for the purpose intended.

P and P^2 are electro magnets arranged respectively in the circuits of the extra local batteries N and N^2, and both acting upon the armature Y M, which closes a bell circuit from battery S U through the alarm bell R and switch Q. The spring S on armature Y M is given such a tension that the strength of only one of the batteries N N^2, or the combined strength of both when weakened, is insuffi-

cient to cause said armature to be attracted by their respective coils P P^2, but when the currents from both batteries N N^2 are allowed to work in their normal strength through their respective coils P P^2, the attraction is sufficient to cause the armature Y M to overcome the resistance of springs S and keep said armature attracted.

It is obvious that the strength of the currents flowing through coils P P^2 is subject to fluctuation, caused by the introduction and the taking out of circuits, the coils H H^2 by the movements of armature B B^2, but the spring S is given such a tension as to nullify these fluctuations. If the armature Y M be attracted by the combined force of batteries N N^2, and one of said batteries be removed, or the force of either one or the two materially weakened, then the remaining force of the battery is not sufficient to hold armature Y M, and it is in consequence released, thus closing the bell circuit and causing the bell to ring from the battery S U. This battery may be a single cell of some good dry open circuit battery not subject to any great change for a considerable time. The magnets P P^2 are connected with each other at the back by a piece of any non-magnetic metal, so as to prevent the effects of no force caused by the battery circuits N N^2 being passed around them in opposite directions.

It is not necessary to trace the effects of the instrument when repeating in the opposite direction as the action is precisely the same as that already described.

To operate the right or left hand half of the instrument separately as when it is not desired to repeat, a switch y' and y^2 and shunt circuit, shown in dotted lines, is made to permanently connect B to ground through X′, and B^2 to ground through X^2.

When the instrument is not used as a repeater but its halves are separately and independently operated these switches are closed. The switches O and O^2 are also opened to prevent batteries N and N^2 and coils H and H^2 from interfering with the movement of the sounder armature B and B^2, and the switch Q of the bell alarm circuit is also opened to prevent the bell from ringing.

The nature of the contact points b' C E^2 and b^2 C^2 E^6 are simply those of circuit preserving contacts, which I am aware are old and have heretofore been used, and I therefore do not claim them broadly, nor do I on the other hand confine my invention to their specific form. I am also aware that the relays I and I^2 and the electric bell R are also in themselves old features, and I make no separate claim to these broadly, but

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

1. A telegraphic repeater comprising a sounder consisting of the combination of an armature lever B, two independent sets of electro magnets G H both arranged upon the same side of the fulcrum of said armature lever and both in local circuits, one local circuit having a relay in the main line circuit, and the other local circuit having a shunt through the other half of the repeater substantially as shown and described.

2. A telegraphic repeater comprising a sounder consisting of the combination of an armature lever B, two independent sets of electro magnets G H both arranged upon the same side of the fulcrum of said armature lever and both in local circuits, a frame E^2, and a spring contact C combined with and interposed between the armature lever B and frame E^2, and the circuits and batteries arranged substantially as shown and described.

3. A telegraphic repeater, comprising a sounder consisting of the combination of an armature lever B, two independent sets of electro magnets G H, both arranged upon the same side of the fulcrum of said armature lever, and both in local circuits, one local circuit having a relay in the main line, and the other local circuit having a shunt through the other half of the repeater, and also an electro magnet P, and a bell circuit and armature key for said bell circuit held open by said electro magnet P in the normal working strength of the circuit actuating magnet H, and arranged to close the bell circuit when the circuit of magnet H is weakened substantially as shown and described.

4. A telegraph repeater consisting of two symmetrically controlled and arranged halves, each consisting of an armature lever with two magnets G and H operating upon the same side of its fulcrum, one of said magnets being in a local circuit having a closing relay arranged in the main line of the opposite half of the instrument, and the other magnet being in an extra local circuit having a shunt, which shunt as well as the main circuit of the second line are controlled by the armature lever and contacts of the other half of the instrument, a pair of magnets P and P^2 separately arranged in the two extra local circuits, an armature key held by the same, and a separate bell circuit and bell arranged to be closed to sound an alarm when the armature key is released by the weakening or failure of either or both the batteries of the extra local circuits, substantially as shown and described.

5. In a telegraph repeater, the combination with the two extra local circuits for the two halves of the instrument; of two independent magnets P and P^2 arranged respectively in the two extra local circuits, a single armature key Y M held by the combined force of both these magnets, a bell R, and bell circuit arranged to be closed by the armature key from the weakening or failure of either or both of the batteries of the local circuits, substantially as and for the purpose described.

ALFRED DEE PINCKNEY WEAVER.

Witnesses:
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