2 Sheets—Sheet 1.

J. J. CLARK.

TELEGRAPH REPEATER.

No. 29,247. Patented July 24, 1860.

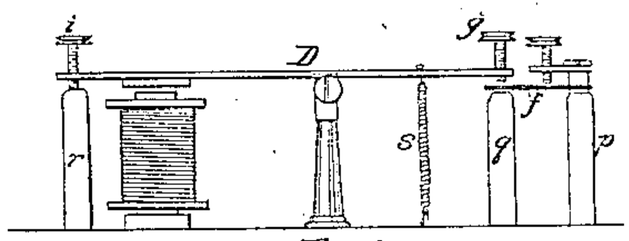
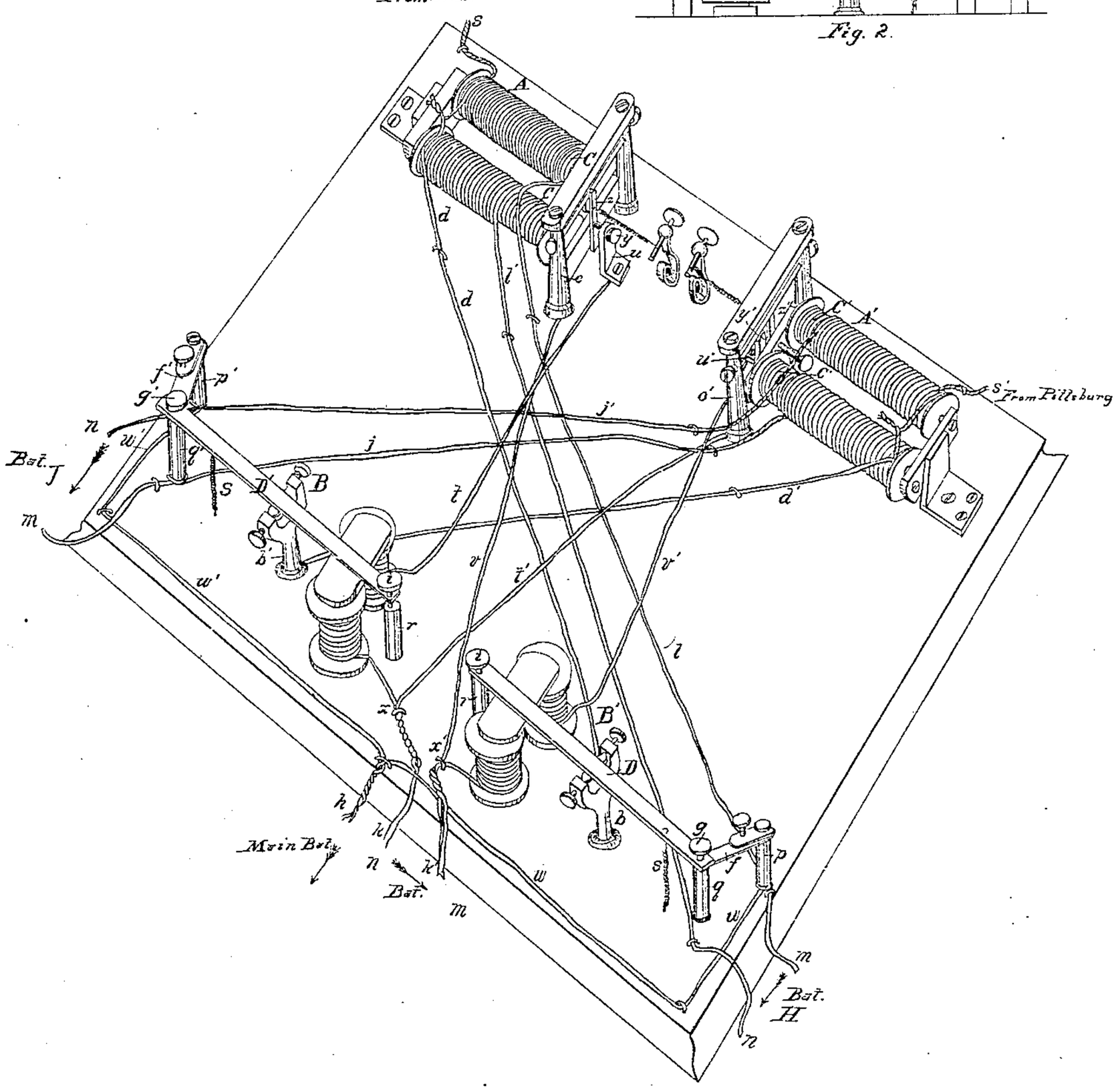


Fig. 2.

Fig. 1.



2 Sheets—Sheet 2.

J. J. CLARK.

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Fig. 1.

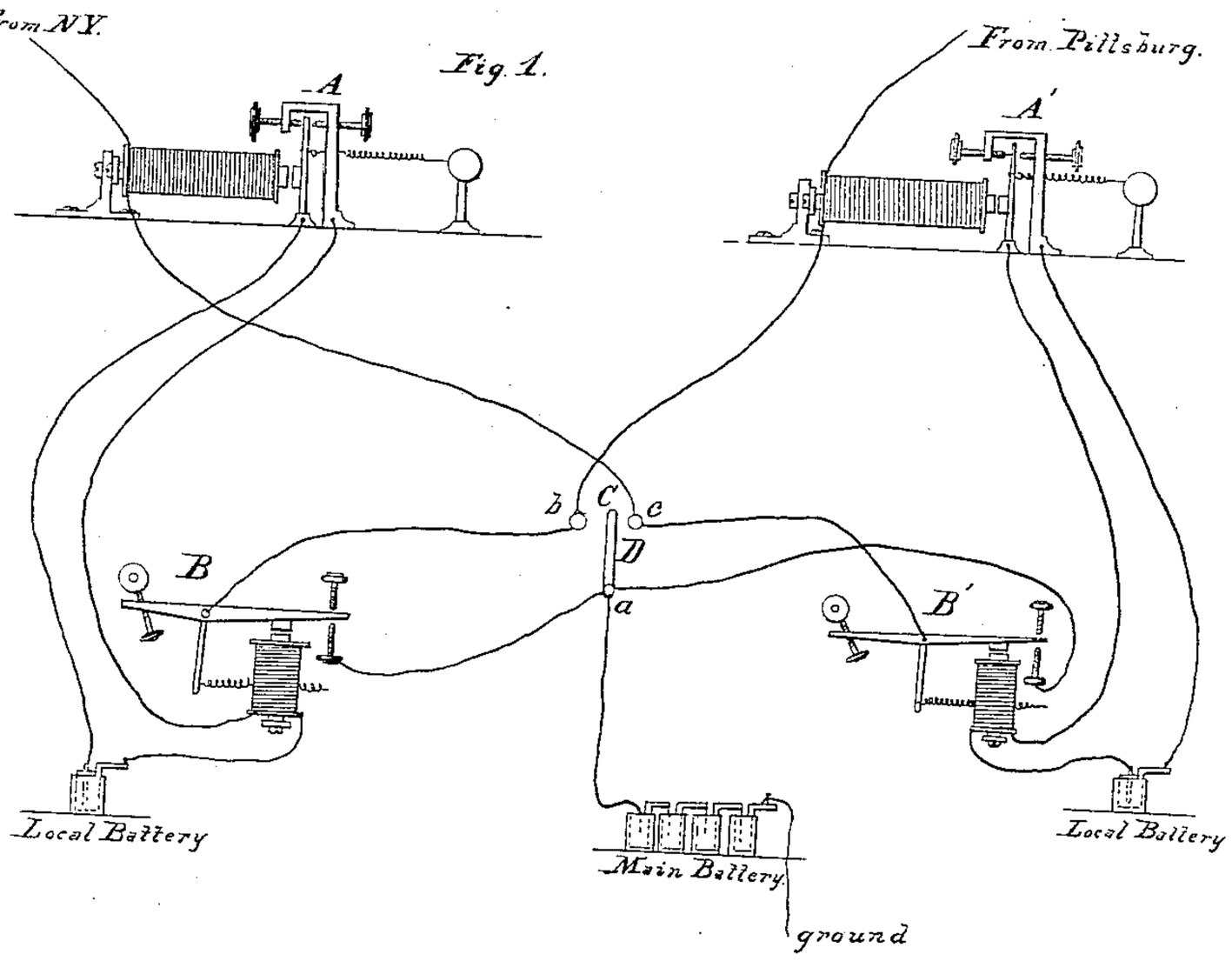
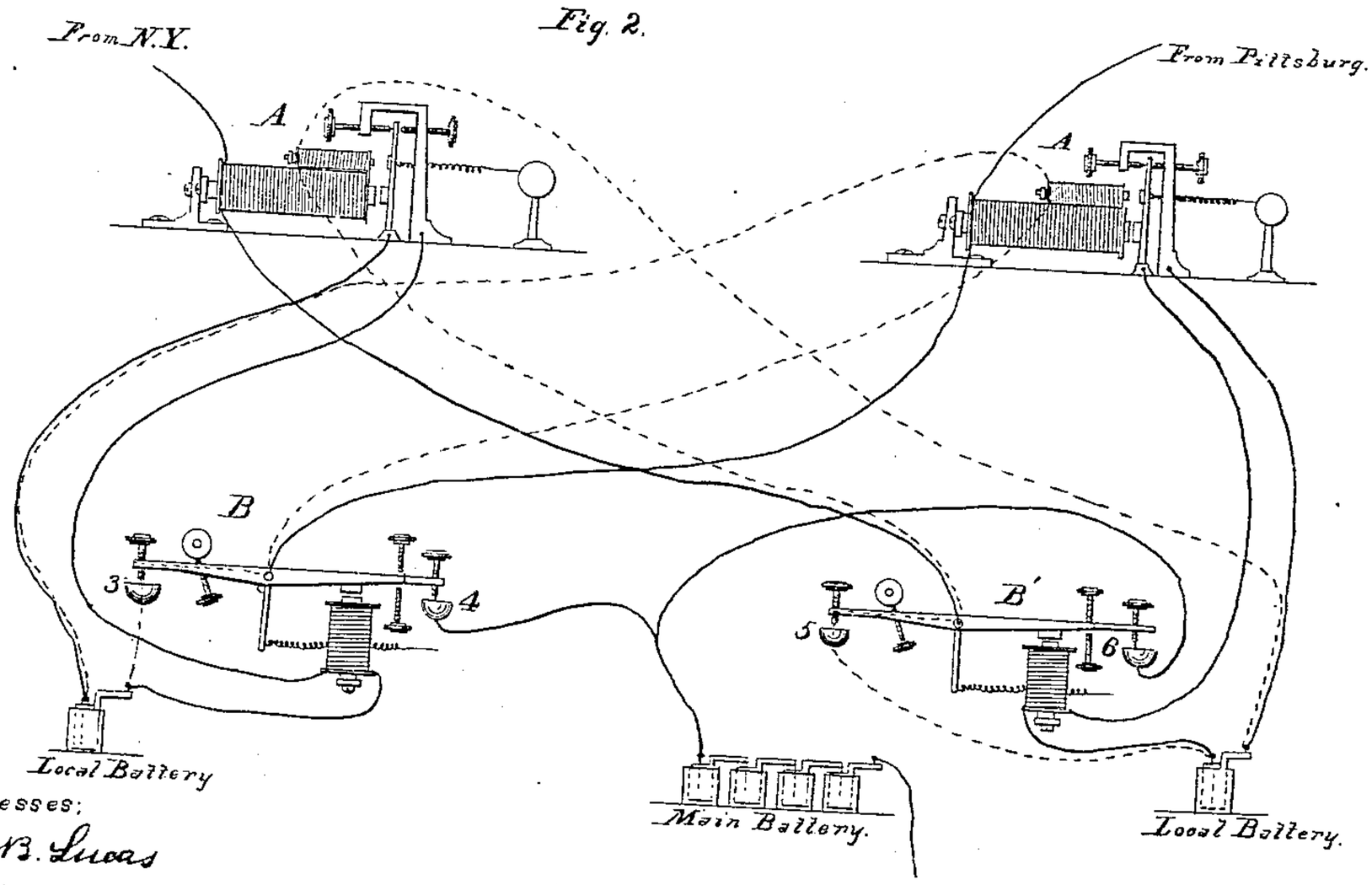


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

JAMES J. CLARK, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN TELEGRAPHIC REPEATERS.

Specification forming part of Letters Patent No. **29,247**, dated July 24, 1860.

To all whom it may concern:

Be it known that I, JAMES J. CLARK, of the city of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Telegraph-Repeaters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and the letters of reference marked thereon, in which—

Figure 1, Plate 1, is a perspective view of my improvement. Fig. 2, Plate 1, is a front view of one portion thereof. Fig. 1, Plate 2, is a front view of the essential parts of a button repeater. Fig. 2, Plate 2, represents another form of my improved repeater.

It has been found that telegraph-lines will not work successfully in longer circuits more than two hundred or three hundred miles. At such intervals, therefore, on long lines it is customary to employ some arrangement by which the breaking and closing of one circuit may be repeated on the next succeeding circuit.

My improvement consists in what is called a "repeater," or an arrangement by which telegraph-lines divided into more than one circuit shall operate with the same advantage as though the whole line were constructed in one long circuit.

The mechanism by which I apply my improvement relates to the repeating-station, or the station at which the terminii of two circuits occur.

In Fig. 1, Plate 1, A and A′ represent two receiving-magnets with extra outer layer or layers of wire insulated from the main wire, and which in the drawings are marked green. Part of these outer layers are removed at C and C′, to show the main wires which surround the magnets, and which in the drawings are marked red.

B and B′ represent two local magnets, with their levers, fulcrums, springs, screws, &c., by which the rewriting is done.

Before proceeding to describe the operation of my improvement I will trace the different circuits.

In the drawings, the main circuit—say from New York, (see drawings)—passes into the receiving-magnet A by the wire *s*, and after passing through the main wire of the receiving-magnet it passes out by the wire *d* to the fulcrum of B′ at *b*, along the lever D to the screw *g*, down the screw *g* to the straight spring *f*, thence by the post *p* to the wire *w*, thence to the wire *h*, thence through the battery to the ground. The main current from Pittsburg (see drawings) passes into the magnet A′ by *s*′, and after passing through the wire on the receiving-magnet it passes out by the wire *d*′ to the fulcrum of B at *b*′, along the lever D′ to the screw *g*′, down the screw *g*′ to the straight spring *f*′, thence by the post *p*′ to the wire *w*′, thence to the wire *h*, thence through the battery to the ground. The current from the positive pole of the local battery, (marked blue in the drawings,) starting from the point *n* proceeds along the wire *k* to the point *x*, through the magnet of B, along the wire *t* to the standard *u*, thence through the screw *y* to the lever *z*, through the fulcrum of the lever, through post *o*, through the wire *v*, thence to *m*, the negative pole of the battery, which completes the circuit through the magnet of B. Another circuit from the same battery, starting from the positive pole at *n*, proceeds along the wire *k*′ to point *x*, thence, by the wire *t*′, through the post *o*′, through the fulcrum of the lever of the receiving-magnet A′, thence down the lever *z*′ through the adjusting-screw *y*′, through the standard *u*′, thence by the wire *v*′ through the magnet of B′, thence to the point *x*′, through the wire *k*′, to the negative pole of the battery at *m*, which completes the circuit through the magnet of B′. The current from another local battery, (which in the drawings is marked H,) starting from the positive pole at *m*, passes into the post *p*, along the wire *l*, thence passing around the outside of the receiving-magnet A with one or more layers of wire, thence along the wire *l*′, to the post *q*, to the other pole of the battery at *n*, which completes the local circuit surrounding the coils of the receiving-magnet A. The current from the other local battery, (which in the drawings is marked J,) starting from the positive pole at *m*, passes through the post *q*′, along the wire *j*, through the wire surrounding the receiving-magnet A′ with one or more layers, and returns by the wire *j*′, through the post *p*′, to the other pole of the battery at *n*, which completes the local circuit surrounding the coils of the receiving-magnet A′.

Fig. 2, Plate 1, is a front view of B or B′,

the repeating or rewriting portion of my apparatus, and consists of a lever, D, operated by a local magnet. At each end of lever D there is an adjusting-screw, *g* and *i*. When the magnet is charged the adjusting-screw *i* rests on its anvil *r*, and the adjusting-screw *g* is so adjusted that it shall not touch the straight spring *f*, and the spring *f* is adjusted by its screw so that it will not touch the anvil *q*. When the circuit is broken in this magnet then the reacting-spring S will draw its end of the lever down and form a contact between *g* and *f*, and, the spring S being stronger than the spring *f*, it will force the spring *f* into contact with the post *q*.

I will now describe the action of my improved repeater in the operation of transmitting a message between two points so distant as to require an intermediate repeating-station, say, from New York to Pittsburg, supposing Philadelphia to be the repeating-station. The description will apply to telegraph-lines using closed circuits.

When the operator at New York breaks the circuit the lever of the receiving-magnet A falls back and forms contact with the adjusting-screw *y*, which closes a local circuit through the magnet of B, which magnet attracts the armature, draws down that end of the lever D′ which breaks contact first between the anvil and the straight spring *f′*, and allows the current from the local battery J to flow through the wires surrounding the outside of the receiving-magnet A′, and simultaneously, or nearly so, breaks contact between the screw *g′* and the straight spring *f′*, which breaks the main circuit from Philadelphia to Pittsburg. The circuit through the receiving-magnet A′ being broken, its lever would fall back by the action of its reacting-spring was it not for the local current, (through green coils,) which has just surrounded the helices. The armature of the receiving-magnet A′ is kept up, so that the repeater B′ may not operate, for if it did it would break the circuit to New York, and the operator there would not be able to close it. When the operator at New York closes his circuit the lever of magnet A will be drawn up and break contact with the screw *y*, which will break the local circuit running through the magnet of repeater B, which will allow the spring S to depress that end of the lever D′ and cause a contact between the screw *g′* and straight spring *f′*, which will close the main circuit through the receiving-magnet A′ to Pittsburg, and simultaneously with this, or nearly so, the straight spring *f′* will be forced into contact with the anvil *q′* and cut off the flow of the local current around the receiving-magnet A. In other words, as New York breaks and closes his circuit it will cause the lever of the receiving-magnet A to vibrate, which vibration will cause a breaking and closing in the local circuit which surrounds the magnet of the repeater B, and the breaking and closing of this circuit will cause the lever D′ to vibrate, which will break and close the main circuit of the receiving-magnet A′ to Pittsburg, and simultaneously with the breaking of this circuit to Pittsburg, or a little before, it will allow the local circuit from battery J to flow around the receiving-magnet A′, and so keep its lever up. When the operator at Pittsburg is writing to New York the same action takes place on the opposite instruments.

Instead of surrounding the receiving-magnets with local coils, as above specified, a small local magnet may be used, having its armature on the lever of the receiving-magnet, as is shown in Fig. 2, Plate 2. The application of this extra local magnet, instead of the local coils surrounding the receiving-magnets, may be optional with the operator.

Fig. 2, Plate 2, represents another form of my improved repeater, in which the arrangement of circuits are slightly varied from those first described. Instead of employing two extra batteries, the register batteries are made use of. There are also two extra local magnets placed respectively upon the tops of the receiving-magnets A and A′, having their armatures attached to the levers of the receiving-magnets. The levers of B and B′ are lengthened, and provided at their ends with small screws having platina points. The ends of these screws dip into mercury-cups, (shown at 3, 4, 5, and 6,) and should be so adjusted that the point of screw 3 shall not leave the mercury in its cup until the point of screw 4 shall have formed contact with the mercury in its cup; and the screws 5 and 6 should be adjusted in the same manner.

The same extra circuits which have been made to hold the levers of the receiving-magnets up can be applied directly to the magnets of the registers or rewriters and thus produce the same effect.

Fig. 1, Plate 2, represents a form of repeater in common use, and known as the "button" repeater. A and A′ represent a front view of two receiving-magnets. B and B′ represent a front view of the magnets, levers, and adjusting-screws of two registers. C represents the button, consisting of three points, *a*, *b*, and *c*, and a switch, D, pivoted on *a*, so as to turn on either of the points *b* or *c*. When the operator at New York wishes to write to Pittsburg, (supposing Philadelphia to be the repeating-station,) the operator at Philadelphia must turn the switch D upon the point *c*, so that the lever of B′ may vibrate without breaking the circuit to New York, for should the circuit to New York be broken by such vibration, the operator at New York would be unable to reclose it, but the circuit to Pittsburg would be broken and closed by the lever of B, which is caused to vibrate by the breaking and closing of the circuit from New York, and all the breaks and closes in the circuit from New York would be repeated in the circuit to Pittsburg. When the operator at Pittsburg wishes to write to New York the switch D must be turned upon

the point *b*, when the same operation as above described will take place in reverse order.

Having thus described my improvement, what I claim, and desire to secure by Letters Patent, is—

The application of springs or mercury-cups, or their equivalents, in conjunction with extra local circuit or circuits, applied in the manner and for the purpose as hereinbefore specified.

JAMES J. CLARK.

Witnesses:
A. B. LUCAS,
WM. H. CLARK.