2 Sheets--Sheet 1.

G. d'INFREVILLE.

Electro-Magnetic Telegraphs.

No. 139,302. Patented May 27, 1873.

Fig. 1.

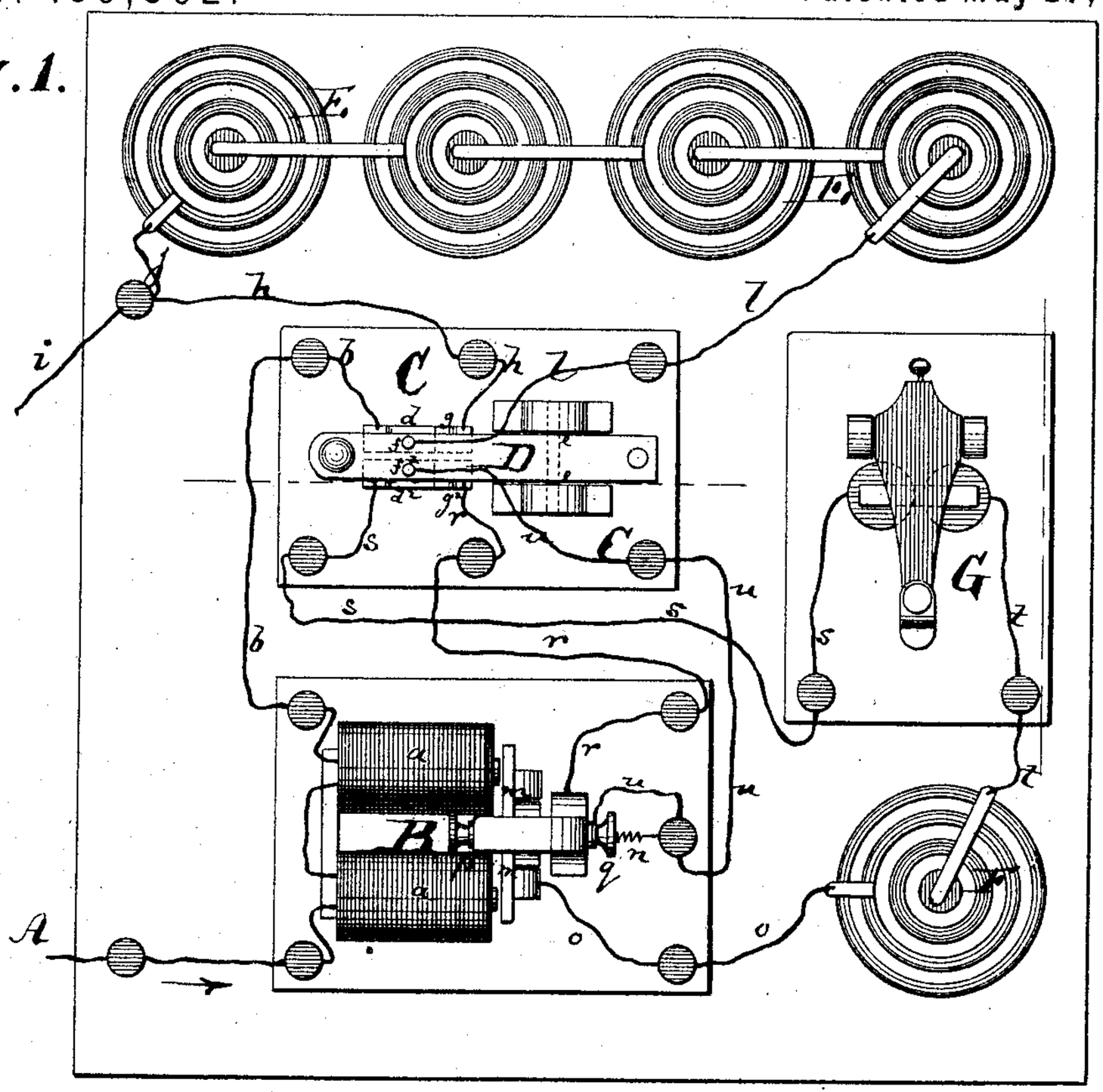


Fig. 2.

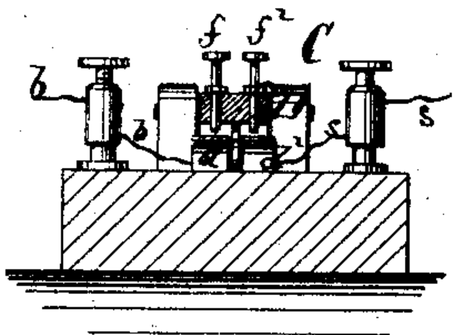


Fig. 3.

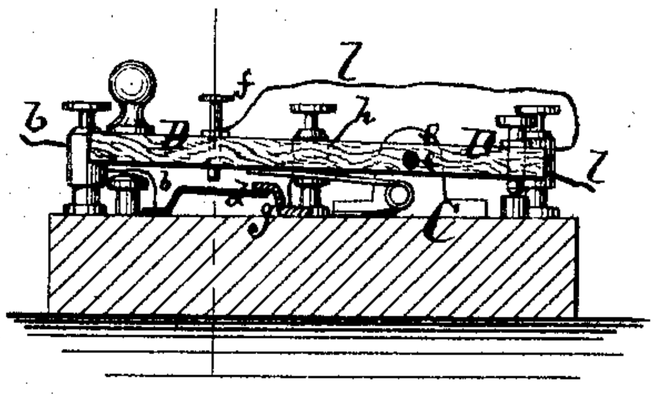
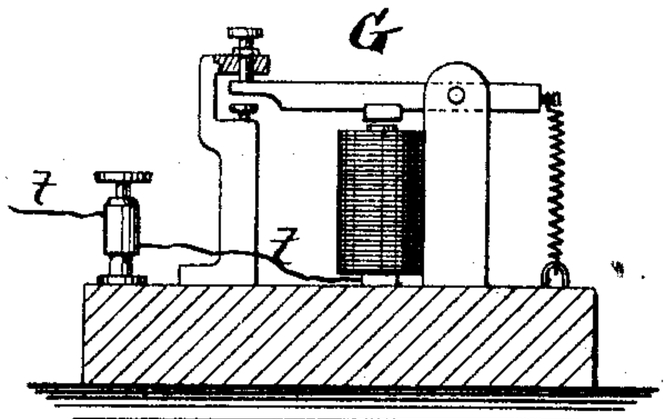


Fig. 4.



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2 Sheets--Sheet 2.

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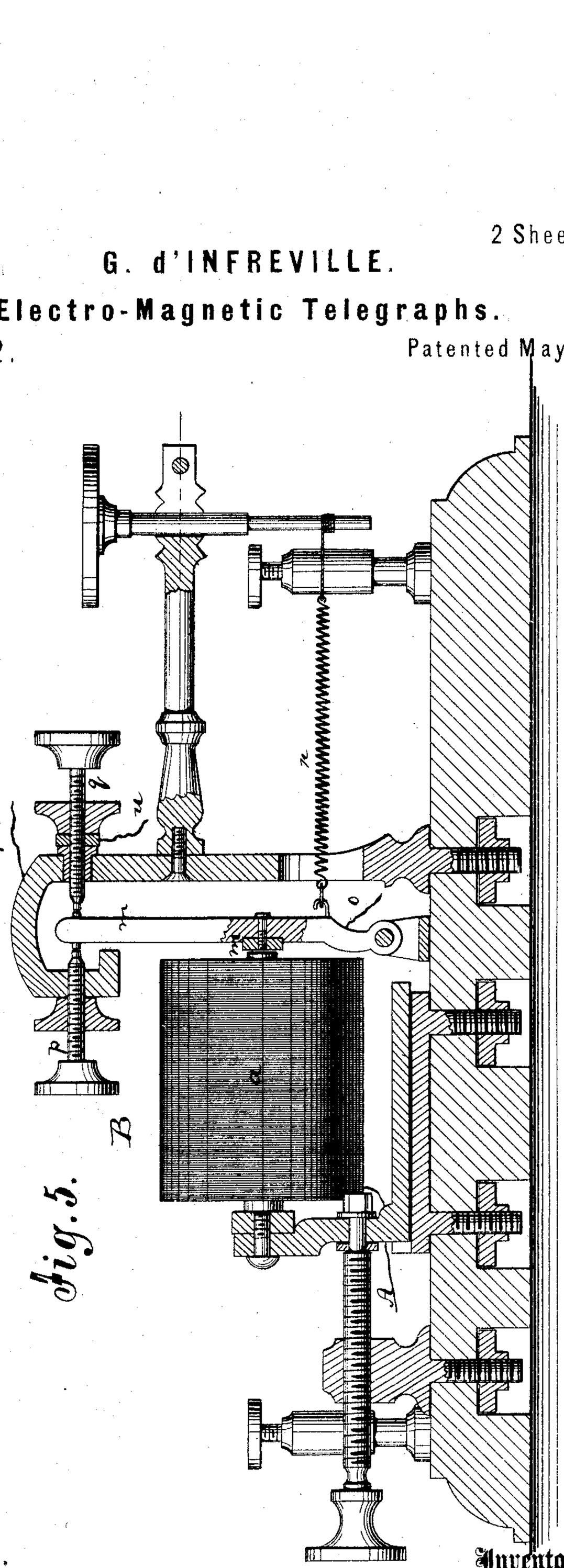
Fig. 6.

Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE D'INFREVILLE, OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRO-MAGNETIC TELEGRAPHS.

Specification forming part of Letters Patent No. **139,302,** dated May 27, 1873; application filed August 10, 1872.

To all whom it may concern:

Be it known that I, GEORGE D'INFREVILLE, of the city, county, and State of New York, have invented a new and Improved Telegraph Instrument, of which the following is a specification:

In the accompanying drawing, Figure 1 represents a top view of my improved telegraph instrument; Fig. 2 is a transverse section of the operating instrument; Fig. 3 is a vertical longitudinal section of the same; Fig. 4 is a side view of the sounder; Fig 5, an enlarged side view, partly in section, of the relay instrument; and Fig. 6 a detail horizontal section through the spring-holding screw, showing how the same is held in place.

Similar letters of reference indicate corresponding parts.

The invention consists mainly in so connecting a telegraph apparatus at two stations that messages may be sent simultaneously from opposite directions over the same wire, and also at different times.

In Fig. 1 of the drawing are shown the instruments which will be required at one station and their respective connections with each other. The other station has substantially the same arrangement, the main wire A connecting directly two relays, B, of the kind shown. When from the distant station a current is sent over the main wire A in the direction of the arrow 1, such current passes through the electro-magnets *a* of the relay B, thence on the wire *b* to a spring, *d*, of the operating instrument C. The lever or key D of this instrument C is pivoted at *e*, and carries a screw or pin, *f*, above the spring *d*, as shown in Fig. 3. But this pin *f*, as long as the lever D is not depressed, is not in contact with the spring *d;* but the spring *d* bears against a metal plate, *g*, from which a wire, *h*, extends to the ground at *i*. E is the battery for transmitting a current to the distant station. This battery connects one pole, by a wire, *j*, with the ground, and the other, by a wire, *l*, with the pin *f*. When the lever D is depressed the spring *d* is brought in contact with the pin *f*, and the current from the wire *l* transmitted to the wire *b*, thence through the electro-magnets *a* to the wire A. The two batteries E, at the two stations, are connected with the main wire A by similar poles. Thus, if the positive pole connects with the wire A at one station it is also the positive pole with which the wire connects at the other, or both connect with the negative poles. When, therefore, the levers D on both stations are depressed at once there will be no current; or, if the batteries are of unequal strengths, no effective current over the wire A, as such wire will then connect the same poles of two batteries. But as soon as one of the levers D is not depressed, while the other is, there will be a current from the battery which is at the station of the depressed lever. The armature *m* of the relay B is attracted by the electro-magnets *a* whenever a current passes through the latter; otherwise it will be withdrawn by the spring *n*. F is the local battery; G, the receiving instrument or sounder. A wire, O, leads from the battery F to direct or metallic connection with the armature-lever *m*. This latter is in contact with a pin, *p*, Fig. 5, hung in the stationary frame of the relay, whenever the main-line current polarizes the magnets *a*. When, however, the armature *m* is withdrawn by the spring *n*, it strikes another pin, *q*, which is fitted through the relay-frame opposite to *p*, as is clearly shown in Fig. 5. The two pins *p* and *q* are insulated from each other in the supporting-frame. A wire, *r*, leads from the pin *p* or from the metallic holder thereof to a plate, g^2, which is close to and similar to the plate *g* under the lever D. This plate g^2 is in contact with a spring, d^2, close to and similar to *d*, from which spring d^2 a wire, *s*, extends to the receiver G. The receiver finally connects, by a wire, *t*, with the local battery F. When, therefore, the armature *m* is attracted to the magnets *a* the current passes from the local battery, *via* the pin *p* and plate g^2, to the sounder, and causes it to operate or sound in conformity to the motions of the armature caused by the currents over the main wire A. There is, however, in the lever D a pin, f^2, near to the pin *f* and above the spring d^2. This pin f^2 connects, by a wire, *u*, with the pin *q*. Whenever, by simultaneous depression of both levers D, the current over the wire A is interrupted, destroyed, or weakened, as stated, the armature *m* on each station will

connect with the pin *q*, thereby establishing a local current *via* the wire *o*, pin *q*, wire *u*, pin f^2, spring d^2, wire *s*, receiver G, and wire *t*. The receiver G will then be operated by the local current, thus deflected over *q* and f^2, in the same manner substantially as it would be if the main-line current operated, for the strokes of the sounder will depend, as before, upon the alternate interruptions and establishments of the main-line current.

Another effect of my new arrangement is that, when one lever D is depressed and the other not, the armature *m* at the operating station remaining attracted to its magnets *a*, the local current at the transmitting-station will be interrupted entirely by the pin f^2, carrying the spring d^2 off the plate g^2.

There is one main wire between two stations, connected with similar poles of the two batteries. When one of these batteries alone is set in action by the depression of the key near it the current passes from it over the wire; when the other battery only is brought into play the current will pass in the opposite direction over the same wire. Thus far all is plain. Now comes into play the invention, which allows the transmission of messages simultaneously in opposite directions over the same wire—not the transmission of simultaneous opposite currents, but of messages. This object is obtained by so connecting the local battery with the relay at each station that it will be set to work and give an impulse to the sounder by the cessation of the current over the main wire. The operator will thereby be enabled to receive a message partly by the main current, if uninterrupted, partly by the induced current when the main is interrupted. Thus, if two parties, A B, telegraph each other, at once, over the same wire, and both depress the keys at once, A will, by B's local induced current, receive a signal as long as B depresses his key; as soon as A raises his key, B's being still depressed, the main current from B's station will go to A and continue the signal, the same as the local gave it to him before. The same will be the effect on B's side. While both keys were depressed B too received a signal by his local, which was put in action by the very absence of the main current toward him; and he too will receive signals, *via* main current, when B raises his key from the main wire. In other words, the local current is in action when the main wire is interrupted, and gives, therefore, a sort of negative message—that is to say, it records at one station the interruptions of the main current produced by the attempt to send a main current from the other station, but only records such interruptions when the same are occasioned by a simultaneous depression of both main keys. Thus simultaneous messages can be sent in opposite directions over the same wire. When the main current is only started at one station both relays will be magnetized so as not to allow the local batteries to come into play.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The connection of one line-wire with the similar poles of two batteries, as and for the purpose set forth.

2. The combination of the relay B having the two screws *p* and *q*, with the lever D having the pins $f\ f^2$, and with the springs d d^2 and plates g g^2, substantially as herein shown and described.

GEORGE D'INFREVILLE.

Witnesses:

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T. B. MOSHER.