(No Model.)

6 Sheets—Sheet 1.

C. G. BURKE.

RELAY AND SOUNDER.

No. 252,927. Patented Jan. 31, 1882.

Fig. 1.

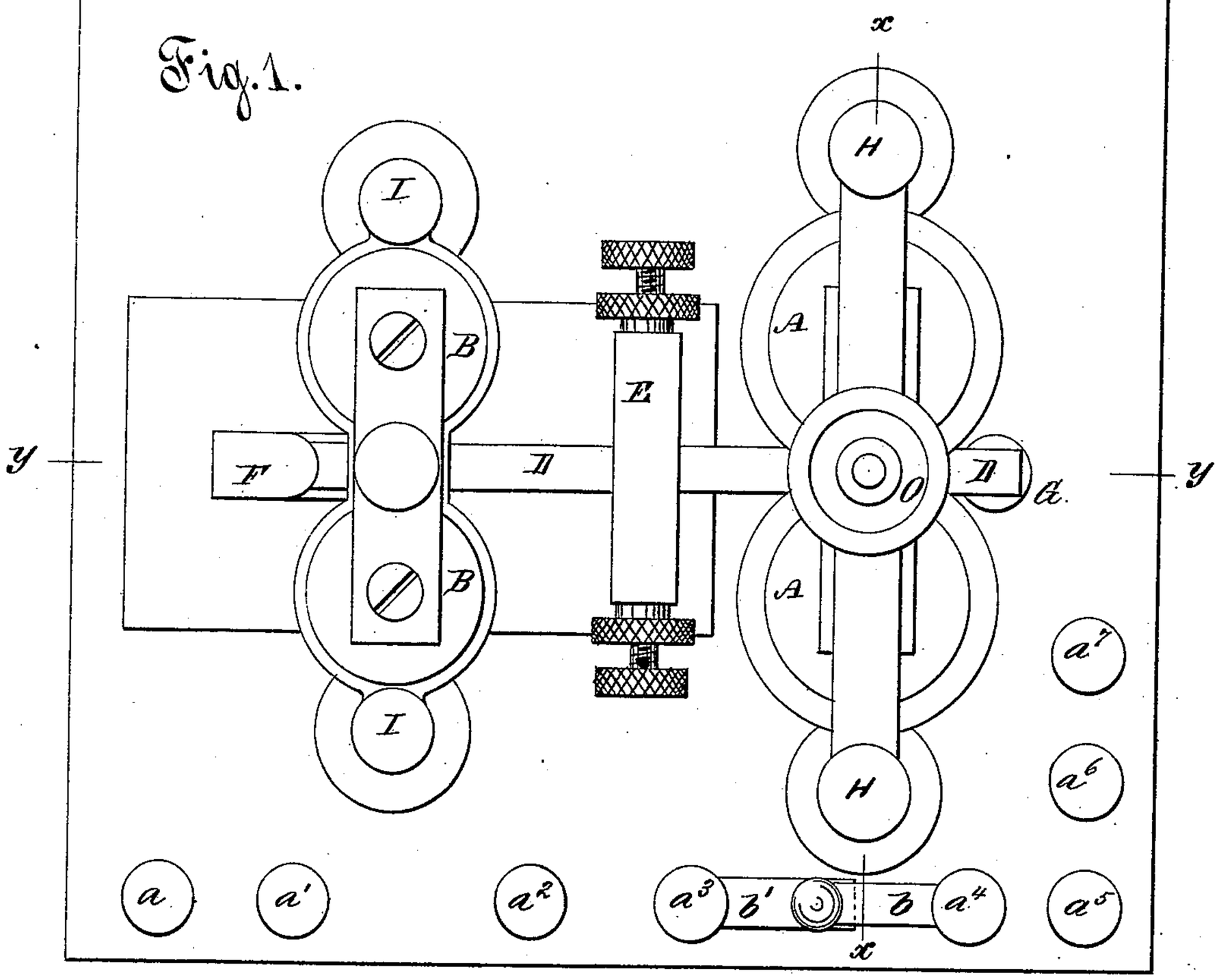
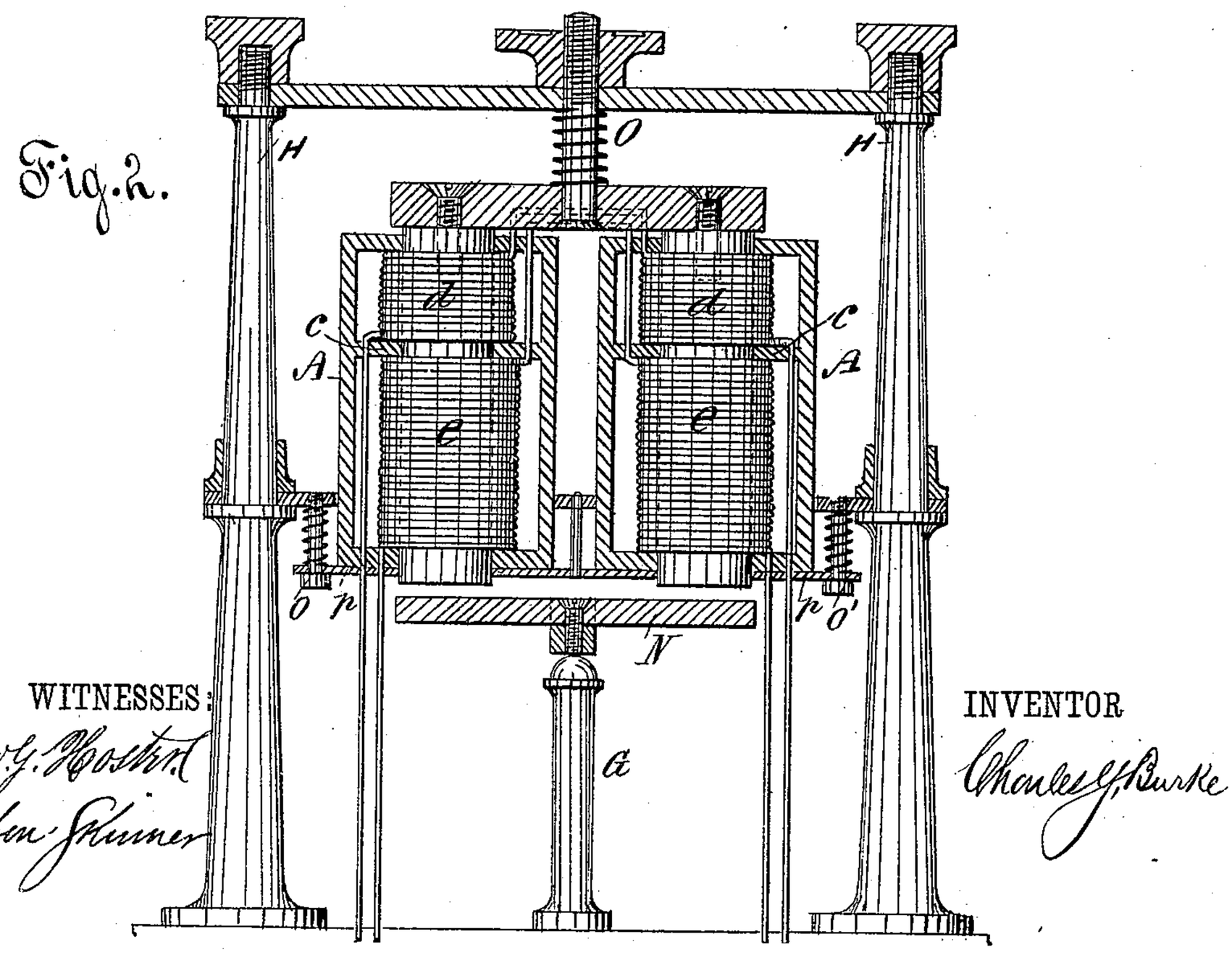


Fig. 2.



WITNESSES:

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RELAY AND SOUNDER.

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Fig. 3.

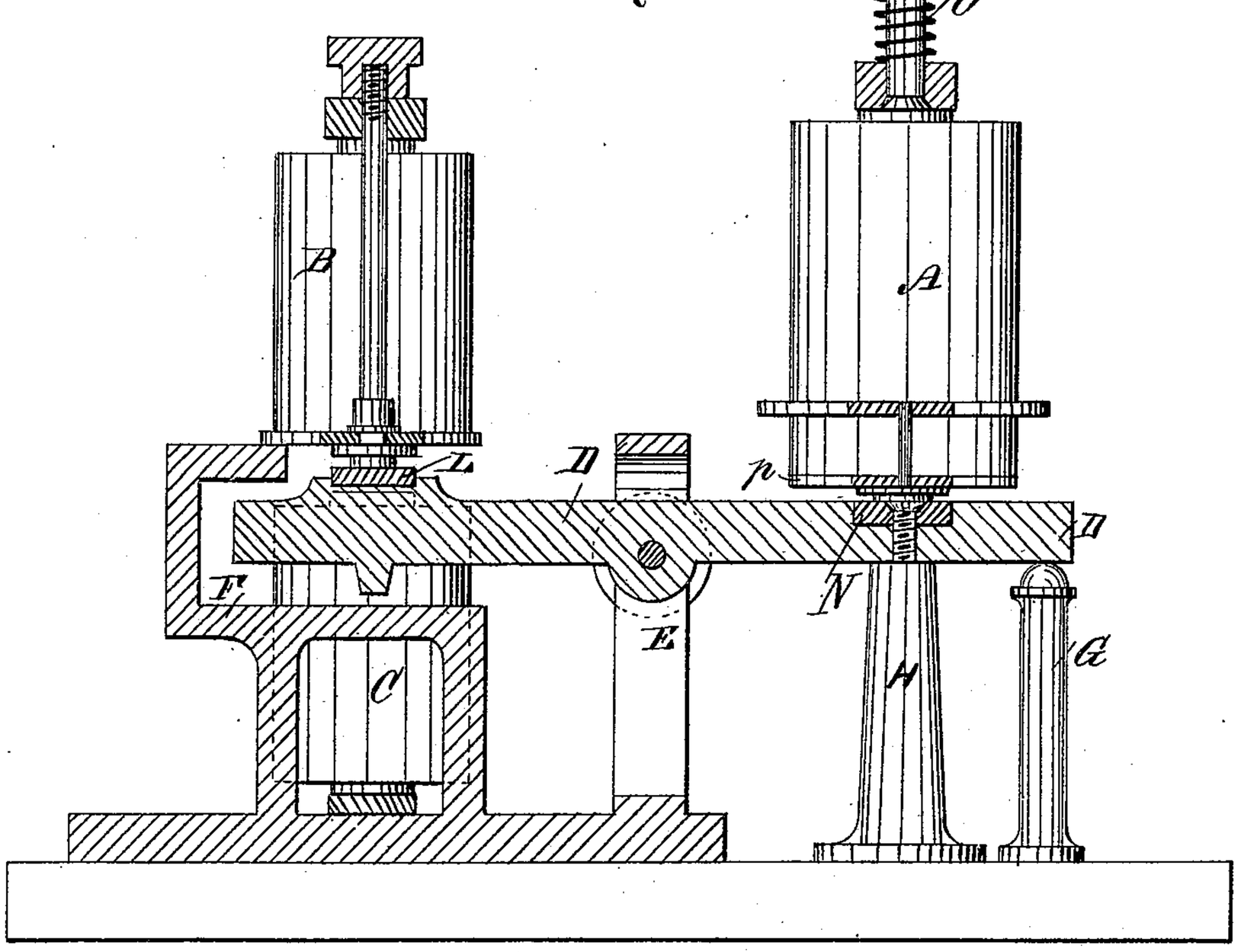


Fig. 4.

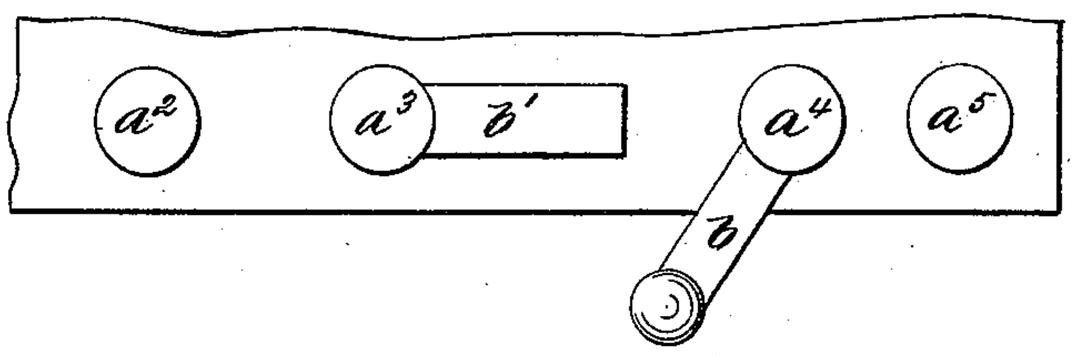
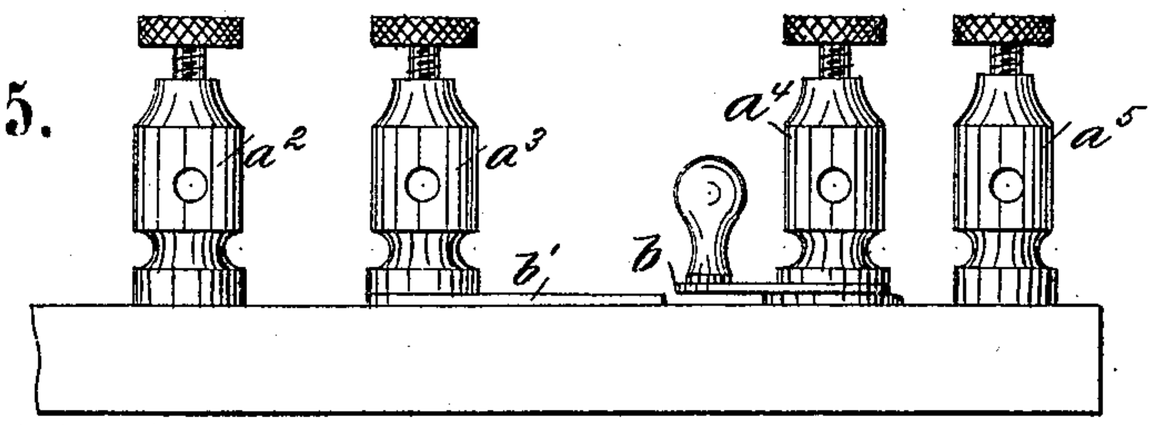


Fig. 5.



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RELAY AND SOUNDER.

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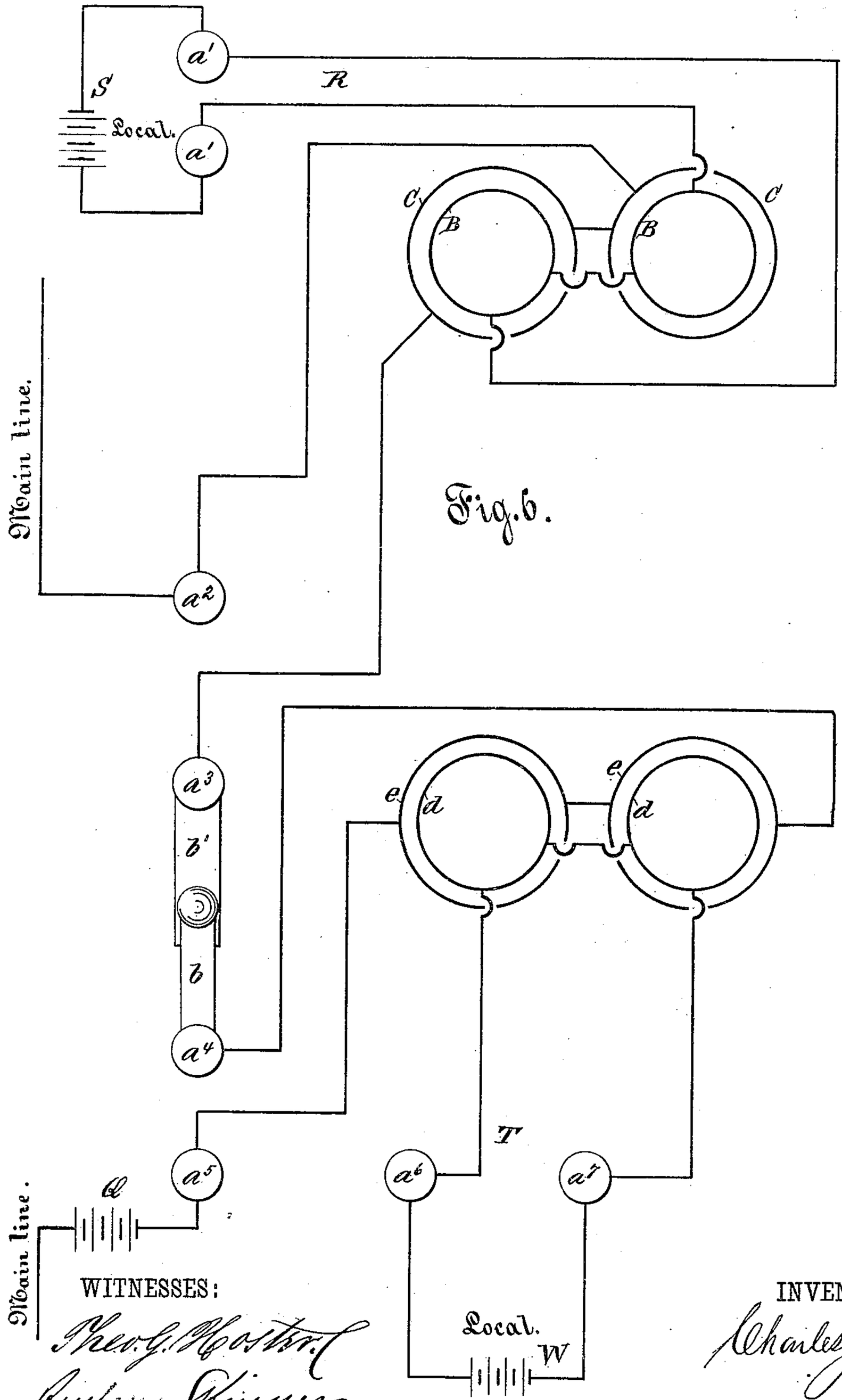

Fig. 6.

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RELAY AND SOUNDER.

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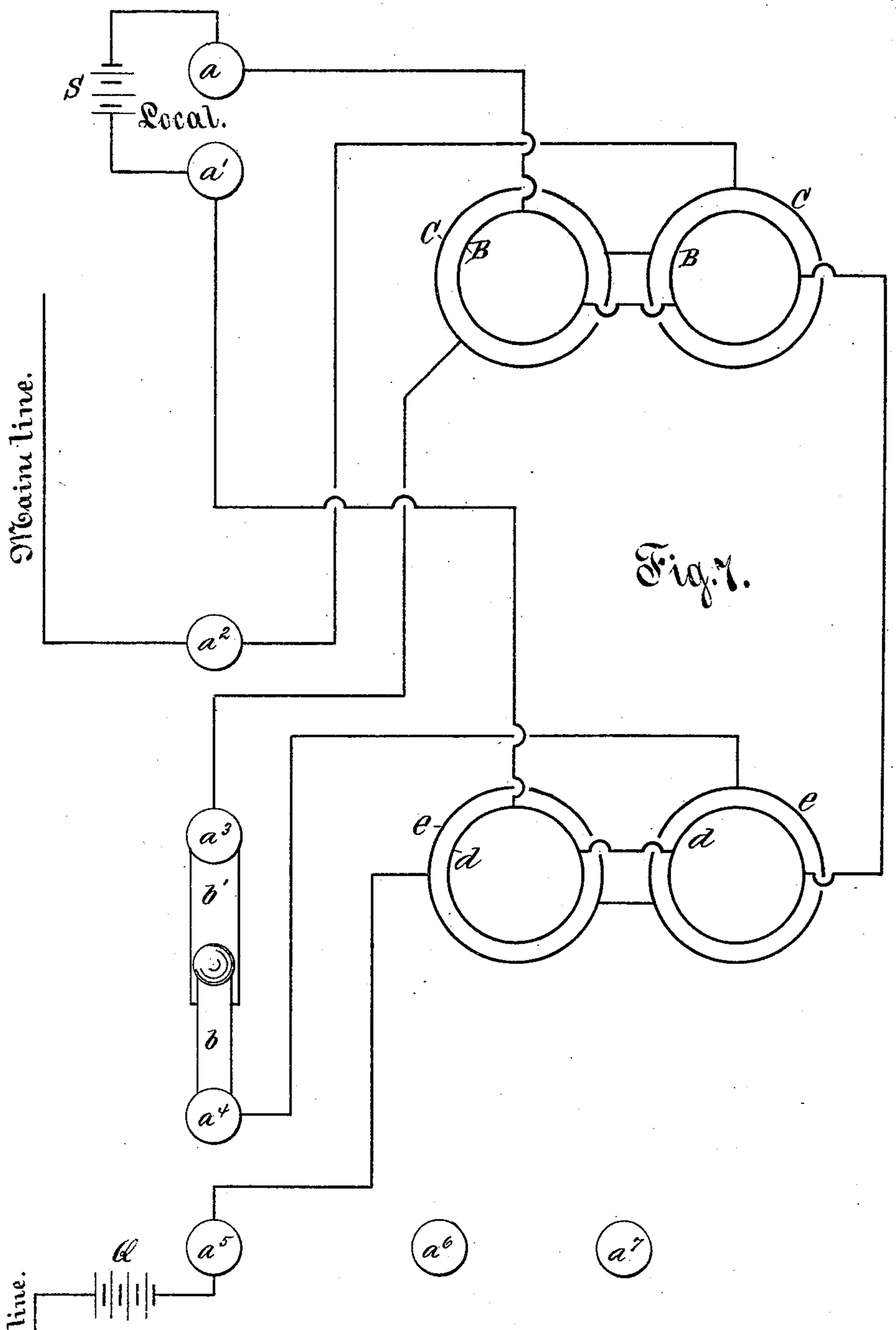

Fig. 1.

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RELAY AND SOUNDER.

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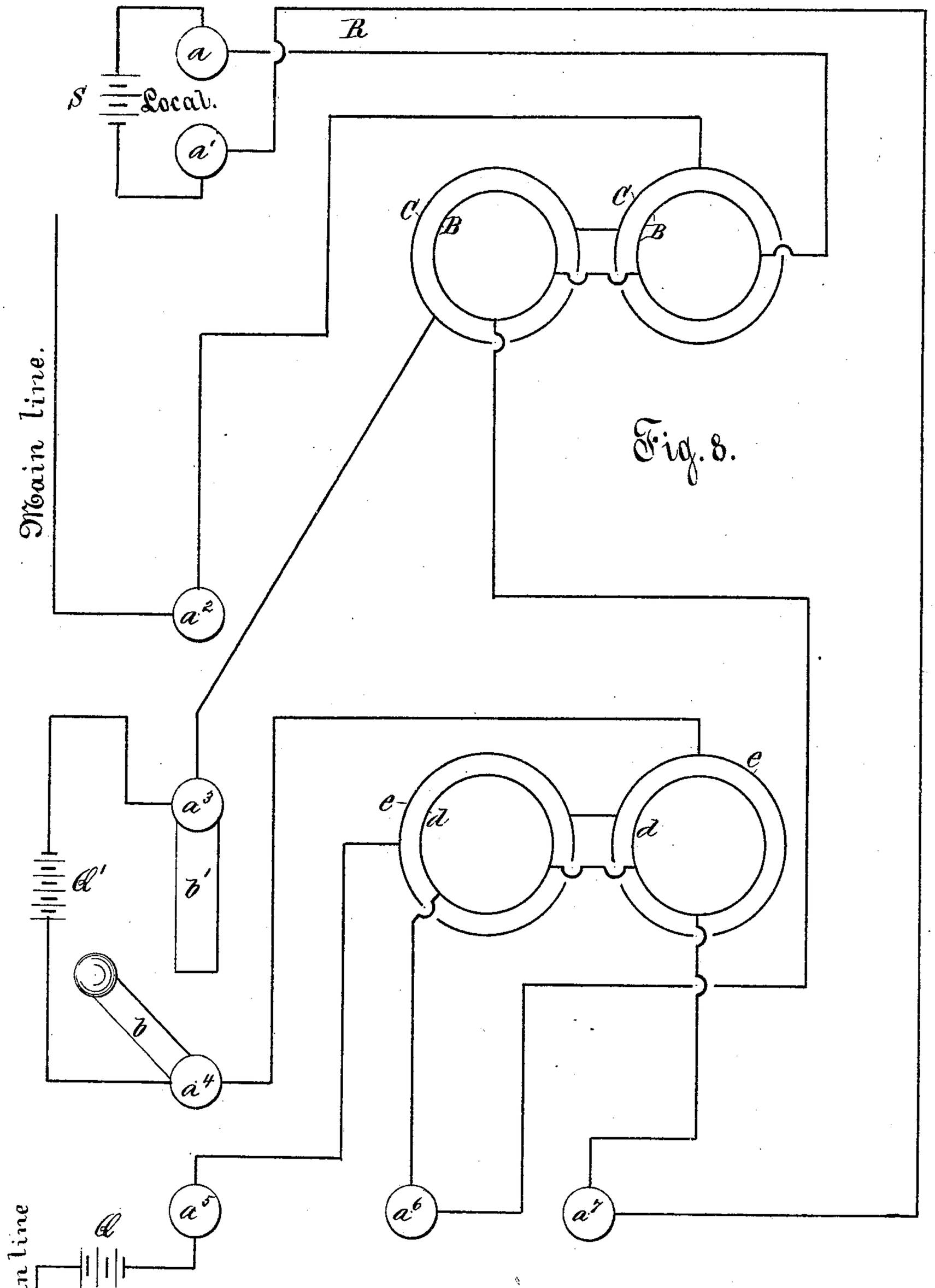

Fig. 8.

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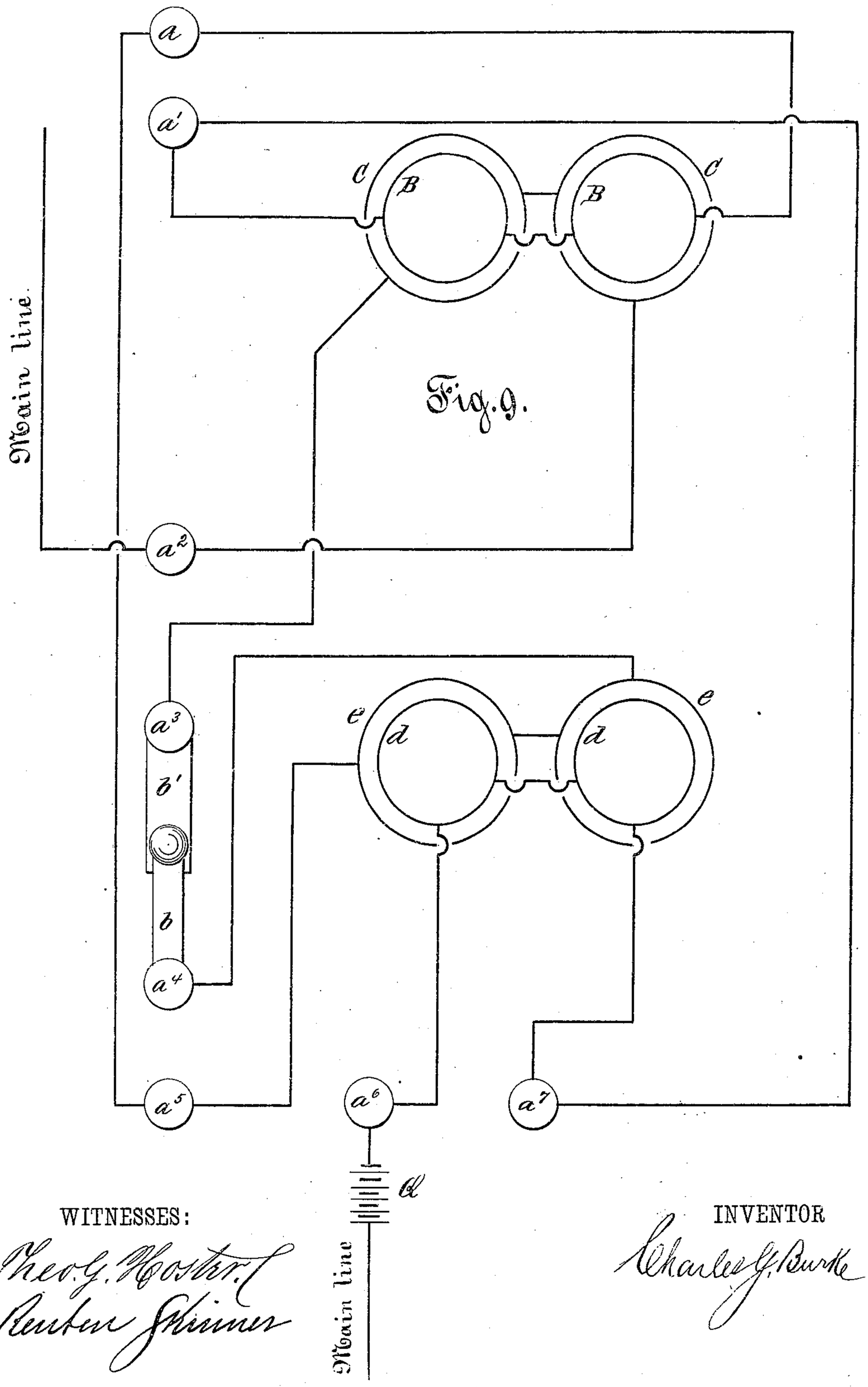

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UNITED STATES PATENT OFFICE.

CHARLES G. BURKE, OF NEW YORK, N. Y.

RELAY AND SOUNDER.

SPECIFICATION forming part of Letters Patent No. 252,927, dated January 31, 1882.

Application filed October 26, 1881. (No model.)

To all whom it may concern:

Be it known that I, CHARLES G. BURKE, of the city and county of New York, and of the State of New York, have made a new and useful Improvement in Telegraphic Relays and Sounders, of which the following is a specification.

The object of my invention is to enable a sounder to be used on long lines or circuits and under varying degrees and conditions of the current without the aid of an intermediate electro-magnetic instrument.

Figure 1 is a top view of an instrument with my improvement. Fig. 2 is a sectional view of same on lines *x x*, Fig. 1. Fig. 3 is a sectional view on lines *y y*. Figs. 4 and 5 are views in detail of a switch-connection shown in Fig. 1. Fig. 6 is a diagram of the courses of the currents in the operation of my improved sounder when two local batteries are employed. Fig. 7 shows the courses of the currents when only one local battery is used. Fig. 8 is a diagram of the currents when one local battery is used in combination with a local or additional main-line battery. Fig. 9 shows the courses of the current when only a main-line battery is employed.

Referring to Figs. 1 and 3, it will be seen that I employ three electro-magnets, marked respectively A B C, and in combination with a common armature-lever, D, which is supported at its center by trunnion E and limited in its vibration by stops F and G. It will further be seen that magnets A and B are supported by frames H and I, that magnet B is not adjustable, but is rigidly affixed to frame I, which supports it above lever D. It will also be seen that magnet C is placed beneath lever D and directly under magnet B, and that its cores, as well as the cores of magnet B, are in magnetic relation to a common armature, L. Magnet A has its own armature N, to and from which it is adjustable by adjustment O.

a a' a² a³ a⁴ a⁵ a⁶ a⁷ are respectively binding-posts, receiving the wires from the magnets and line and local batteries.

b and *b'* is a switch, by which magnets A and C may be connected with and disconnected from each other.

For the purpose of distinction I designate magnets A and C as magnets of attraction and magnet B as a magnet of retraction.

Fig. 2 shows a section of magnet A with its magnet-wires exposed; and it will be seen that the core of this magnet A is wound in two sections by separate and independent coils insulated from each other by a non-conducting division, *c*. The coils *d* and *e* in magnet A are of different resistance, and their wires have separate binding-posts and connections. Coil *d* is of a lower resistance than coil *e*, and has for its binding-posts a^6 and a^7, Fig. 1. Coil *e* is of high resistance, and has for its binding-posts a^4 and a^5. Magnet B, Fig. 3, is of low resistance, its resistance being about the same as that in coil *d* in magnet A, and has for its binding-posts *a* and *a'*. Magnet C is wound with the same resistance as coil *e* in magnet A, and has for its binding-posts a^2 and a^3 respectively. Guard *p*, supported by screws *o* and *o'*, prevents the cores of magnet A from impinging upon armature N.

Referring to Fig. 6, the course of the currents may be traced as follows, it being understood that the circuit of the main line is broken by the ordinary means, in the ordinary way, and for ordinary purposes, it being further understood that where top views are shown, and the courses of the currents of the circles which represent the magnets, the inner ones represent respectively coil *d* in magnet A, and retracting-magnet B. Commencing, then, with main-line battery Q, the current, when the circuit is closed, passes to binding-post a^5; thence to coil *e* of magnet A, through coil *e* to binding-post a^4, through switch *b* and *b'* to binding-post a^3; thence to the coil of magnet C, through magnet C to binding-post a^2, and thence as the line may run. The current of the local circuit R may be traced as follows: Commencing at one pole of battery S, it passes to binding-post *a'*; thence to coil of magnet B, through magnet B to binding-post *a*, and thence to the other pole of battery S. The current of local circuit T may be traced as follows: Commencing at one pole of battery W, it passes to binding-post a^7; thence to coil *d* in magnet A, through coil *d* to binding-post a^6, and thence to the other pole of battery W.

In Fig. 7 it will be seen that the current of the main line traverses the same course as in Fig. 6. The current of the local circuit is as follows: Commencing at one pole of battery S it passes to binding-post *a*; thence to coil

of magnet B, through magnet B to coil *d* in magnet A through coil *d* in magnet A to binding-post *a'*; thence to the other pole of battery S. Battery W may be used in place of battery S, binding-posts a^6 and a^7 being used for connections instead of *a* and *a'*, the course and effect of the current being substantially alike.

In Fig. 8 an auxiliary main-line battery, Q', is placed between magnets A and C, so that its power, as well as that of the other main-line batteries in use, is communicated to these magnets whenever the main-line battery Q is brought into action by the closing of its circuit. The course of the current of the local battery in this combination is identically the same as shown and provided for in Fig. 7.

In Fig. 9 the main-line current is shown to pass directly through magnets B C and both coils of magnet A simultaneously. On the longest lines and under the most adverse condition of the main-line current the combination shown in Fig. 8 can be used to the best advantage, and under such circumstances is to be preferred. I will therefore preferably describe the operation of my improved sounder under such an arrangement.

It will be seen that the power of battery S, Fig. 8, is permanently active through coil *d* in magnet A, and rendering magnet A attractive in its relation to armature N, Fig. 2; that this power is also permanently active in magnet B, and rendering magnet B retractive in its relation to armature L and lever D, Fig. 3, and that therefore the power of battery S is at all times operating in two opposite directions and tending to produce opposite results. As armature-lever D, which is pivoted at or near its center, has arms of equal weight, or nearly so, it is essential that the power of magnet B or the retractile power should at all times be greater than the attractile power of coil *d* exercised through magnet A, and this being so one arm of lever D will be held up and sustained by this excess of power in magnet B, its depressed arm resting on stop G at the same time. This excess of power in magnet B must always be sufficient to overcome the residual magnetism of magnets A and C, the permanent magnetism of magnet A exercised through its coil *d*, and the inertia of lever D when the current of the main-line batteries is interrupted or broken, and to retract promptly the depressed arm of lever D when the same should be retracted. As an equilibrium of power is nearly established as between coil *d* in magnet A and magnet B, only slight impulses of additional energy will be needed to enable magnets A and C to operate lever D in one direction; and when such additional energy ceases then the permanently-existing power of magnet B will operate it in the other direction. This operation of lever D and the resulting impact of its arms with stops F and G alternately defines the nature, value, and meaning of the signal given, and enables the operator to read the same from the sound emitted by and arising from such impact.

Coil *d* in magnet A may be used independently of coil *e* in such magnet A.

Coil *e* in magnet A may be used independently of coil *d*.

Magnet A, with its coils *d* and *e*, or either of them, may be used independently of magnet C or in combination therewith.

Coils *d* and *e* in magnet A may be of equal resistance, and when only a main-line current is used the coils of all the magnets should be of the same, or nearly the same, resistance.

I am aware that it is not new to employ two or more magnets and two or more batteries to operate electro-magnetic instruments, and this I do not claim broadly. Neither is it new to have two distinct coils on a common core, and this I do not claim broadly. Neither is it new to operate a sounder over a long line without the aid of an intermediate instrument; and this I do not claim broadly.

I am also aware that it is not new to employ a local battery in combination with a main or line battery, and to use such local battery for a continuous magnetization of one or more electro-magnets, whether for the purpose of vibrating the same or for producing local effects by a change of polarization or temporary annulment otherwise, or by partial diversion or division, or by shunting, or by other change therein, and this I do not claim; but

What I do claim, and for which I desire Letters Patent, is—

1. In a relay or sounder, the combination of electro-magnet A, with its coils *d* and *e*, electro-magnet B, electro-magnet C, armature-lever D, armatures L and N, trunnion E, stops F and G, supporting-frames H and I, adjustment O, binding-posts *a* *a'* a^2 a^3 a^4 a^5 a^6 a^7, switch *b* and *b'*, battery S, with its closed circuit R, and battery W, with its closed circuit T, substantially as described, and for the purposes set forth.

2. In a relay or sounder, the combination of electro-magnets A, B, and C, double-armed lever D with armatures L and N, support E, stops F and G, magnet-suppports H and I, battery S, and closed circuit R, substantially as described, and for the purpose set forth.

3. In a relay or sounder, the combination of coil *d* in electro-magnet A, electro-magnet B, armatures L and N, lever D, and its support E, stops F and G, magnet-supports H and I, adjustment O, battery W, and closed circuit T, substantially as described, and for the purpose set forth.

4. In a relay or sounder, the combination of electro-magnet C, coil *d* in electro-magnet A, electro-magnet B, armatures L and N, lever D, stops F and G, magnet-supports H and I, battery S, and its closed circuit R, substantially as described, and for the purpose set forth.

5. In a relay or sounder, the combination of

electro-magnet A with its coils *d* and *e*, and electro-magnet C, both attracting armature-lever D from opposite sides of such lever, for the purpose of moving such lever in one direction only, the other or reverse motion of such lever resulting from the force of retractor B, in further combination with such magnets and lever, substantially as described, and for the purpose set forth.

CHARLES G. BURKE.

Witnesses:
GEORGE LESTER,
JOHN SPECK.