No. 618,144. Patented Jan. 24, 1899.

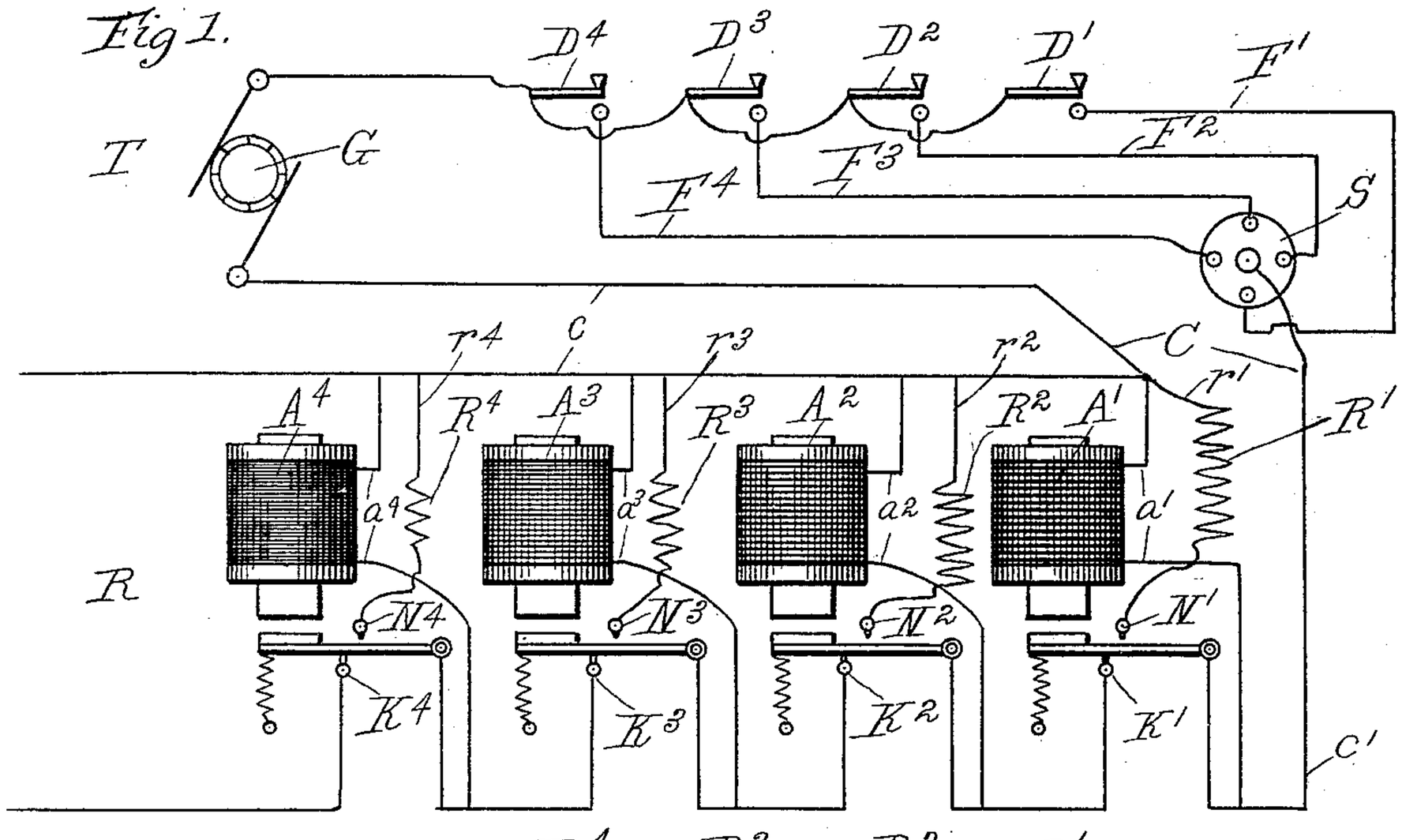
J. S. THOMPSON.

ELECTRICAL SELECTIVE APPARATUS.

(Application filed Oct. 10, 1898.)

(No Model.)

Fig. 1.



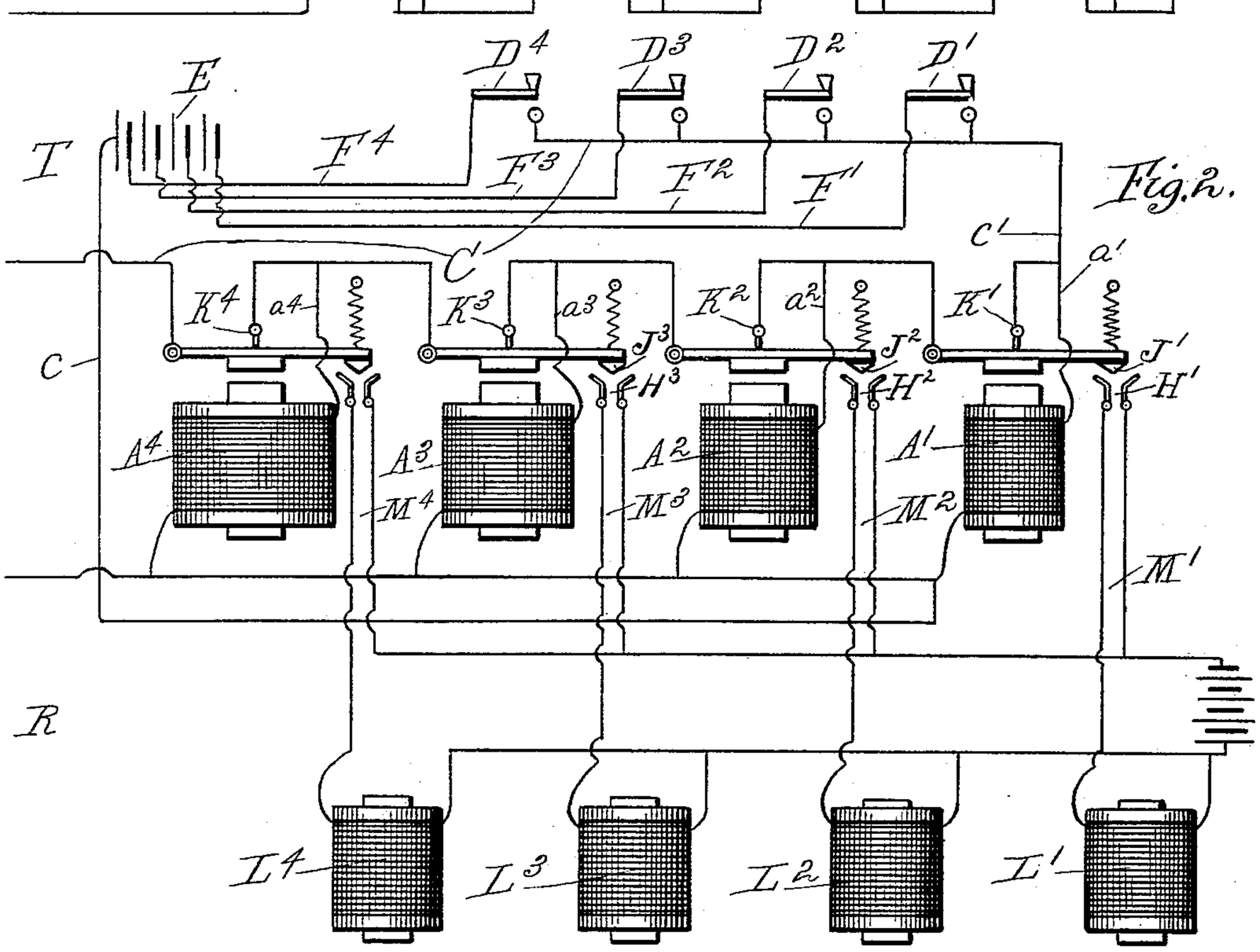


Fig. 2.

Witnesses:
Edward R. Price
C. W. Goodridge

Inventor:
John S. Thompson
by A. Miller Belfield,
Atty.

UNITED STATES PATENT OFFICE.

JOHN S. THOMPSON, OF CHICAGO, ILLINOIS.

ELECTRICAL SELECTIVE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 618,144, dated January 24, 1899.

Application filed October 10, 1898. Serial No. 693,107. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. THOMPSON, a citizen of the United States of America, and a resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Electrical Selective Apparatus, of which the following is a specification.

My invention relates to electrical apparatus which is adapted to permit or cause the separate or individual operation from a removed or distant point of any desired one of a series of devices, such as type-writer keys, signals, and the like.

Prominent objects of my invention are to provide an effective and practical apparatus of the class specified, to simplify the same and its mode of operation as much as possible, to reduce to a minimum its cost of construction and maintenance and the liability of its getting out of order, to allow the number of devices so selectively operated to be made very large, to dispense with mechanical contrivances and adjustments, and to accomplish such results in a simple, inexpensive, and expeditious manner.

To the attainment of the foregoing and other desirable ends, my invention involves matters hereinafter set forth.

In the accompanying drawings, Figure 1 is a diagrammatic view of an electrical selective apparatus or system embodying my invention, and Fig. 2 is a similar view of a slightly-modified form of the same.

The series of devices—such as type-writer keys, signals, and the like—which are to be selectively operated are not shown in the drawings, but are understood to be suitably situated in any desired locality, which will be called the "receiving-station" R. (Lower portion of the drawings.) The removed or distant point from which these devices are to be thus operated will be termed the "transmitting-station" T. (Upper portion of the drawings.) These two stations R and T are connected with one another by a suitable transmitting-circuit C, conveniently shown as consisting of a couple of conductors *c* and *c'*.

In carrying out my invention I locate a series of electromagnetic devices A' A^2 A^3 A^4 at the receiving-station R in suitable position for association with the series of devices which are to be selectively operated. These electromagnetic devices A' A^2 A^3 are so constructed as to be respectively actuated by successively smaller currents—that is to say, the device A^2 is constructed so as to be actuated by a current smaller than that required to actuate the device A', the device A^3 by a current smaller than the one required to actuate the device A^2, and so on. They are also so constructed as to require successively greater periods of time for their actuations—that is to say, the device A^2 requires for its actuation a period of time greater than that required for the actuation of the device A', the device A^3 a period of time greater than that required for the device A^2, and so on. These devices A' A^2 A^3 are connected in the transmitting-circuit C in such a manner as to permit of their acting in accordance with their own characteristics and independently of the characteristics of each other when subjected to the influence of the transmitting-current—as, for example, by connecting them in parallel in the transmitting-circuit. When so connected in parallel, they can be connected with the opposite sides *c* and *c'* of such circuit by a series of bridging conductors or shunts a' a^2 a^3. Furthermore, they are provided with means whereby upon the actuation of any one of them the transmitting-circuit is opened or broken at a point immediately beyond it, so as to, in effect, cut the remaining or the relatively-slower ones out of circuit—that is to say, the device A' is provided with means whereby, upon its actuation, it will break or open the transmitting-circuit immediately beyond itself, so as to, in effect, cut out of circuit the devices A^2 A^3 A^4; the device A^2 being provided with means whereby, upon its actuation, it will, in effect, cut the devices A^3 A^4 out of circuit, and so on. By such construction and arrangement when a current is developed in the transmitting-circuit it will divide among the devices A' A^2 A^3 and tend to energize them all. If the portion of such current traversing the device A' is sufficient to actuate it, this actuation will occur before the actuation of any of the remaining devices in the series and will upon occurring break or open the circuit immediately beyond such device A'. As a result, the other or more slowly

operating devices A^2 A^3 A^4 will, in effect, be cut out of circuit before they have time to act, and the device A′ alone will be actuated.

If the transmitting-current is insufficient to actuate the quickest device A′, but is sufficient to actuate the next succeeding device A^2, the latter will in like manner cut out of the transmitting-circuit all of the devices A^3 A^4 relatively slower than itself before they have time to act. So in this case the device A^2 alone will be actuated. In a similar manner when the transmitting-current is insufficient to actuate the first two devices A′ and A^2, but sufficient to actuate A^3, the latter will cut out of circuit all of the relatively-slower ones A^4 and will alone be actuated, and so on throughout the entire series. So it will be seen that in order to selectively actuate any desired one of the series of devices A′ A^2 A^3 it is only necessary to develop in the transmitting-circuit a current having a size or strength sufficient to actuate such desired device, but insufficient to actuate the relatively-quicker ones. Hence in order to procure the desired selective operation of the series of devices, such as type-writer keys or the like, to be operated it will be necessary to allot the latter to the differentially-operative electromagnetic devices A′ A^2 A^3 and to connect or associate them therewith in such a manner that they will be respectively operated thereby.

It will be observed that the breakage or opening of the transmitting-circuit by the actuation of any one of these devices A′ A^2 A^3 throws into such actuated device and the relatively-quicker ones the current cut off from the relatively-slower ones. By so proportioning the resistances of these devices as to prevent the total current passing through the device or devices relatively quicker than the one actuated, as augmented by the current so shunted, from becoming equal to the current required to actuate such device or one or more of such devices, the latter will not be actuated, and the proper operation of the system will therefore not be affected; but in case it is not desired to so proportion the resistances, or in case it would be inconvenient so to do—as, for example, where the number of devices in the series is very large—there can be incorporated in the apparatus some form of independent means for preventing the action of one or more of the relatively-quicker devices upon the shunting into them of this current.

As a simple arrangement I have shown a series of resistances R′ R^2 R^3, Fig. 1, respectively allotted to and associated with the devices A′ A^2 A^3 and provided with connections whereby each can be thrown into circuit upon the actuation of the device to which it is allotted. In this way upon the actuation of any of the devices A′ A^2 the current shunted from the relatively-slower ones can be diverted from the relatively-quicker ones to a sufficient extent to prevent the latter from receiving an amount sufficient to actuate one or more of them.

As a preferred arrangement the size or amount of each of the resistances R′ R^2 R^3 is equal to the combined resistance of all the devices A′ A^2 A^3 which are cut out of circuit by the actuation of that one of these devices to which it is allotted—that is to say, the resistance R′ is equal to the combined resistance of all the devices A^2 A^3 A^4 cut out of circuit by the actuation of the device A′, the resistance R^2 to the combined resistance of the devices A^3 A^4 cut out of circuit by A^2, and so on. In this way the amount of resistance thrown into circuit upon the actuation of any device is equal to that thrown out, and so the amount of current traversing such device is not changed.

For the differentially-operative devices A′ A^2 A^3 I can employ any style or form of device possessing the characteristics above set forth. The style shown in the drawings consists of suitably-constructed electromagnets provided with spring-controlled armatures. To so construct them, these magnets can be wound either with successively smaller wire, as in Fig. 1, or with a successively greater number of turns of the same-sized wire, as in Fig. 2. It is obvious that in either case the amount of current required for actuation will be successively less throughout the series and also that the self-induction, and consequently the periods of time required for actuation, will be successively greater. If desired, and as a matter of further improvement, these magnets can be so wound with reference to the size of their actuating-currents as to possess throughout the series the same number of ampere-turns when actuated. In such case they will all have the same power, and so, although actuated by different-sized energizing-currents, may do the same amount of work; also, if desired, and as a matter of still further improvement, they may be so wound with reference to the size of their actuating-currents as to be saturated when actuated. In such case they can all be made as small as possible and operated in the most economical way.

The devices to be selectively operated could be associated or connected with their allotted electromagnetic devices A′ A^2 A^3 in any desired way.

Where electromagnets with armatures constitute the devices A′ A^2 A^3, as shown in the drawings, the devices to be operated could be connected with the armatures of such magnets so as to be operated directly thereby by any well-known or suitable mechanical connections, as assumed to be the case in the arrangement of Fig. 1. This is especially desirable and advantageous where the magnets are so made as to have the same power throughout the series, or such devices could be operated through the medium of a series of local electromagnets L′ L^2 L^3, as shown in Fig. 2. In this figure the magnets L′ L^2 L^3 are shown

respectively allotted to the magnets A′ A^2 A^3 and included in local self-exciting circuits M′ M^2 M^3, which are normally open, but are respectively closed by the attraction of the armatures of their allotted magnets A′ A^2 A^3. The means shown for so closing them comprises the contacts J′ J^2 J^3 on the ends of the magnet-armatures and the contact-jaws H′ H^2 H^3 opposite such contacts J′ J^2 J^3. Also when electromagnets constitute the devices A′ A^2 A^3 the relatively slower ones can be conveniently, in effect, cut out of circuit upon the actuation of any one of them by the arrangement illustrated in the drawings. In this arrangement the magnet-armatures are successively included in or arranged to form a part of the side *c′* of the transmitting-circuit at points therein respectively beyond the connections of the branch conductors *a′* a^2 a^3 therewith. They are also held by their retractile springs normally in contact with suitable contacts or anvils K′ K^2 K^3, which are respectively connected with the portions of the side *c′* of the transmitting-circuit respectively leading to the next succeeding magnets. By such arrangement the attraction of any armature withdraws it from its contact or anvil K′ K^2 K^3 and so breaks or opens the side *c′* of the transmitting-circuit at a point between the connections of the magnet of such attracted armature and the next succeeding magnet. Also when electromagnets constitute the devices A′ A^2 A^3 the resistances R′ R^2 R^3 can be readily substituted in the circuit for the cut-out devices by the arrangement shown in the drawings. In this arrangement such resistances are connected by means of conductors *r′* r^2 r^3 with the side *c* of the transmitting-circuit and also with a series of contacts or anvils N′ N^2 N^3. The latter are arranged opposite and normally out of contact with the armatures of the magnets A′ A^2 A^3, but in such position as to make contact with these armatures when they are attracted by their magnets. By such arrangement the attraction of any one of the armatures connects the resistance allotted to its magnet with the opposite sides of the transmitting-circuit and so in parallel with such magnet in such circuit.

Any suitable apparatus could be employed at the transmitting-station for developing in the transmitting-circuit the currents of successively smaller size or strength necessary to selectively actuate the devices A′ A^2 A^3. As illustrative of such apparatus I have shown in the drawings two different forms thereof. That shown in Fig. 1 comprises a series of keys D′ D^2 D^3, respectively adapted to close the transmitting-circuits; a generator G, included in the transmitting-circuit between the side *c* thereof and the keys D′ D^2 D^3; a rheostat or resistance-box S, connected with the side *c′* of the transmitting-circuit and provided with successively larger resistances adapted when included in the transmitting-circuit to cause the current generated by the generator G to assume the successively smaller sizes or strengths necessary to actuate the various electromagnetic devices A′ A^2 A^3, and a series of conductors F′ F^2 F^3, connecting the anvils of the keys D′ D^2 D^3 in succession with the successively larger resistances of the rheostat S, whereby the depression of any one of the keys D′ D^2 D^3 will close the transmitting-circuit and throw thereinto the corresponding one of the successively larger resistances of the rheostat S. The means shown in Fig. 2 comprises similar keys D′ D^2 D^3 and connecting-conductors F′ F^2 F^3, and a battery E, having one terminal connected with the side *c* of the transmitting-circuit and the other connected with the conductor F′, and also having successively smaller portions of itself connected in succession with the conductors F^2 F^3, whereby, in addition to closing the transmitting-circuit, the key D′ will, when depressed, throw thereinto all of the battery E and the keys D^2 D^3 successively less portions thereof, it being understood, of course, that the battery E and portions thereof so thrown into circuit are adapted to develop therein the successively smaller currents necessary to properly actuate the electromagnetic devices A′ A^2 A^3. In both arrangements the depression of key D′ will cause the independent actuation of the device A′, and therefore the independent operation of that one of the series of devices to be operated allotted thereto and associated therewith. The depression of the key D^2 will likewise cause the independent actuation of the device A^2, and therefore the independent operation of its allotted and associated device, and so on throughout the entire series.

From the foregoing it will be seen that the apparatus embodying my invention is practical and efficient; that it is exceedingly simple both in construction and mode of operation; that its action is sure and unfailing; that it involves a minimum number of very simple parts, and so is inexpensive to construct and maintain, and that it dispenses with the many mechanical contrivances and adjustments heretofore employed in devices for accomplishing the same result.

What I claim as my invention is—

1. An electrical selective apparatus, comprising a series of electrical devices which are constructed so as to be actuated by successively smaller currents and also so as to require successively greater periods of time for actuation, and which are arranged and connected so as to cause their action to be controlled entirely by their respective characteristics; and means whereby, upon the actuation of any one of said devices, the relatively-slower ones are in effect rendered inoperative.

2. An electrical selective apparatus, comprising a series of electromagnetic devices which are constructed so as to be actuated by successively smaller currents and also so as to require successively greater periods of time

for actuation, and which are connected in parallel with one another; and means whereby, upon the actuation of any one of said devices, the relatively-slower ones are in effect disconnected.

3. The combination with an electrical selective system comprising a series of electromagnetic devices which are so constructed as to be actuated by successively smaller currents, and also so as to require successively greater periods of time for actuation, and which are connected in parallel with one another; and means whereby, upon the actuation of any one of said devices, the relatively-slower ones are in effect disconnected: of a series of devices to be selectively operated, respectively allotted to said electromagnetic devices, and associated therewith in such manner as to be operated by their actuation.

4. The combination with a transmitting-circuit, and with means for developing therein currents of different predetermined sizes or strengths, of a series of electromagnetic devices which are constructed so as to be actuated by successively smaller currents, and also so as to require successively greater periods of time for actuation, and which are connected in parallel in the transmitting-circuit; and means whereby, upon the actuation of any one of such devices, the relatively-slower ones are in effect cut out of circuit.

5. The combination with a series of electromagnetic devices which are constructed so as to be actuated by successively smaller currents and also so as to require successively greater periods of time for actuation, and which are connected in parallel with one another; of means whereby, upon the actuation of any one of said devices, the connections to relatively-slower ones are broken or opened; and means whereby, upon such actuation, the current shunted from the devices so disconnected, is prevented from actuating one or more of the relatively-quicker ones.

6. The combination with the transmitting-circuit, and with means for developing therein currents of predetermined different sizes or strengths, of a series of electromagnetic devices which are constructed so as to be actuated by successively smaller currents and also so as to require successively greater periods of time for actuation, and which are connected in parallel in the transmitting-circuit; means whereby, upon the actuation of any one of said devices, the relatively-slower ones are in effect cut out of circuit; and a series of resistances allotted to said devices, and each provided with means whereby it is thrown into circuit upon the actuation of its allotted device.

7. The combination with the transmitting-circuit and with means for developing therein currents of different predetermined sizes or strengths, of a series of electromagnetic devices which are constructed to be actuated by successively smaller currents in successively greater periods of time, and also so as to have the same power when actuated, and which are connected in parallel in the transmitting-circuit; and means whereby, upon the actuation of any one of such devices, the relatively-weaker ones are in effect cut out of circuit.

8. The combination with the transmitting-circuit, and with means for developing therein different-sized currents, of a series of electromagnetic devices which are constructed so as to be actuated by successively smaller currents in successively greater periods of time, and which are connected in parallel in the transmitting-circuit; means whereby, upon the actuation of any one of such devices, the relatively-weaker ones are in effect cut out of circuit; and a series of normally open local self-exciting circuits respectively allotted to said devices and each provided with means whereby it is closed upon the actuation of its allotted device, and also with an electromagnet or other translating device.

9. The combination with the transmitting-circuit, and with means for developing different-sized currents therein, of a series of electromagnets constructed so as to be energized by successively smaller currents in successively greater periods of time, and connected in parallel in the transmitting-circuit; a series of resistances respectively allotted to such magnets and made equal in amount to the combined resistances of all the magnets relatively slower than the one to which it is allotted; and means whereby, upon the energization of any magnet, the relatively-slower magnets are thrown out of circuit, and its allotted resistance thrown into the same.

Signed by me, at Chicago, Illinois, this 8th day of October, 1898.

JOHN S. THOMPSON.

Witnesses:
A. MILLER BELFIELD,
MARY F. LINCOLN.

It is hereby certified that in Letters Patent No. 618,144, granted January 24, 1899, upon the application of John S. Thompson, of Chicago, Illinois, for an improvement in "Electrical Selective Apparatus," errors appear in the printed specification requiring correction, as follows: In line 110, page 2, the semicolon after the word "work" should be stricken out and a period inserted instead, and the following word "also" should commence with a capital A, making a new paragraph, and line 131, same page, the comma after the word "series" should be stricken out and a period inserted instead, and the following word "or" should commence with a capital O, making a new paragraph; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 7th day of March, A. D., 1899.

[SEAL.]

WEBSTER DAVIS,
Assistant Secretary of the Interior.

Countersigned:

C. H. DUELL,
Commissioner of Patents.