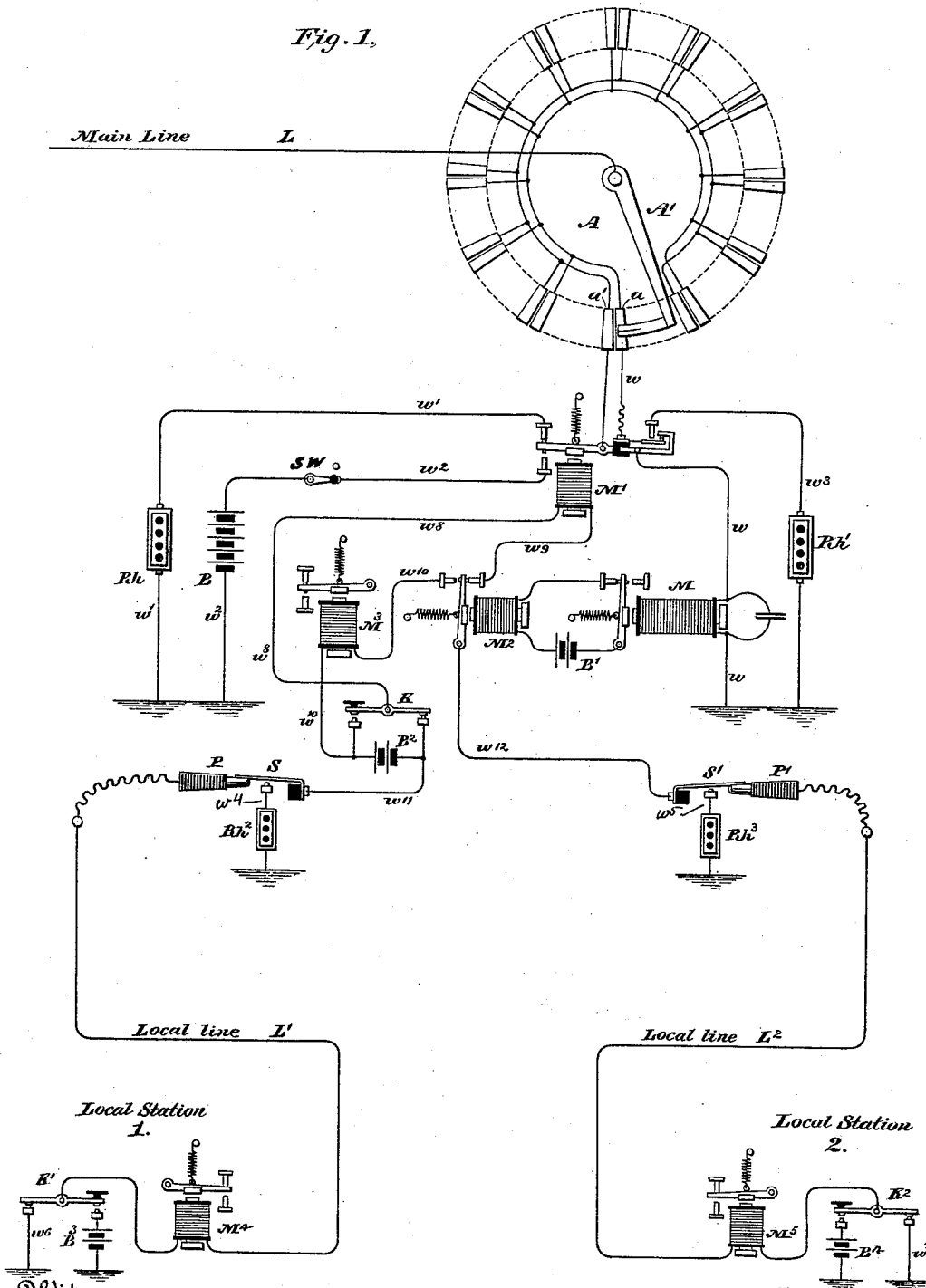


R. G. BROWN.
MULTIPLEX SYNCHRONOUS TELEGRAPH.

No. 423,901.

Patented Mar. 25, 1890.

Fig. 1.



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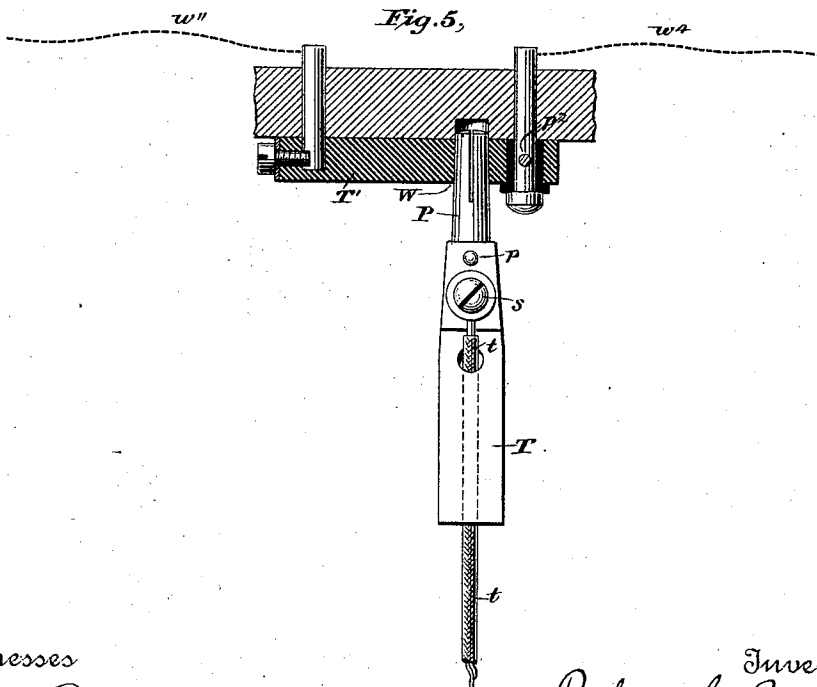
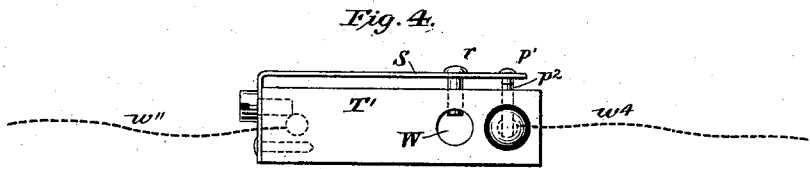
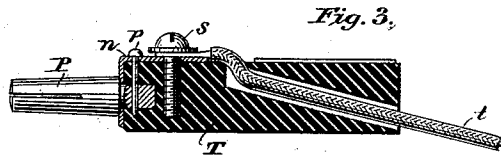
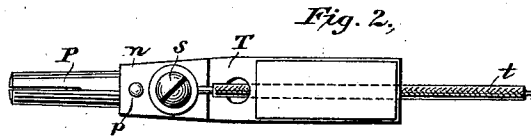
(No Model.)

2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

ROBERT G. BROWN, OF BROOKLYN, NEW YORK.

MULTIPLEX SYNCHRONOUS TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 423,901, dated March 25, 1890.

Application filed April 27, 1889. Serial No. 308,879. (No model.)

To all whom it may concern:

Be it known that I, ROBERT G. BROWN, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have made a new and useful invention in Telegraphy, of which the following is a specification.

My invention relates particularly to improvements in that branch of the telegraphic art in which intercommunication is had between several operators through instruments located at two or more outlying stations, and has special application in the adaptation of this type of intercommunication between the several telegraphic operators located at each end of that class of telegraphic apparatus known as "synchronous multiplex telegraphs," and in which each operator has the use of the line for intervals of time sufficient to permit him to transmit messages to a distant station; and its object is to devise an apparatus in which these several operators may communicate with each other at will or with outlying local apparatus on local lines at each station, the arrangement being such that each and all of the operators in the entire system may at their pleasure interchange signals.

To this end my invention consists in the apparatus hereinafter described, and particularly pointed out in the claims which follow this specification.

In a prior patent granted to me on the 11th day of January, 1887, and numbered 355,860, I have disclosed an arrangement of circuits whereby any one of a series of operators located at a central multiplex station may communicate with any outlying local station on some particular circuit, and at the same time communicate with some particular operator at the distant central station, and also with some particular operator at an outlying local station in the vicinity of said distant central station.

My invention is an improvement upon the arrangement of circuits disclosed in said patent, in that I have devised means whereby general intercommunication may be had between all of the operators both at the central and at outlying local stations at will.

In order that my invention may be fully understood, reference is had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view of a main line or central station in a system of multiplex synchronous telegraphy, showing the apparatus for one of the main-line operators with two outlying local lines, and operators' instruments located at distant local stations, and my improved arrangement for connecting up the circuits thereto. Figs. 2, 3, 4, and 5 are detail views of switch-plugs and connections for connecting the respective circuits.

A represents a circle of insulated segments of a system of synchronous telegraphy, said segments being connected together in accordance with the principle enunciated in my prior applications, Serial Nos. 194,302 and 194,303, filed in the United States Patent Office on the 6th day of March, 1886, the segments for one operator's instruments only being shown, and A' represents the trailing arm connected by the main line L to an entirely similar system located at the distant central station.

The series of segments a' are connected to the armature-lever of the transmitter-magnet M', the back contact of which is connected, through the conductor w' and rheostat R h , to earth, while the series of contacts a are connected through an insulated spring-contact borne by the same armature-lever and by wire w , through relay-magnet M, to earth.

M is the main-line relay-magnet, actuated by electrical impulses through the series of segments a from the distant station, transmitted from a main-line battery similar to B, located at said station, as fully described in my prior application above referred to.

The arrangement of circuits herein shown, embracing the wires $w w' w^2 w^3$ and rheostats R h and R h' , together with the peculiar construction of the armature-lever of magnet M' and its spring-contact with the arrangements of segments a and a' , whereby the receiving-relay M is actuated by the discharge of the line, and method of operation of such apparatus constitute subject-matter of two applications for patents filed as above specified, and are only shown here to illustrate the application of the present invention to systems of multiplex synchronous telegraphy, the same being equally applicable to all well-known forms of multiplex synchronous telegraphs.

L¹ and L² represent two outlying local

lines running from the central station to outlying offices and including receiving-instruments M^4 and M^5 , with keys K' and K^2 , and open-circuit batteries B^3 and B^4 , said lines being earthed through wires w^6 and w^7 and the front contact of the keys K' and K^2 . These lines are connected to the central-station operator's instrument through the switch-plugs P and P' , springs S and S' , wires w^{11} and w^{12} , key K , and armature-lever of magnet M^2 , and wires w^8 and w^9 , and magnet M' .

Two earth-circuits w^4 and w^5 contain adjustable rheostats R/h^2 and R/h^3 , each substantially equal in resistance to the local lines L' and L^2 , which they replace when the switch-plugs P and P' are removed, so that when said local lines are disconnected or are connected through their respective switch-plugs with any circuit, either jointly or singly, the particular sets of central-station instruments will be earthed through said wires, and the adjustments of transmitter M' will therefore not require changing.

It will of course be understood that there may be an indefinite number of these local circuits with analogous switch-plug mechanism located upon a central-station switch-board, whereby any order of connections may be made either with the single main line L or one or more additional lines provided with similar central apparatus.

I have only shown two such local circuits and connections in order that my invention may be fully understood, such connections as I have referred to being mere duplications and at once obvious to those skilled in the art.

Sw is a switch in circuit w^2 for disconnecting battery B when local operators at stations 1 and 2 are operating and do not wish their signals to be transmitted to the distant station over main line L .

The details of the switch-plugs are shown in Figs. 2, 3, 4, and 5, in which T is an insulating base-block, and P is the metallic plug, connected through the metallic pin p to a metallic plate n and by a screw s to an ordinary flexible conducting-cord t , t being in turn connected to either of the local wires L' or L^2 .

T' is a metallic block carrying a metallic spring S , which has a pin r extending through a hole in said block to the plug-hole W . This spring S and metallic block T' are connected to the wire w^{11} or w^{12} , while the free end of said spring carries a contact-point p' , adapted to contact with a fixed insulated contact p^2 , which latter in turn is connected to the earth-wires w^4 or w^5 .

When the plug is in position, as shown at Fig. 1, the metallic plugs P and P' are in contact with the springs S and S' through the metallic block T' . (Shown in Fig. 4.)

The operation of the apparatus is as follows: Suppose the synchronizing-arm at the distant station to be revolving in unison with the arm A' and the circuit-connections at the station to be identical with those indicated

in Fig. 1, and suppose the main-line operator at that station to close the key corresponding to the key K . In that event a series of impulses will come over the line L through the trailer A' in a manner described in my prior applications above referred to, and the line will discharge itself through the wire w , spring-contact on the armature of M' , wire w , magnet M , to earth. This energizes the magnet M and causes its armature to be drawn forward, thus breaking the circuit of the battery B' , demagnetizing the magnet M^2 , and allowing its armature to fall on its back-stop, when a circuit will be closed from the battery B^2 as follows: Passing from one pole by w^{10} , magnet M^3 , armature of magnet M^2 on its back-stop, wire w^{12} , spring S' , switch-plug P' , local line-wire L^2 , outlying receiving-instrument M^5 , and key K^2 , located at station 2, by wire w^7 , and thence to the earth-wire w^6 at station 1, thence through key K' , magnet M^4 , and the other local outlying line L' , switch-plug P , spring S , wire w^{11} , to the remaining pole of the battery. It will thus be seen that the impulse sent from the distant station actuated at the receiving central station the local sounder M^3 and the outlying sounders M^4 and M^5 at stations 1 and 2. It will also be seen that either one of the outlying operators at station 1 or station 2 could transmit a signal from the open-circuit batteries B^3 or B^4 , which would actuate relay M' and sounders M^4 and M^5 , at the same time sending a signal to sounder M^3 at the distant station and to outlying local stations on outlying local lines; or the operator at the central station by his key K could transmit a similar signal to all of said outlying operators at the same time. With such a system of connections it is possible to connect up two distant multiplex synchronous central stations in such manner that absolute and certain inter-communication may be had between any and all of the outlying operators.

It will be observed that the system to which I have shown my invention as applicable is what is technically known as an "open-circuit" system—that is, a system in which the transmitting-batteries are left open when the operator or operators are not actually sending or receiving; but it is equally applicable to all systems of synchronous multiplex telegraphs, as will be readily understood.

I am aware that it is not new with me to connect a series of outlying individual local lines with main-line multiplex synchronous apparatus through the agency of switch-board connections, so that any local line may be connected at the central-station apparatus with any preferred set of segments in such apparatus, and I make no claim to this feature, my invention being an improvement upon such apparatus and directed to the novel idea herein described and claimed of connecting outlying local lines in looped pairs, so that messages are received simultaneously at all stations on any two looped lines

connected up at the main-line stations and also on the main-line apparatus at said main-line station, the object of such invention being to increase the capacity of the central or main-line apparatus.

Having thus described my invention, what I claim as new, and desire by Letters Patent of the United States, is—

1. In a system of multiplex synchronous telegraphy, the combination of two or more sets of synchronous mechanism, including receiving-instruments, with transmitter magnets and keys located in normally-open local battery-circuits earthed through switch-contacts on either side, and outlying local lines, two or more, including transmitting and receiving instruments, and switch mechanism for disconnecting the earth-circuits and connecting the local lines in circuit with the transmitting magnets and keys, substantially as set forth.

2. In a system of multiplex synchronous telegraphy, the combination of two or more sets of synchronous mechanisms, including receiving-instruments, with transmitter magnets and keys located in normally-open battery-circuits earthed through switch-contacts and rheostats on either side, and outlying local lines, two or more, including transmitting and receiving instruments, and switch mechanism for disconnecting the earth-circuits and connecting the local lines in circuit with the transmitting magnets and keys first named, substantially as described.

3. In a system of multiplex synchronous telegraphy, the combination of two or more sets of synchronous mechanism, including receiving-relays adapted to be connected in the main-line circuit with secondary relays in independent local battery-circuits and local sounders at the central station, with outlying receiving and transmitting instruments in outlying local lines, which are arranged in pairs, said local lines being connected to the central-station sounders and connections, substantially as described.

4. In a system of multiplex synchronous telegraphy, the combination of two main-line stations provided with multiplex synchronous transmitting and receiving apparatus and pairs of outlying local lines at each station, including also receiving and transmitting in-

struments with switch-connections for connecting said pairs of lines to the main-line apparatus, whereby signals from either of the main-line transmitters or from any transmitter on either leg of either of the pairs of lines may be received simultaneously by all of the operators so connected, substantially as described.

5. In a system of multiplex synchronous telegraphy, the combination of sets of main-line multiplex synchronous transmitting and receiving apparatus with pairs of outlying local lines at each main-line station, said pairs of lines including transmitting and receiving apparatus and switch-connections, substantially as described, whereby any two main-line operators and all operators on the two outlying local lines looped in circuit with said main-line operators at each main-line station may receive all signals sent by any one of the transmitters, substantially as described.

6. In a system of multiplex synchronous telegraphy, the combination of sets of multiplex transmitting and receiving apparatus located at each main-line station with pairs of outlying local lines looped in circuit with the main-line apparatus at each of said main-line stations, whereby signals may be sent out from either end of the main line or from any of the local stations in either of the loops and received at all of the stations so connected up, substantially as described.

7. In a system of multiplex synchronous telegraphy, the combination of the following elements: two or more sets of multiplex transmitting and receiving apparatus connected to a single main line, pairs of outlying local lines at each main-line station, including transmitters and receivers, a main-line receiving-relay for each pair of local lines, a repeating-relay controlled by said main-line receiving-relay, the armature of said repeating-relay having front and back contact-connections with the two outlying local lines, a main-line transmitter-magnet in circuit with both local lines, and switch-plug connections, all substantially as described.

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