No. 819,190. PATENTED MAY 1, 1906.

J. F. WEBB & C. E. FREDERICKSON.

ELECTRIC SIGNALING SYSTEM.

APPLICATION FILED APR. 25, 1905.

4 SHEETS—SHEET 1.

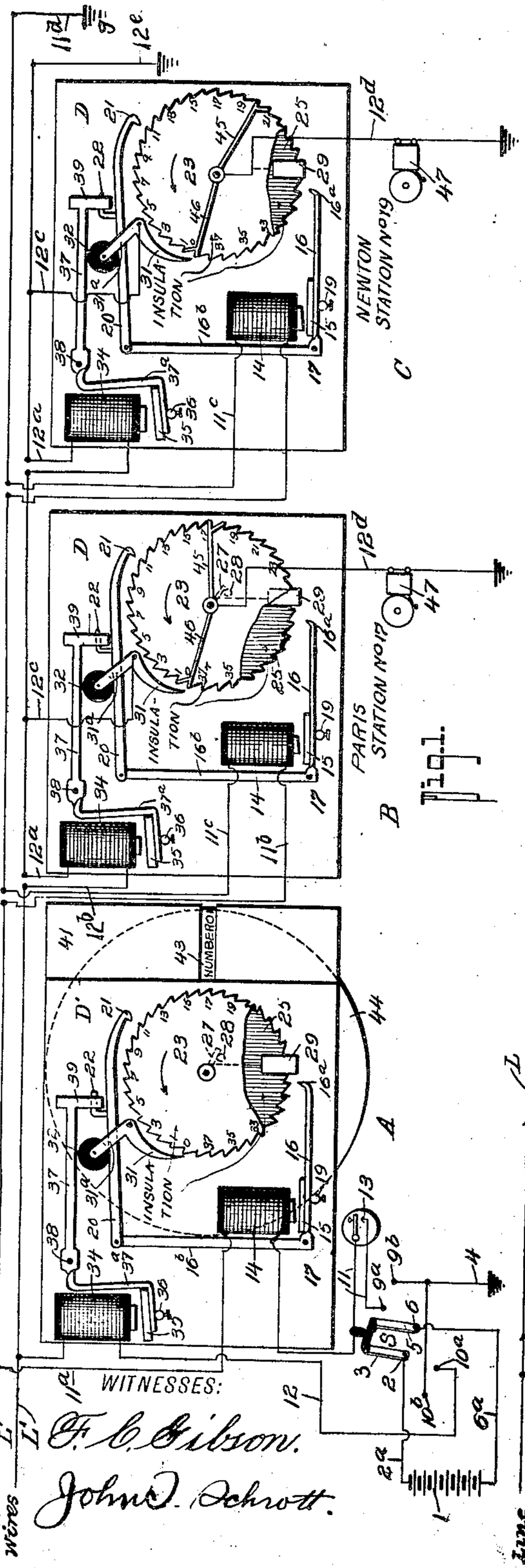

Fig. 1.

Fig. 2.

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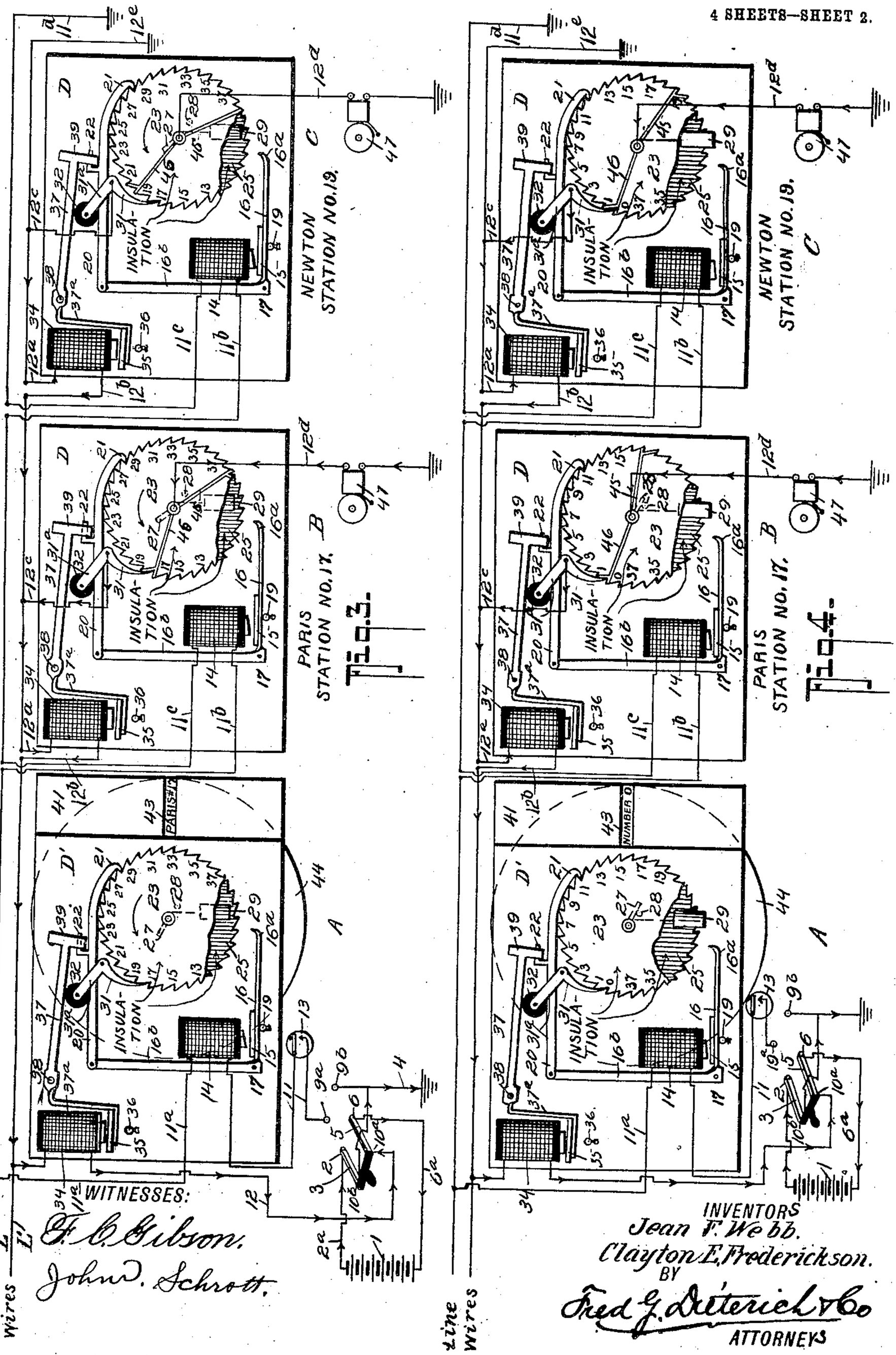

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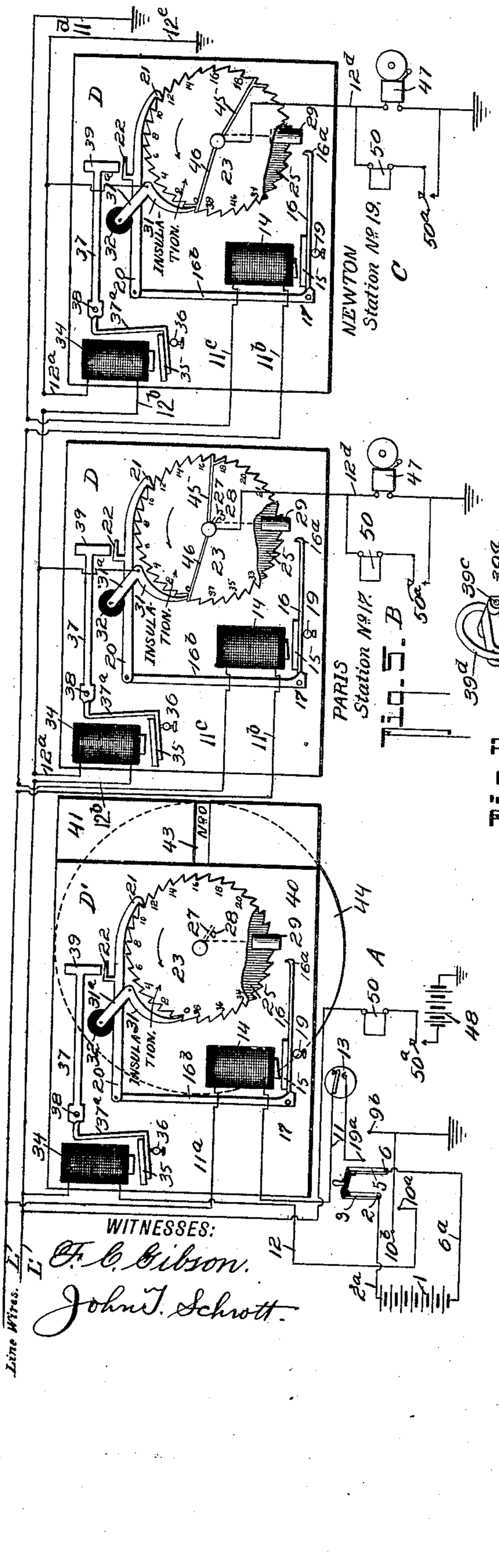


Fig. 10.

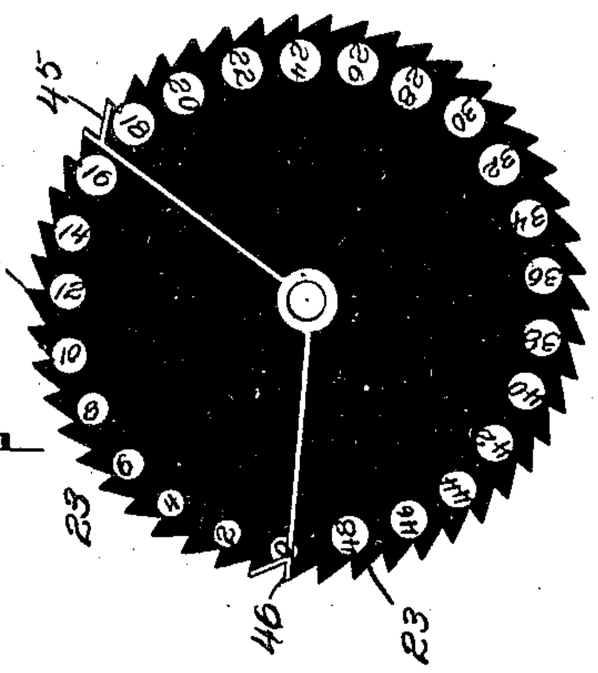
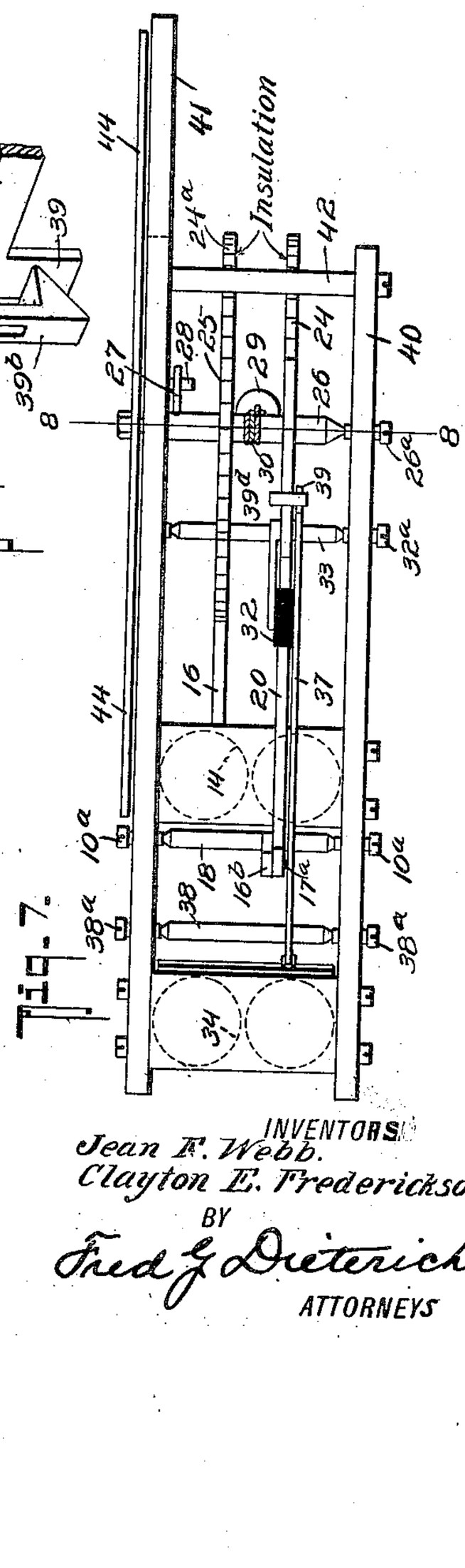


Fig. 11.



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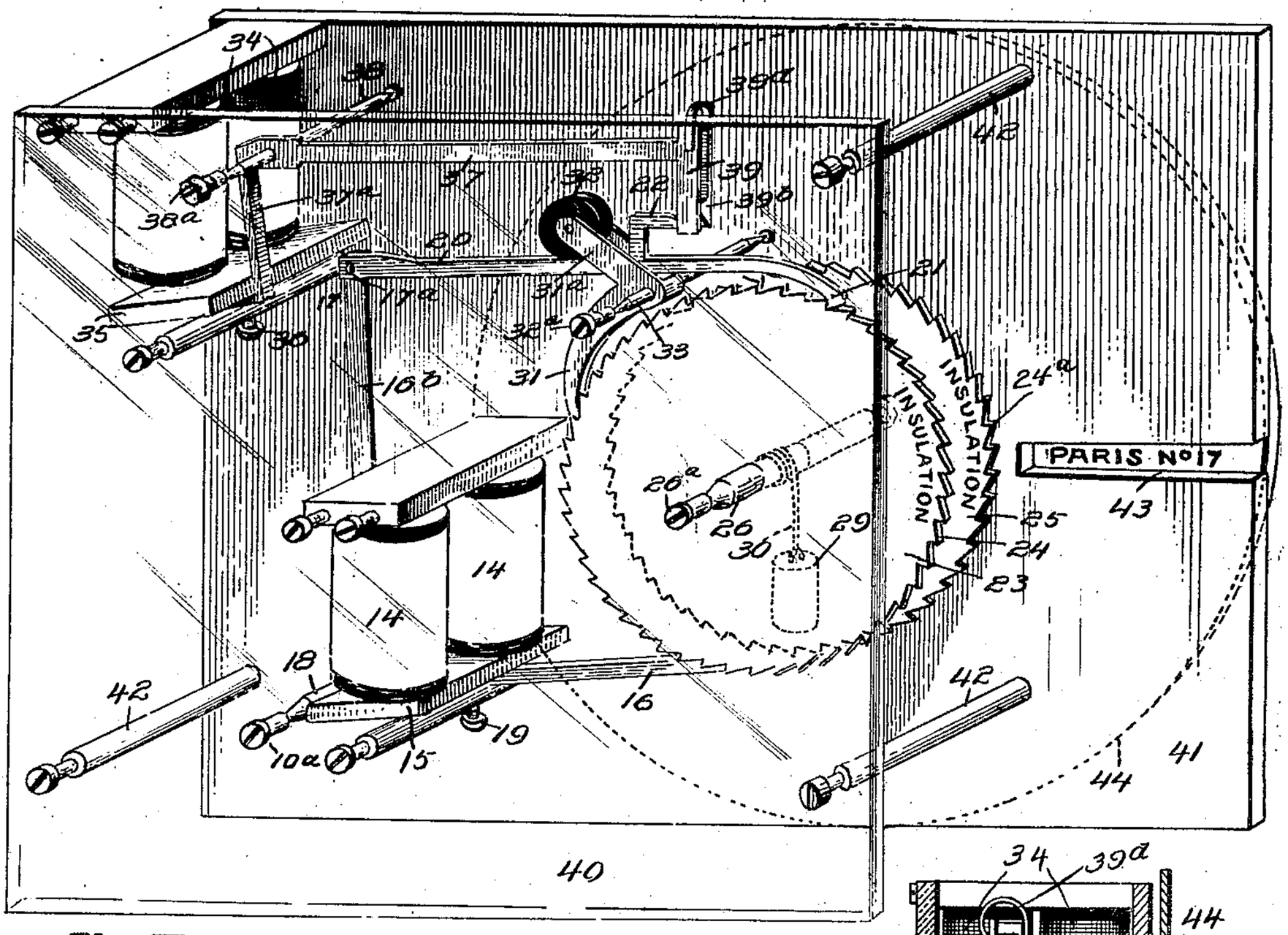


Fig. 8.

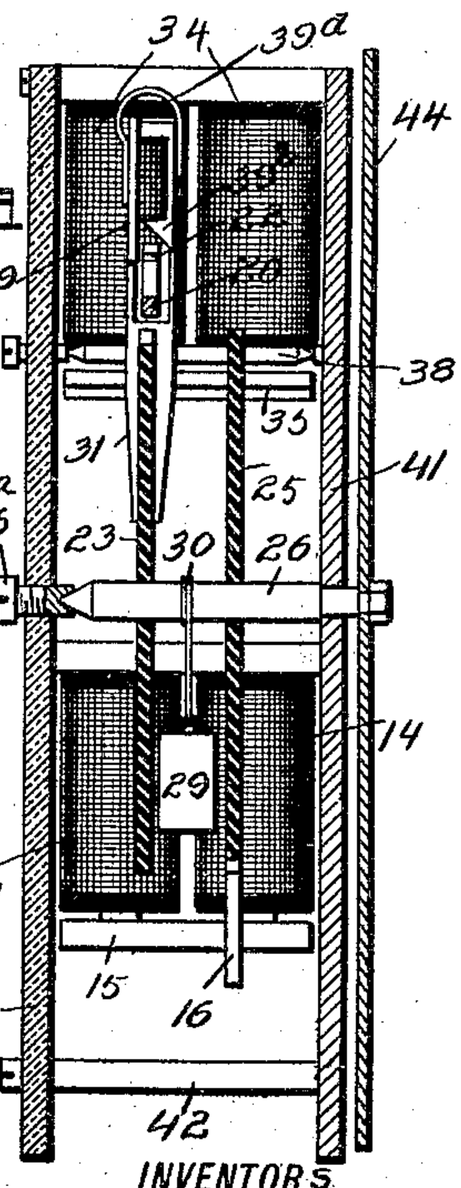
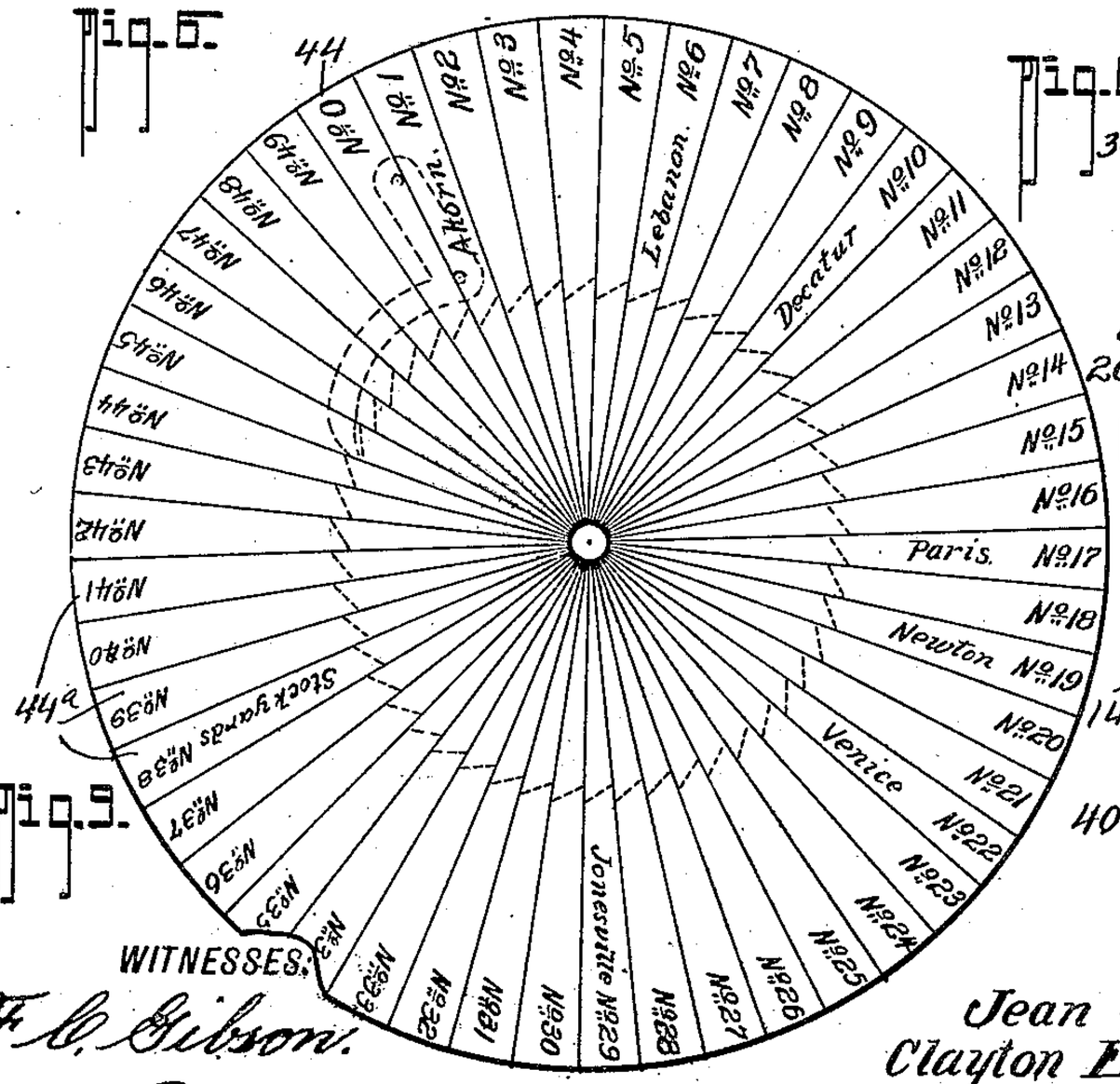


Fig. 9.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SIGNALING SYSTEM.

No. 819,190. Specification of Letters Patent. Patented May 1, 1906.

Application filed April 25, 1905. Serial No. 257,355.

To all whom it may concern:

Be it known that we, JEAN F. WEBB and CLAYTON E. FREDERICKSON, residing at Denver, in the county of Denver and State of Colorado, have invented a new and Improved Electric Signaling System, of which the following is a specification.

This invention relates to certain new and useful improvements in that class of electric signaling mechanisms in which the several parts are especially designed for conveniently and accurately making selective calls, whereby a signal or signals may be transmitted from a central station to any particular one of a number of stations in the same electric circuit without interfering with the other stations.

Our invention also includes means whereby the central station may place all of the other stations in circuit with itself to permit signaling between the central station and all of the other stations at the same time, as well as to permit signaling between any two or more of the stations themselves.

Our invention in its generic nature comprehends an improved construction and cooperative arrangement of selecting mechanisms, indicating mechanisms, including rotary spacing-disks, indicator-disks, circuit-closing and signaling devices, and means electrically controlled for actuating the several parts of the system in such a manner that calls or signals can be conveniently and quickly effected.

In its more detail nature our invention seeks to provide a mechanism for the purposes stated of a simple, inexpensive, and durable construction, which in its subordinate features consists in certain details of construction and peculiar combination, arrangement, and design of parts, including the electric circuit, all of which will be hereinafter first fully explained and then specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view of our complete system, showing several stations connected in circuit and the several parts of the system being in their normal position. Fig. 2 is a similar view showing the position of the parts when station No. 17 is in circuit with the "central" station. Fig. 3 is a similar view showing the parts in the position they assume when current is flowing through the disk-releasing magnets and signal device of said station just prior to allowing the parts to be returned to their normal position. Fig. 4 is a diagrammatic view of the complete system in the position when all the signal-stations are in circuit with the main or central station. Fig. 5 is a diagrammatic view of the parts in their normal position when used in connection with a telegraph system for sending telegraphic messages between two or more stations. Fig. 6 is an enlarged view of the central-office indicator mechanism. Fig. 7 is a top plan view of the indicator shown in Fig. 6. Fig. 8 is a section on the line 8 8 of Fig. 7. Fig. 9 is a detail face view of the indicator-dial. Fig. 10 is a detail face view of one of the circuit-closing spacing-disks. Fig. 11 is a detail view of the catch hereinafter referred to.

Referring now to the accompanying drawings, in which like numerals and letters of reference indicate like parts in all the figures, A designates the main or central station, which when our invention is used as a train signaling system may be the despatcher's office.

B and C are substations along the line, of which but two are shown in the drawings, although it should be understood that any desired number of substations may be connected on the line, the number of substations, however, being only limited by the number of teeth on the rotatable circuit-closing signaling-disks used in connection with our system. Each substation is provided with a step-by-step circuit-closing mechanism D, the circuit-closing mechanism of each station being of the same construction, with the exception of that, D′, in the central office. The central-office step-by-step mechanism serves only as an indicator and not as a local-circuit closer ordinarily, though it may be when the apparatus is used on telegraph-lines.

For convenience of description we shall first describe the apparatus having the step-by-step circuit-closing mechanisms for the various stations along the line, and as each of said circuit-closing mechanisms is of the same construction, as before stated, a detailed description of one of them, it is thought, will suffice.

Each circuit-closing mechanism and the central-office indicating mechanism comprise a supporting-frame which consists of the back plate 41 and the front plate 40, which front plate, whenever it is found desirable, is constructed of transparent material, such as

glass, &c., to give a clear view of the internal operating parts. The back plate 41 and the front plate 40 are spaced apart by the binding-rods 42 42, as shown.

Arranged between plates 40 and 41 on a spindle 26, rotatable in bearings 26^a 26^a, is a pair of disks 23 25, constructed of fiber or other insulating material, and the said disks 23 25 have their peripheral surfaces provided each with an equal number of ratchet-teeth 24 24^a, respectively. The teeth 24 on the disk 23 are arranged in one direction, while the teeth 24^a of the other disk 25 are arranged in a direction opposite to that of the teeth 24 on the disk 23 for a purpose presently to appear.

Each disk 23 of the various substations is provided with a metallic contact-tooth member 46, serving as the "zero" contact-tooth, and a second or individual contact-tooth member 45, spaced from the contact 46 at an angular distance which varies and is different for each substation disk. (See Fig. 1.) In other words, "station No. 17" will have its contact 45 spaced from contact 46 a distance equal to seventeen (17) teeth, while station No. 19 will have its contacts 45 and 46 spaced nineteen (19) teeth apart for a purpose presently fully understood.

Each shaft 26 is provided with a radial stop-pin 27, which when the parts are in their normal position engages a fixed stop 28 on the plate 41 to limit the movement of the disks. Secured to the shaft 26 by a cord or chain 30 is a counterweight 29, which serves to bring the disks 23 25 to their normal position at predetermined times, with the radial stop-pin 27 in engagement with the fixed stop 28, as shown diagrammatically in Fig. 1. In practice we preferably number each tooth upon the disks 23, as shown in the drawings, each tooth corresponding to one station along the line.

Pivotally mounted in bearings 32^a 32^a in the plates 40 and 41 on a spindle 33 is a metallic pawl 31, having a bifurcated extension 31^a, between the extreme ends of which a roller 32, of insulating material, is rotatably secured. The pawl 31 is adapted to engage with the teeth 24 of the disk 23 when it is released, as will be hereinafter explained.

Pivotally mounted in bearings 10^a 10^a on a shaft or pintle 18 is an L-shaped lever 17, (hereinafter called the "disk-actuating lever,") which includes the arm 16^b and a second arm 16 at right angles to the arm 16^b. The arm 16 has an escapement finger or tooth 16^a at its free end, which when the lever 17 is rocked engages with the teeth 24^a of the disk 25 to hold the disks 23 25 from moving more than one notch or step at each operation of the lever 17, and thereby serving as an escapement.

15 designates an armature carried by the arm 16 of the lever 17 to coöperate with the lever-actuating magnets 14, which magnets 14 are mounted between the plates 40 and 41, as shown.

19 designates an adjustable stop for limiting the movement of the lever 17.

To the free end of the arm 16^b of the lever 17 a pawl or pitman 20 is fulcrumed, as at 17^a, the free end of said pitman 20 being provided with a dog or tooth 21 to engage the teeth 24 of the disk 23 to rotate the disks 23 25 on their axis in the direction of the arrows in Fig. 1 when the lever 17 is actuated. The pitman 20 passes between, but does not touch the bifurcated portion 31^a of the pawl 31, and when lifted is engaged by the roller 32. Upon its upper side the pitman 20 is provided with an angle-heel 22 to coöperate with the lifting catch member 39 on the end of a lever 37, which is pivotally mounted on a pintle 38 in bearings 38^a between the plates 40 and 41 and above the lever 17. The lever 37 includes a downwardly-projecting angle portion 37^a, to the lower end of which an armature 35 is attached.

Mounted between the plates 40 and 41 to operate with the armature 35 is a magnet 34, which operates the lever 37 and which we shall hereinafter term the "releasing-magnet" to distinguish it from the magnet 14, which we shall hereinafter term the "actuating-magnet." An adjustable stop 36 is provided to coöperate with the lever 37, by means of which stop the lever 37 is adjusted.

The catch 39 comprises a plate 39^a, held at right angles to the main arm of the lever 37, to which plate 39^a the catch member 39^b is pivoted, as at 39^c. A spring 39^d may be provided, if found desirable, to hold the catch 39 against the plate 39^a.

Referring now to the indicator mechanism of the despatcher's office, the same is constructed substantially like the circuit-closing mechanism of the substations, with the exception that the contact members 45 and 46 are omitted from the disk 23 in the central-station indicator and the shaft 26 of said indicator projects through the plate 41 and carries an indicating-dial 44, which is shown in detail in Fig. 9. Also disk 23 may be constructed of brass or other conducting material if it is desired to pass the current through instead of around the indicator mechanism. The plate 41 in the indicating apparatus is also lengthened and provided with a slot 43, whereby to expose a portion of the dial 44 for a purpose presently understood.

By referring now to Fig. 9 of the drawings the construction of the indicator-dial will be clearly understood. The dial 44 has its face divided into a plurality of equal radial spaces 44^a, corresponding in number to the number of teeth on the disks 23, and these spaces are provided with numbers corresponding to those of the disk 23 and also with the names of the stations bearing such num-

bers. The disk 44 is so mounted on the shaft 26 with respect to the disk 23 that whenever zero tooth of disk 23 is in a position to be engaged by the pawl 31 the space on the dial 44 containing the zero number will be in alinement with the slot 43, as clearly shown in Fig. 1.

In our present invention there are essentially three distinct electric circuits, although parts of each circuit are connected in common to avoid the necessity of running an excessive number of line-wires—*i. e.*, a main or actuating circuit, a supplemental or releasing circuit, and a signaling-circuit. The main or actuating circuit comprises the main source of electrical energy 1, whose terminals are connected, through wires 2^a and 6^a, to the contact-points 2 and 6, respectively, of the throw-switch S, which switch may be either a double-throw switch, as shown, or may be composed of two single switches connected to act as a double switch. The contacts 9^b 10^b of the switch S are connected together and grounded through a wire 4.

11 designates a portion of the main-circuit wire which connects through a push-button or other normally open circuit-closer 13 to one terminal of the actuating-magnets 14 of the indicator mechanism. The other terminal of the magnet 14 is connected with the line-wire L through the wire 11^a, as shown. Each of the circuit-closing mechanisms at the substations has its actuating-magnet 14 connected in series to line-wire L by wires 11^b and 11^c, except that the final substation has its actuating-magnet 14 grounded by the wire 11^d. The main circuit comprises, therefore, the source of electrical energy 1, the wires 2^a and 6^a, the switch-points 2 and 6, the switch knives or plates 3 and 5, the wire 11, the push-button 13, the actuating-magnets 14 of the indicator mechanism, the wire 11^a, line-wire L, the wires 11^b and 11^c, the actuating-magnets 14 of the circuit-closer mechanism at the substations, ground-wires 4, and earth return. The releasing-magnets 34 are each connected to the line-wire L′ by the wires 12^a and 12^b, and the releasing-magnets 34 of the final substations are grounded through wires 12^e, while the releasing-magnets 34 of the indicator mechanism in the signal-stations are connected with the switch-contact 10^a through a wire 12. The supplemental circuit therefore comprises the source of electric energy 1, switch-contacts 2 and 6, switch-plates 3 and 5, ground-wires 4 and 11^d, switch-points 10^b and 10^a, wire 12, releasing-magnets 34, wires 12^a and 12^b, line-wire L′, and ground return. The switch S is common to both the main and the supplemental circuits, as is also the main source of electric energy 1 and the ground return.

When our system is to be used as a signal system for operating semaphores or bell-signals alone, then the signaling-circuit includes the source of electrical energy 1, switch S, wire 12, magnets 34 of the indicator mechanism, line-wire L′, shunt-wire 12^c, pawl 31, contacts 45 or 46 of disk 23, and the grounded wire 12^d, to which the signal 47 is connected. In this case the signaling-circuit and the supplemental circuit are practically the same, the signaling devices (semaphore or bell) and the pawls 31, together with the contacts 45 and 46, being connected in shunt with the releasing-magnet 34 of their respective substations. However, when our invention is used in connection with a telegraph system the signaling-circuit and the supplemental circuit have only a portion in common, and in this case we connect the telegraph receiving instrument 50 and the transmitting-keys 50^a of the despatcher's office directly to the line-wire L′ and ground or directly to the ground and through the axle 26, disk 23, pawl 31, axle 33, and wire 12^c to the line-wire L′ when it is desired to send the message through the indicator mechanism instead of around it, a supplemental source of electrical energy 48 being connected in circuit with the telegraph-receiver 50 and transmitting-key 50^a, as shown.

The receiving and transmitting instruments 50 and 50^a, respectively, of the substations are connected in the place of the signals 47 when the system is used for telegraphing alone, or when used both as a semaphore or bell system and a telegraph system the instruments 50 and 50^a are connected in shunt with the signal 47, it being understood that the magnets 34 and signals 47 are operable under strong current from the main source of electrical energy, while the telegraph-receiver 50 operates when under the weaker current from the supplemental source of electrical energy 48. The signals 47 and the telegraph instruments 50 and 50^a may be of any approved type, as the same *per se* form no part of our present invention.

Operation: Assume the parts to be in position shown in Fig. 1, which is the normal position of the parts when used without the telegraph instruments, no current flowing in any of the circuits and the pawls 31, pitmen 20, and lever 16 disconnected from their respective disks 23 and 25 and the disks 23 and 25 in their normal or zero position, the main, supplemental, and signaling circuits being broken at switch S, the main circuit being broken at push-button 13 and the signaling-circuit broken at disks 23. The operator throws switch S into engagement with contacts 9^a 9^b to close the main circuit at switch S. He then closes circuit at push-button 13 as many times as the number of the station to be called—say 17. As he pushes the button the seventeenth (17th) time and just prior to releasing said button 13 the parts will be in the position shown in Fig. 2, current flowing in the main circuit, as indicated by the arrow-

heads. As the operator releases push 13 current ceases to flow and the levers 17 and pitmen 20 return to the position shown in dotted lines in Fig. 2, no current now flowing. The signaling-circuit is now closed at pawl 31 and contact 45 at the desired station—say station No. 17. Operator now reverses switch S to engage the contacts 10^a 10^b to close the supplemental circuit at switch S, which causes current from the main source of electrical energy to flow through the supplemental circuit and signaling-circuit to energize the releasing-magnets 34 and operate the signal 47 at the connected station, (in this case station No. 17,) it being understood that the signals 47 at the remaining substations will not operate at this time, as the signaling-circuits at all stations, excepting the one connected up, (No. 17,) are broken at the contact-carrying disks 23. The parts are now in a position shown in Fig. 3, the catches 39 of all stations having engaged their respective heels 22. As soon as the operator breaks the circuit at switch S the armatures 35 and 15 will cause their respective levers to return to the position shown in Fig. 1. The levers 37 lift pitmen 20 clear of disks 23. The levers 20 in turn lift pawls 31 clear of disks 23 to allow weights 29 to return disks to the normal position, as shown in Fig. 1. When our invention is being used in connection with telegraphs, then the normal position of the parts is that shown in Fig. 5, by reference to which it will be seen that the pawls 31 of all stations are in contact with the zero contacts of all the disks 23 to place the telegraph instruments 50 and 50^a of all the substations in circuit with each other and with the despatcher's office, switch S being open. Now should the despatcher desire to telegraph all stations simultaneously he merely operates his telegraph-key in the usual manner, when the message will be transmitted to all stations. Should the despatcher desire to communicate with one particular station only, he closes switch S to contacts 9^a 9^b and operates push-button 13 until the desired station is in connection with central station. He then opens switch S again and proceeds to telegraph as before. After he has completed his communication with such station the operator throws switch S to the position shown in Fig. 3 to return the parts to the position shown in Fig. 1. This cuts out all stations. The operator may then place all stations in communication with central office and each other by throwing switch S in the position shown in Fig. 2 and pushing the button 13 once, which releases pitmen 20 and pawls 31 to engage disks 23. The operator then again opens switch S, and the parts will now be in the position shown in Fig. 5, which is the normal position when our invention is used as a combined semaphore signaling and telegraphic signaling system. In practice the source of electrical energy 48 may be made to send currents in the directions reverse to that sent by the main source of electrical energy 1, and polarized telegraphic receiving instruments may be used to prevent them from being operated upon by the current of the main source of electrical energy when switch S is closed to operate releasing-magnets 34.

While we have shown the actuating-magnets 14 of each station connected in series with one another and while we have shown the releasing-magnets 34 of each station likewise connected, yet we desire it understood that we do not limit ourselves to such manner of connecting the magnets, as the several sets of magnets may be connected in any other manner well known in the electrical art and as conditions may require.

By using our system in connection with the telegraphic communication it will be seen that when all stations are to be signaled or to be communicated with or they wish to communicate with each other the signals or messages are sent through metallic contacts numbered 0, and the disks 23 are not moved. This point is of particular advantage where a number, large or small, of parties (say of brokers) are on the same telegraphic line, as it will enable the central office to send or receive quotations or other messages from all generally or by moving the disks 23 to send or receive messages to some particular one for the time being, so that in reality each party will have a direct undivided line for his individual use whenever he desires it.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the complete operation, construction, and many advantages of our invention will be readily understood by those skilled in the art to which it appertains, and we desire it understood that slight changes in the detailed construction, operation, and arrangement of parts may be made without departing from the scope of the appended claims.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. A step-by-step mechanism for signaling systems comprising a supporting-frame, a pair of ratchet-disks mounted for simultaneous rotation in said frame, the teeth of one of said disks being disposed in a direction opposite to the teeth of the other disk, actuating means for said disks comprising a pivot-lever having a finger at one end for engaging the teeth of one of said disks, a pitman connected to the other end of said lever and having a dog, for engaging the teeth of the other disk, a pawl pivotally mounted on said frame and engaging the teeth of said other disk, and engaging said pitman, electromagnets for operating said actuating means, releasing mechanism for disconnecting said pitman and

pawl from connection with the rotatable disk, electromagnets for actuating said releasing mechanism, and means for returning said disks to their normal positions when released, substantially as shown and described.

2. A step-by-step mechanism for signaling systems comprising a supporting-frame, a pair of ratchet-disks mounted for simultaneous rotation in said frame, the teeth of one of said disks being disposed in a direction opposite to the teeth of the other disk, actuating means for said disks comprising a pivot-lever having a finger at one end for engaging the teeth of one of said disks, a pitman connected to the other end of said lever and having a dog for engaging the teeth of the other disk, a pawl pivotally mounted on said frame and engaging the teeth of said other disk, and engaging said pitman, electromagnets for operating said actuating means, releasing mechanism for disconnecting said pitman, and pawl from connection with the ratchet-disks, electromagnets for actuating said releasing mechanism, means for returning said disks to their normal positions when released, and a plurality of contacts on said other disk for contacting with the pawl at times substantially as shown and described.

3. A device of the class described comprising a supporting-frame, a shaft rotatable therein, a pair of rotatable disks mounted on said shaft to turn therewith, said disks having peripheral ratchet-teeth, an L-shaped lever fulcrumed on said frame and having a finger for engaging with one of said ratchet-disks at times, an operating-pitman connected with said L-shaped lever for engaging the other ratchet-disk at times, a pawl engaged by said pitman for engaging said other ratchet-disk, means for operating said L-shaped lever to operate the pitman to rotate the disks in one direction, a pivotally-mounted catch member for engaging said pitman at times to disengage it from the rotatable disks, magnetically-operating means for said actuating member and means for returning said ratchet-disks to their normal positions when released, substantially as shown and described.

4. An indicator for selective signaling systems comprising a supporting-frame, a shaft rotatable therein, a pair of rotatable disks mounted on said shaft to turn therewith, said rotatable disks having peripheral teeth, an indicating-dial mounted on the shaft to rotate therewith, an L-shaped lever fulcrumed on said frame and having a dog for engaging with one of said ratchet-disks at times, an operating-pitman connected with said L-shaped lever for engaging the other ratchet-disk at times, a pawl for engaging said other ratchet-disk, said pawl being engaged by said pitman, means for operating said L-shaped lever to operate the pitman to rotate the disks in one direction, a pivotally-mounted catch member for engaging said pitman at times to disengage the pitman from the rotatable disks, magnetically-operating means for said actuating member, and means for returning said ratchet-disks to their normal positions when released substantially as shown and described.

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