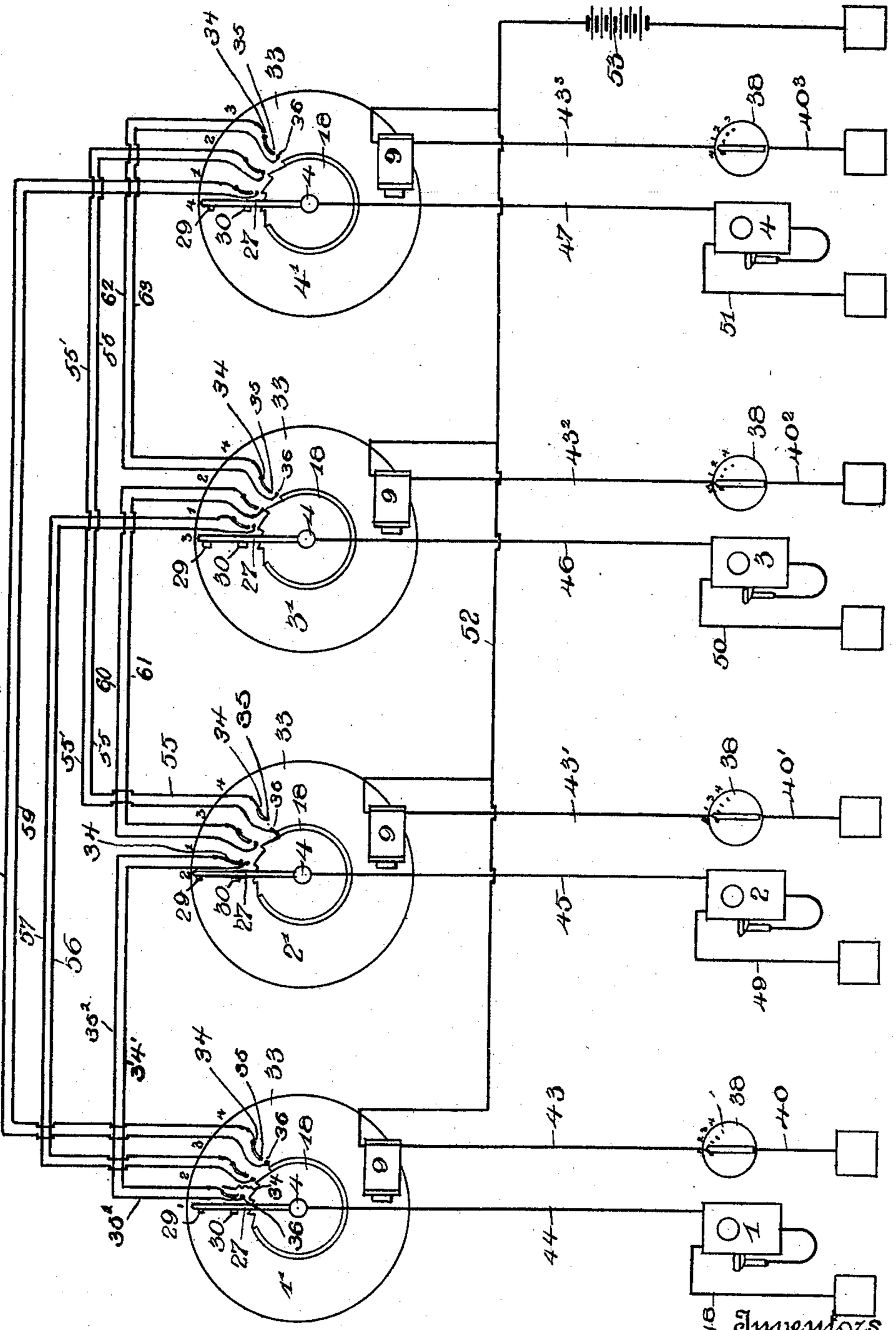
(No Model.)

6 Sheets—Sheet 1.

W. A. STILWELL & A. BARNECK.

TELEPHONE SIGNAL SYSTEM.

No. 604,434. Patented May 24, 1898.



Witnesses
Wm. F. Doyle.
F. A. Hillson

Inventors,
Wallace A. Stilwell.
Alex. Barneck.
By H. B. Willson Attorney

(No Model.) 6 Sheets—Sheet 2.

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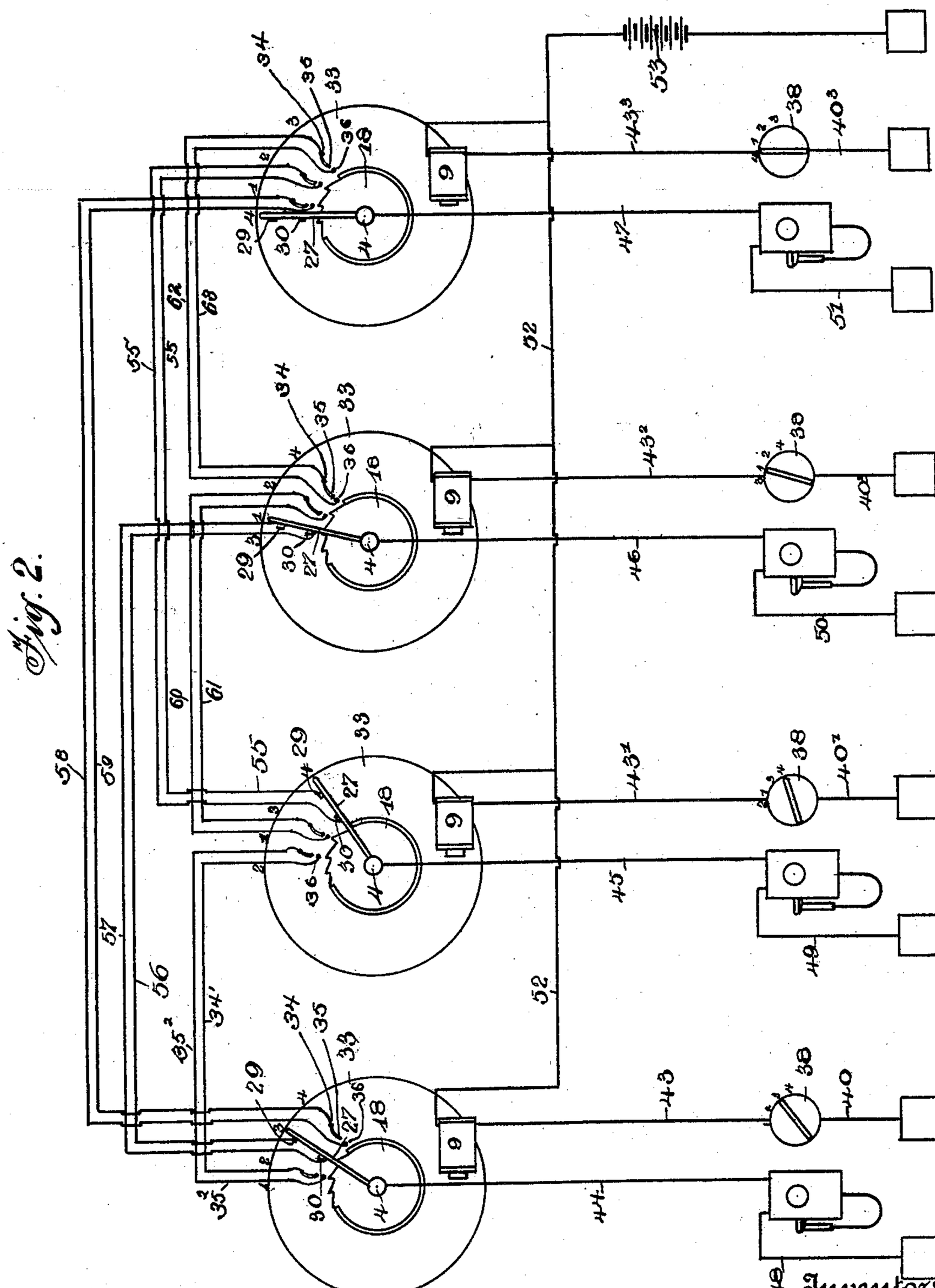

Fig. 2.

Witnesses
Wm. G. Doyle
F. A. Wilson

Inventors.
Wallace A. Stilwell.
Alex. Barneck.
By H. B. Wilson, Attorney

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W. A. STILWELL & A. BARNECK.

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Fig. 3.

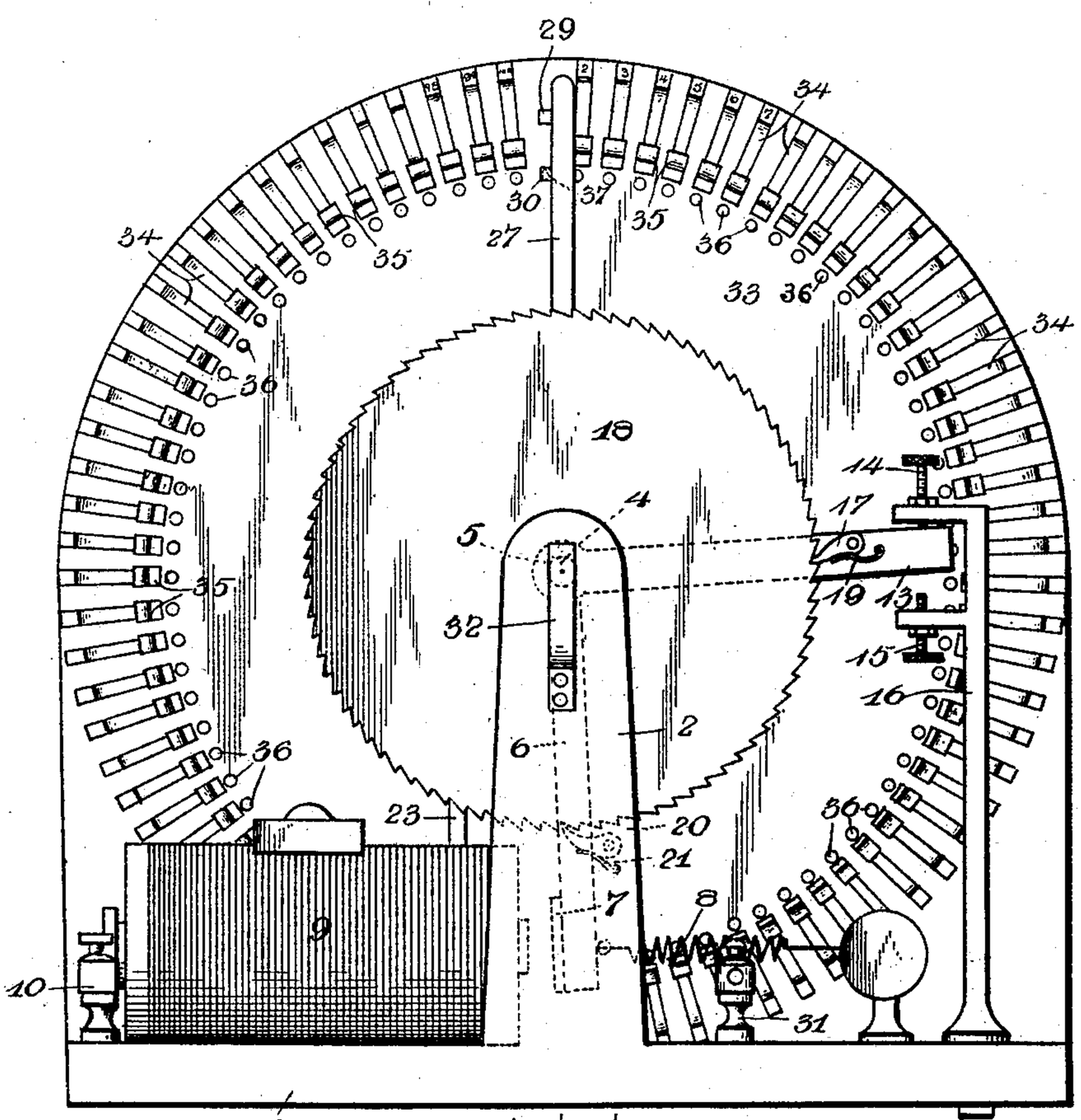
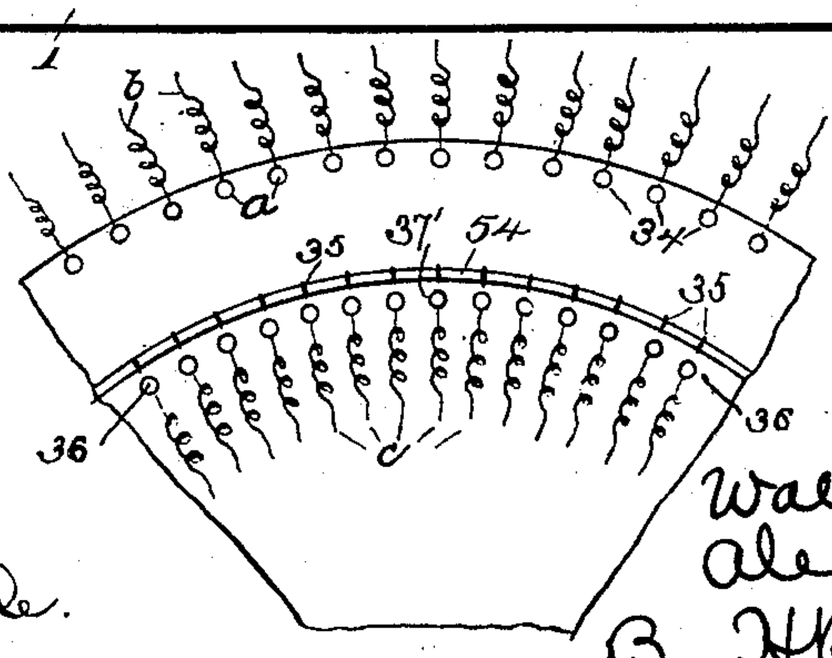


Fig. 4.



Witnesses
Wm. F. Doyle.
F. A. Hilsen.

Inventors.
Wallace A. Stilwell.
Alex. Barneck.
By H. B. Wilson.
Attorney

(No Model.) 6 Sheets—Sheet 4.

W. A. STILWELL & A. BARNECK.

TELEPHONE SIGNAL SYSTEM.

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Fig. 5.

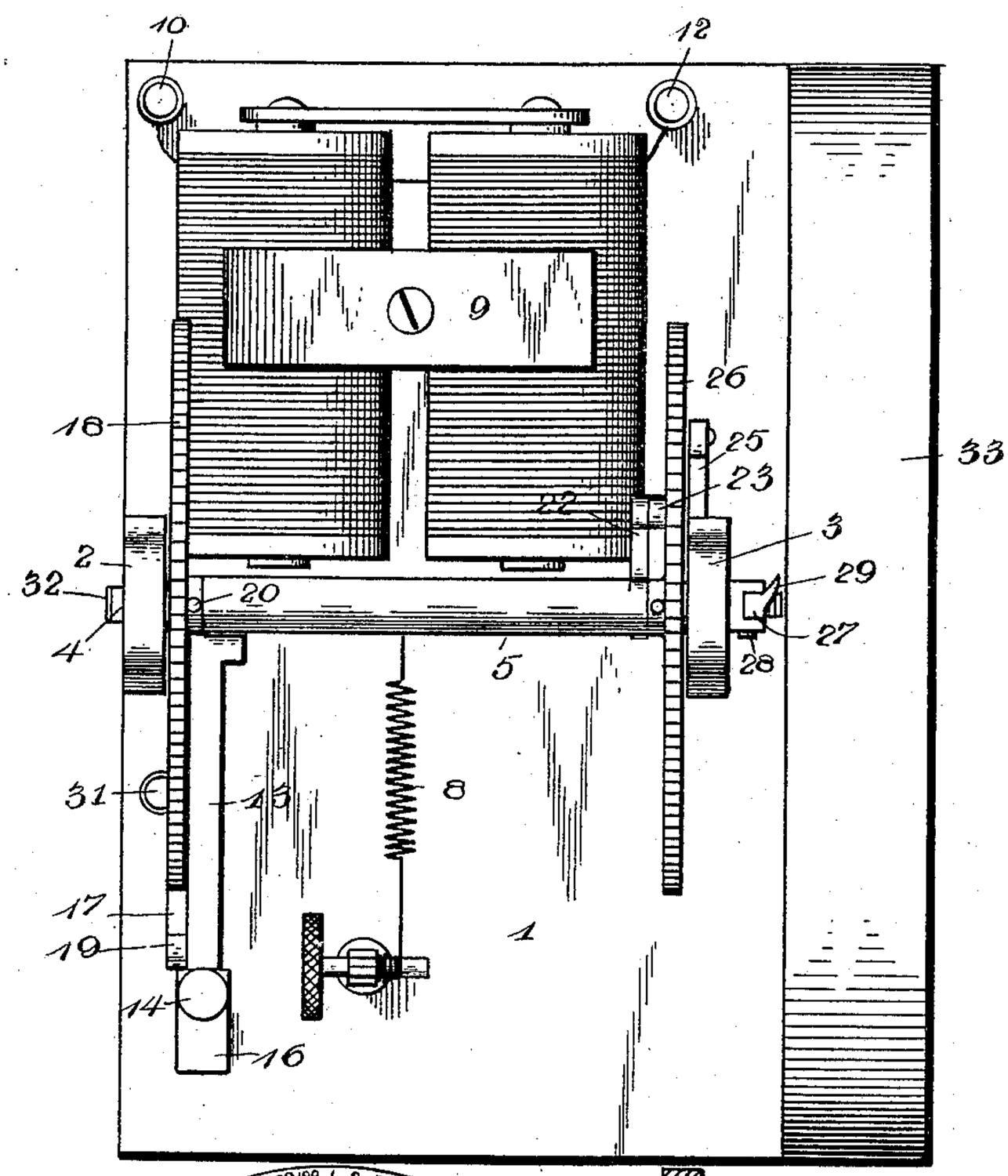


Fig. 6.

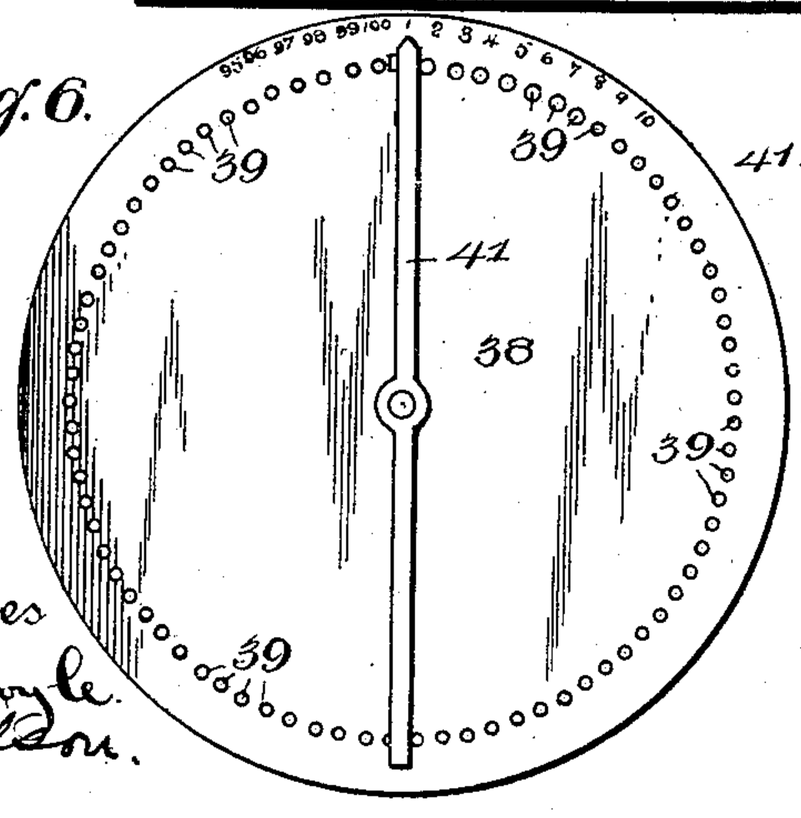
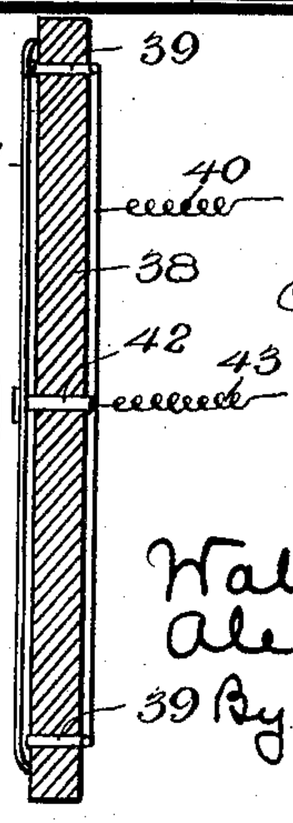


Fig. 7.



Witnesses
W. F. Doyle.
J. A. Hillson.

Inventors.
Wallace A. Stilwell.
Alex. Barneck.
By H. B. Willson.
Attorney

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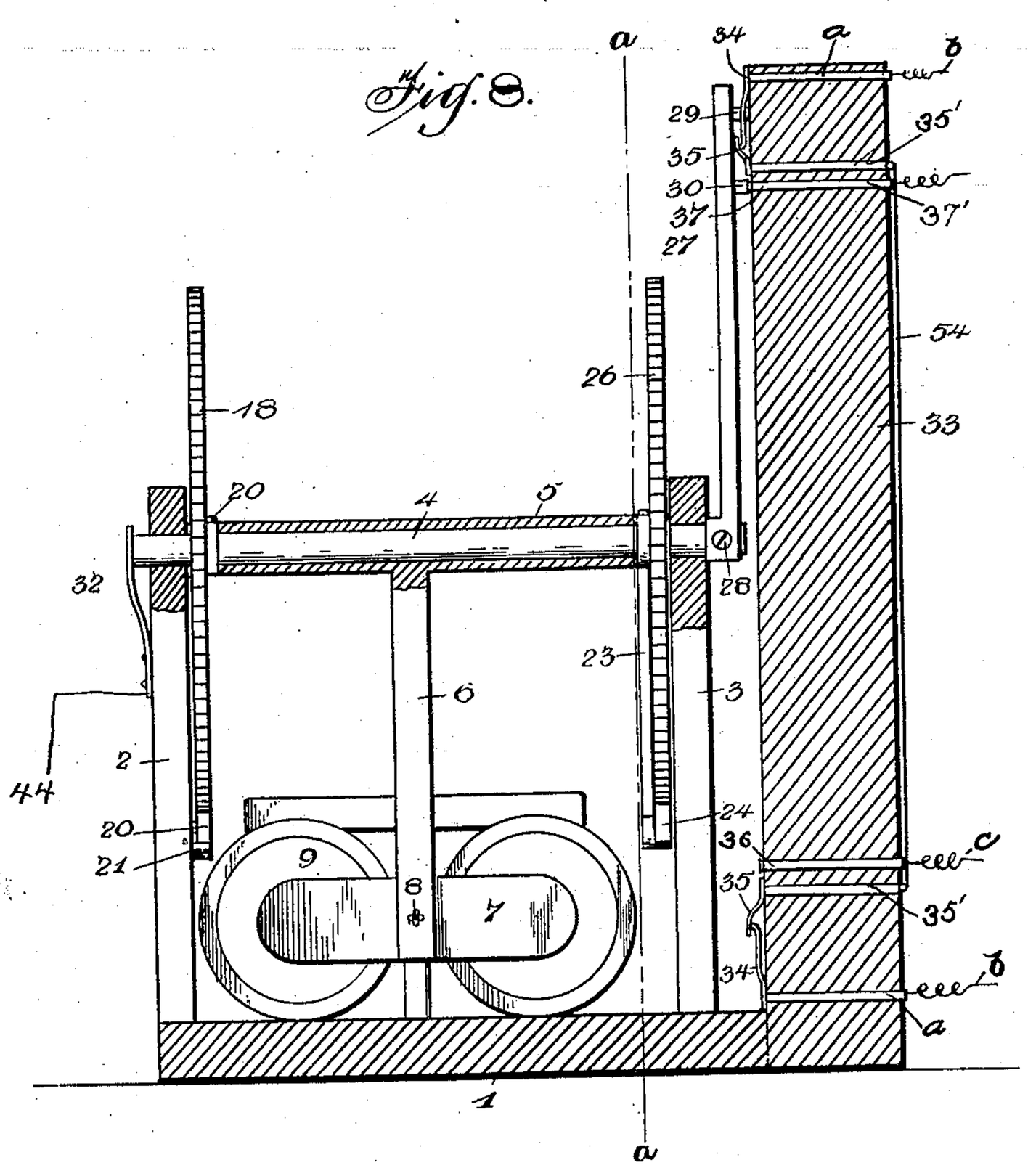
W. A. STILWELL & A. BARNECK.

TELEPHONE SIGNAL SYSTEM.

No. 604,434. Patented May 24, 1898.

Fig. 8.



Witnesses
W. F. Doyle.
F. A. Hillson.

Inventors.
Wallace A. Stilwell.
Alex. Barneck.
By H. B. Willson, Attorney

(No Model.) 6 Sheets—Sheet 6.

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TELEPHONE SIGNAL SYSTEM.

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Fig. 9.

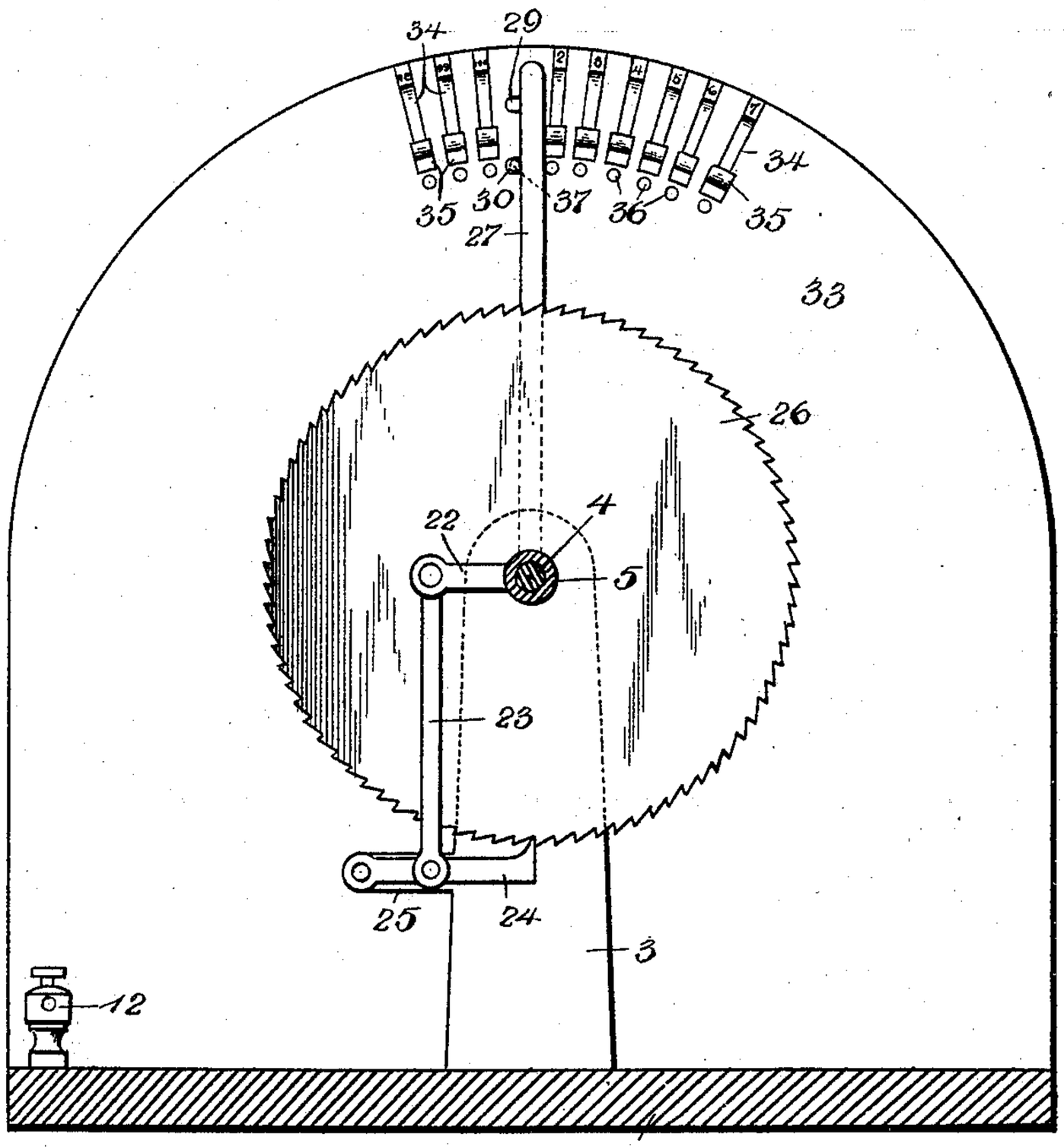
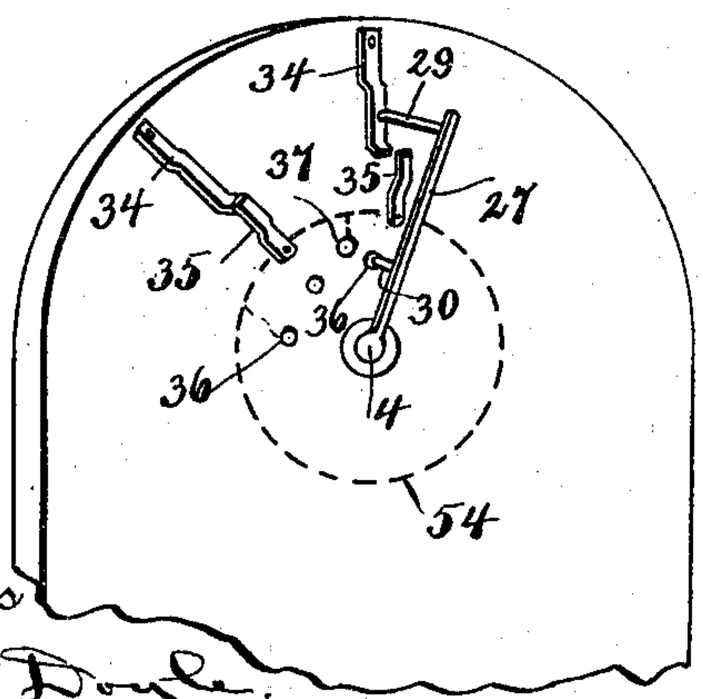


Fig. 10.



Witnesses
Wm. F. Doyle.
F. A. Hillson.

Inventors.
Walter A. Stilwell.
Alex. Barneck.
By. H. B. Willson.
Attorney

UNITED STATES PATENT OFFICE.

WALLACE A. STILWELL AND ALEXANDER BARNECK, OF SALINA, KANSAS.

TELEPHONE SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 604,434, dated May 24, 1898.

Application filed November 10, 1896. Serial No. 611,656. (No model.)

To all whom it may concern:

Be it known that we, WALLACE A. STILWELL and ALEXANDER BARNECK, citizens of the United States, residing at Salina, in the county of Saline and State of Kansas, have invented certain new and useful Improvements in Telephone Signal Systems; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to improvements in telephone signal systems in which a series of subscribers' or sub stations are connected with a central station, and the object is to provide a simple and reliable means whereby any one subscriber can connect his telephone with any other subscriber at will.

To this end the invention comprises a central office in which is located a series of switch-boards, one for each distant or subscriber's station, a pair of conductor-wires leading from each board to each of the other switch-boards, one of these wires terminating in a spring-contact which normally contacts with one of a series of shoes which are connected by a common conductor and also connected to a unison-post which is normally in contact with a rotating contact-arm having a ground connection through the corresponding telephone, and the other wire of each pair leads from a fixed contact-post located in the path of and adapted to be engaged by a spring-contact carried by said rotating contact-arm, as will be hereinafter more fully described, and particularly pointed out in the claims.

In the accompanying drawings the same reference-numerals indicate the same parts of the invention.

Figure 1 is a diagrammatic view of our improved signaling system, showing the same arranged for four substations or subscribers, the instruments all being set at unison. Fig. 2 is a similar view in which station No. 2 is connected for ordinary communication with station No. 4 and station No. 1 is connected for confidential communication with station No. 3. Fig. 3 is a front elevation of the subscriber's signal-switch. Fig. 4 is a detail view of the rear face of the switch-disk. Fig. 5 is a top plan view of the signal-switch. Fig. 6 is a plan view of the transmitting-switch. Fig. 7 is a transverse vertical section of the same. Fig. 8 is an end elevation, partly in section, of the signal-switch. Fig. 9 is a front elevation of the signal-switch, taken on the line *a a* of Fig. 8. Fig. 10 is a detail perspective view of the rotating arm 27 and the contiguous face of the disk 33, carrying the contact-points through which communication is established between the stations.

1 represents a base-plate, and 2 and 3 the integral vertical standards, in which is journaled a horizontal shaft 4. 5 represents a sleeve loosely mounted on said shaft, and about midway of its length it is formed with an integral depending arm 6, on the lower end of which is secured an armature 7, provided with the usual adjustable retractile spring 8, and 9 is an electromagnet in communication with the binding-posts 10 12. 13 represents a horizontal lever fixed on the outer end of said sleeve, its free end being adjustably limited in movement by the adjusting-screws 14 15 in the standard 16.

17 represents a pawl pivoted on the side of the lever 13 and held in contact with the teeth on the ratchet-wheel 18 by a spring 19. This ratchet-wheel is adjustably secured on the shaft 4 by a set-screw 20, and each impulse of the magnet moves the ratchet-wheel one tooth through the medium of the lever 13 and pawl 17.

20 is the usual retaining-pawl, pivoted on the standard 2 and held in contact with the ratchet-wheel 18 by a spring 21, its office being to prevent any back motion.

22 represents a short horizontal arm fixed on the inner end of the sleeve 5, and to the outer end of said arm is pivoted the upper end of a connecting-rod 23, the lower end of which is pivoted to a pawl 24, fulcrumed on a bracket 25, integral with the standard 3. The inner free end of this pawl engages the teeth on the ratchet-wheel 26, fixed on the shaft 5, and the teeth on this ratchet-wheel incline in the reverse direction to those on the ratchet 18, the office of the ratchet-wheel 26 and pawl 24 being to prevent the shaft 5 from moving more than one step ahead at a time when the armature 7 is operated.

The inner end of the shaft 5 projects through the standard 3, and on this projecting end is mounted a radial arm 27, being ad-

justably secured in place by a set-screw 28, and its outer end is provided with two contact-springs 29 30, the arm 27 and shaft 5 being in electrical connection with the binding-post 31 on the base 1 through the contact-spring 32, bearing against the end of the shaft 5, as shown in Fig. 8.

33 represents a fixed vertical disk of any suitable non-conducting material, the face of which, contiguous to the arm 27, being provided with an annular series of contact-points, each member of the series consisting of points—viz., a spring 34, a shoe 35, and a post 36, the spring and the post being located in the path of the contact-springs 29 and 30, respectively, and in their normal position the spring 34 is always in contact with the shoe 35. The number of the series of contact-points on the disk 33 is the same as the number of teeth on the ratchet-wheels, which also corresponds to the number of substations in communication. There is also a single post 37, which is termed the "unison-post," on which the arm 27 rests when the instrument is not in use.

In the sectional view shown in Fig. 8 it will be seen that each spring 34 is connected to a post or rod *a*, which extends through the disk 33, and its opposite end is provided with a conductor *b*, which corresponds to the conductor 34′ on the first instrument in Figs. 1 and 2. The posts 36 also extend through the disk, and their opposite ends are each provided with a conductor *c*, which corresponds to the conductor 35^2 on the first instrument in Figs. 1 and 2.

The unison-post 37 is connected by a rod 37′ with the "common conductor" 54, so called because it is connected by the rods 35′ with one of the shoes 35 on the face of the disk 33.

Referring to Figs. 6 and 7, which represent the transmitting-switch, 38 is a non-conducting disk provided with an annular series of contact-points 39 in electrical connection with a common conductor 40, and 41 is a spring-lever mounted on a central post 42 and in electrical connection with the conductor 43, the lever being adapted to swing around on the contact-points 39 and open and close the circuit as many times as there are contact-points on the disk 38, and when said lever 41 is at its normal position its point of contact rests on the disk between the last and the first contact-point—say No. 1—thus leaving the circuit at its end of the conductors 40 and 43 open.

Referring to Fig. 1, the large numerals 1, 2, 3, and 4 indicate the four substations or subscribers' telephones, and 1′ 2′ 3′ 4′ represent the respective signal-switches located in a central office. Each telephone is connected with the arm 27 of its respective signal-switch by a single conductor, as 44, 45, 46, and 47, respectively, and with the earth by a ground-wire 48, 49, 50, and 51. Each transmitting-switch 38 likewise has a ground-wire 40 $40'$ 40^2 40^3, respectively, and a line-wire 43, 43′, 43^2, and 43^3, which is in communication with the magnet 9 of its respective signal-switch in the central office, the circuits of which are completed through a common conductor 52 through the common battery 53 to the ground.

The series of shoes 35 on the face of the disk 33 on each instrument are connected to conducting-rods 35′, which extend through said disk and connect to a common conductor 54, fixed on the back of the disk 33. This common conductor 54 is simply a metallic ring, to which the rod 35′ from each shoe 35 is soldered. The unison-post 37 of each instrument is likewise connected to said common conductor 54 on the same instrument.

By referring to Figs. 1 and 2 it will be seen that the first post 36 on the first instrument is connected by a conductor 35^2 with the first of the series of springs 34 on the second instrument, and the contiguous spring 34 on the first instrument is in electrical connection by a conductor 34′ with the first post 36 contiguous to the first spring 34 on the second instrument. The second post 36 on the first instrument is connected by a conductor 57 with the first spring 34 on the third instrument, and the contiguous spring 34 on the first instrument is electrically connected by a conductor 56 with the first post 36 contiguous to the first spring 34 on the third instrument. The third post 36 on the first instrument is connected by a conductor 58 with the first spring 34 on the fourth instrument, and the corresponding spring 34 on the first instrument is connected by a conductor 59 with the first post 36 on the fourth instrument. The second post 36 and its spring 34 on the second instrument are similarly connected by the conductors 60 61, respectively, with the second spring 34 and post 36 on the third instrument, and the third post 36 and spring 34 on the second instrument are connected by the conductors 55 55′, respectively, with the second spring 34 and post 36 on the fourth instrument. The third post 36 and spring 34 on the third instrument are connected by the conductors 62 and 63, respectively, with the third spring 34 and post 36 on the fourth instrument, and so on throughout the remainder of the series. Thus, for instance, the connection between any two instruments, say one and two, is as follows: 34′, 56, and 59 connect with each of the contacts 34 at one, and the wires 35^2, 57, and 58 connect the post 36 with the post 36 at two, three, and four, and the common conductor 54 (shown in dotted lines) connects all the shoes and post 37 at each instrument. This arrangement gives two independent conductors between each pair in the series, and by referring to Fig. 2 it will be seen that No. 2 has moved his transmitter-switch to the fourth post. This means that he has closed and opened his transmitter-switch circuit four times and consequently sent four impulses through his signal-switch magnet 9 four times and moved

the arm 27 to the fourth contact-point, as shown, and in so doing the contact-spring 29 on said arm rests on the spring 34 in contact with it and at the same time breaking its contact with its shoe 35. The contact-spring 30 on the arm 27 is also in connection with the post 36 immediately below said shoe. The condition of affairs now is that No. 2 has established a circuit over his wire 45, arm 27, and spring 30 with the post 36, and thence over the wire 55 to the second spring 34 on No. 4 instrument and through said spring to its shoe 35, thence through the common conductor 54 to the unison-post 37, through the contact-spring 30 on the arm 27 to the wire 47 to No. 4's telephone, and thence through wire 51 to the ground, which places Nos. 2 and 4 in circuit for ordinary conversation, for while No. 2 is cut out from all the other instruments No. 4's telephone is still connected to the common conductor 54 on his signal-switch, and consequently if any other subscriber were to switch onto No. 4 he would then be in the same position as No. 2 and in communication with Nos. 4 and 2 as well.

By referring to Fig. 2 it will be seen that Nos. 2 and 4 are in communication, as above indicated, for ordinary conversation, and in the same figure we show how any two substantions—as Nos. 1 and 3, for example—are connected for confidential or secret communication—that is, No. 1 moves his signal-transmitter, and consequently the arm 27 of his signal-switch, three points, which connects the spring 29 on his arm 27 with the spring 34 and the conductor 56 to the post 36 on No. 3's switch. No. 3 then moves his transmitter to No. 1, which places the spring 29 on his arm 27 in contact with the spring 34 on his own instrument and from that over the conductor 57 to the post 36 on No. 1's instrument, and as the unison-posts 37 on each instrument are the only means of communication common to all the instruments it follows that when the arm 27 of a particular subscriber's instrument is off of its unison-post he can only be communicated with by the subscriber on whose line he is switched. Of course it will be understood that when any two instruments are connected, as above described, for confidential conversation the current is split at the switch-arm 27 and follows both conductors. As represented in the diagram in Fig. 2, it will be seen that No. 1's arm 27 is on the conductor 56 leading to No. 3's post 36 and No. 3's arm 27 is on the conductor 57 leading to No. 1's post 36, and as both of the arms 27 are off their respective union-posts 37 they are both cut off from communication with all the other instruments in the system.

Of course it will be understood that when a subscriber is through talking he carries his transmitter-switch around to the starting-point, which brings the arm 27 of his instrument around to the unison-post, which places his instrument in position for communication with all the others, and if two subscribers have arranged their instruments for secret communication both of course must restore their respective instruments to unison.

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

1. A telephone-exchange system, comprising a central office in which is located a series of switchboards, one for each distant or subscriber's station, a pair of conductor-wires leading from each board to each of the other switchboards, one of these wires terminating in a spring contact-point 34 which normally contacts with one of a series of contact-shoes 35, which are connected by a common conductor 54, and also connected to a unison-post 37 which is normally in contact with a rotating contact-arm 27 having a ground connection through the corresponding telephone, and the other wire of each pair leading from a fixed contact-post 36 located in the path of and adapted to be engaged by a spring contact-finger 30 carried by said rotating contact-arm 27, as and for the purpose set forth.

2. A telephone-switchboard comprising two series of fixed contacts arranged in concentric circles, a common conductor normally connected with each contact of one of the series, a series of wires arranged in pairs, the ends of the wires of each pair terminating in a contact in each series, a switch-arm movably secured relatively to the series of contacts and normally electrically connected with the common conductor and permanently connected through a telephone-station with the ground, said switch adapted to simultaneously connect with the contiguous ends of any pair of wires in said series, as and for the purpose set forth.

3. A telephone signal system comprising an electrically-operated switch having a movable switch-arm carrying two contact-points as 29 and 30, and permanently connected through a telephone-station with the ground, of a series of individual conductors arranged in pairs, the contiguous ends of each pair terminating in the path of said contact-points 29 and 30, one end of one wire of each of which pairs is connected to an insulated contact-post as 36, and the other wire to a contact-spring as 34, normally in contact with a common conductor as 54, said common conductor having a normal ground connection through the switch-arm, as and for the purpose set forth.

In testimony whereof we hereunto affix our signatures in presence of two witnesses.

WALLACE A. STILWELL.
ALEXANDER BARNECK.

Witnesses:
F. A. BARNETT,
T. N. BARNETT.