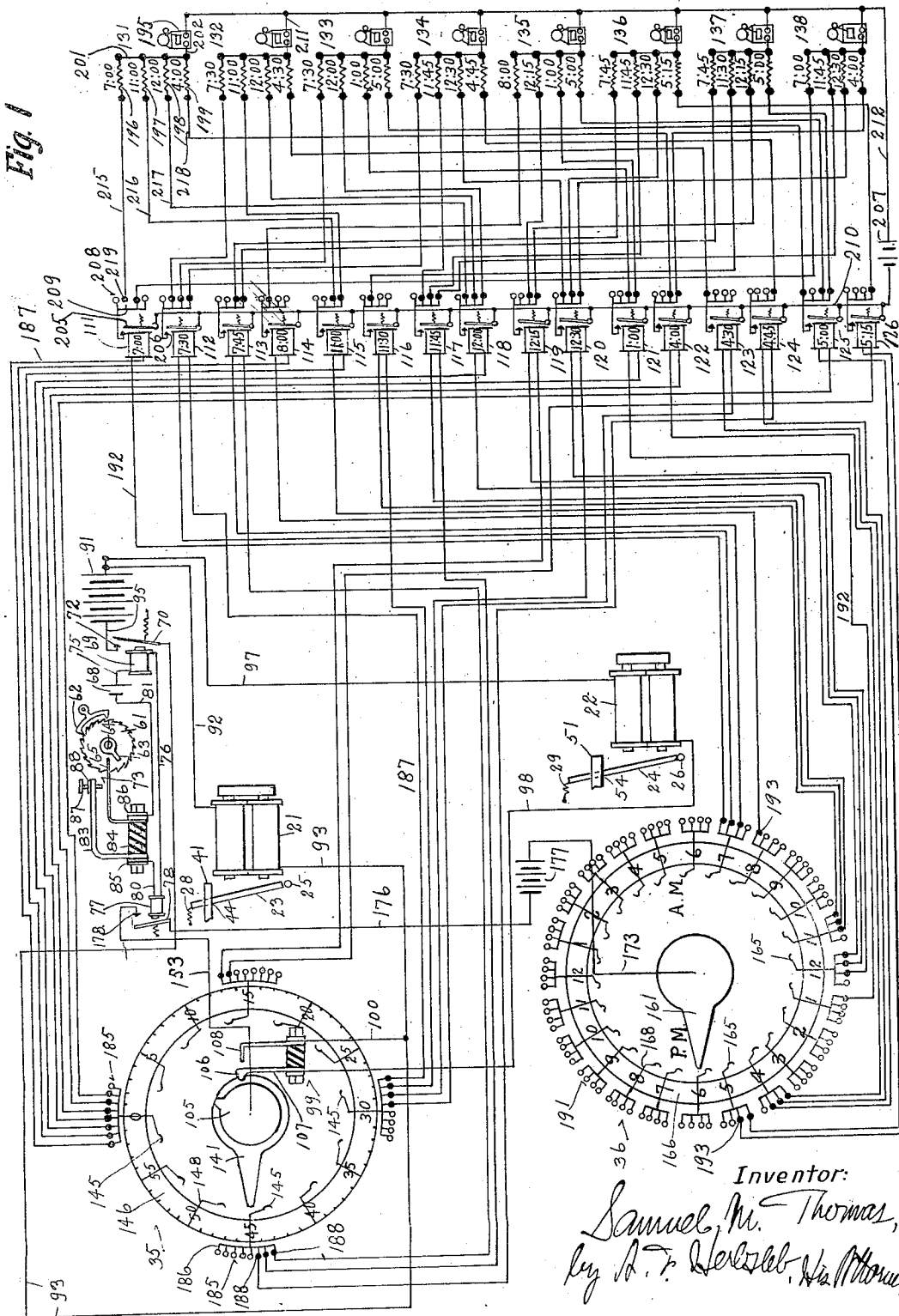


1,369,146.

Patented Feb. 22, 1921.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

Fig. 2

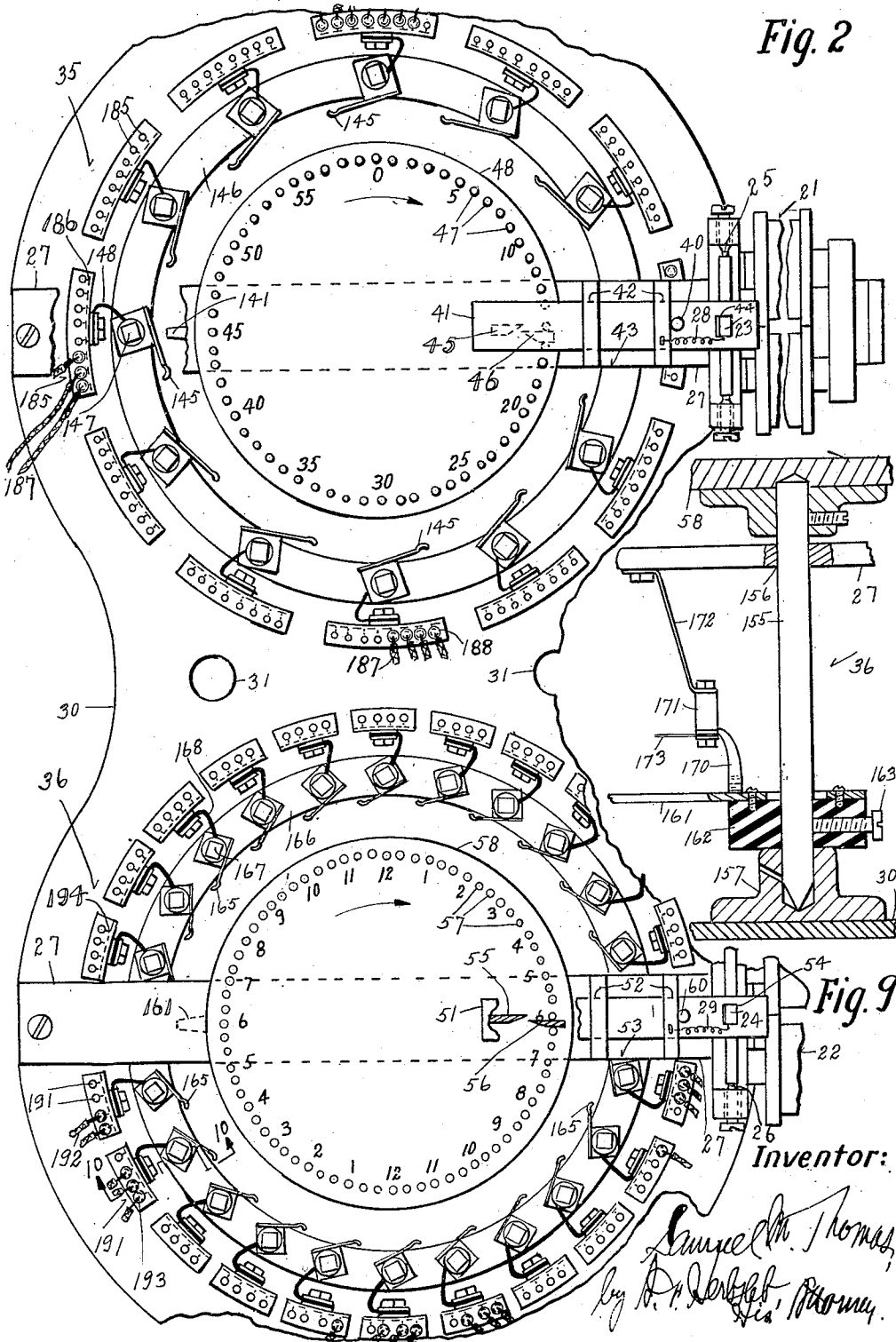


Fig. 9

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S. M. THOMAS.
SIGNALING SYSTEM.
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4 SHEETS—SHEET 3.

Fig. 3

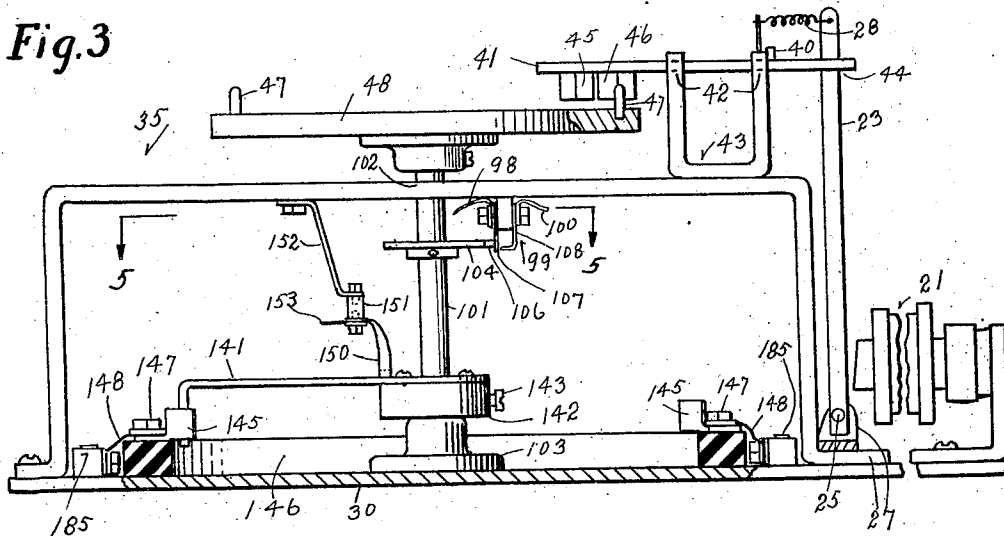


Fig. 4

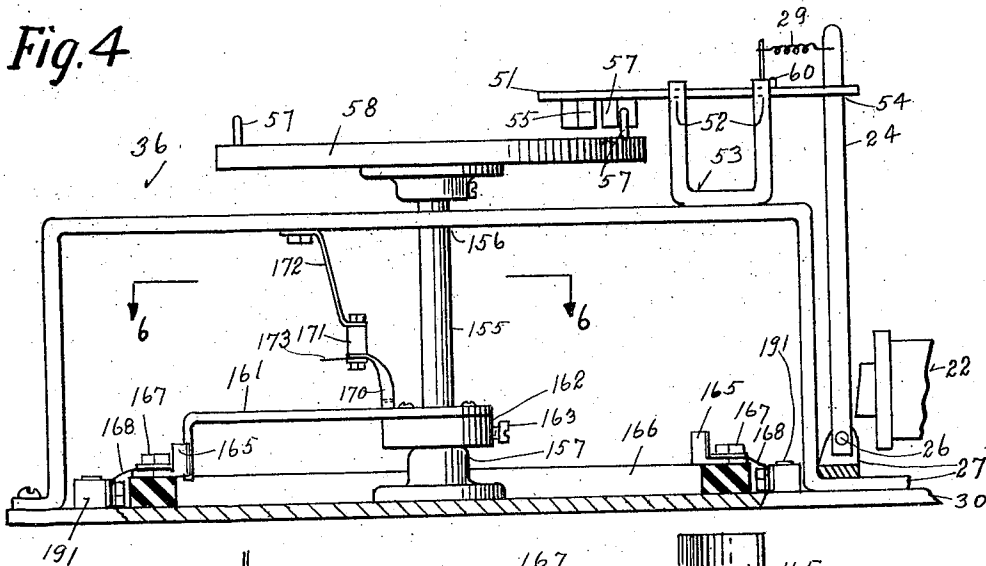
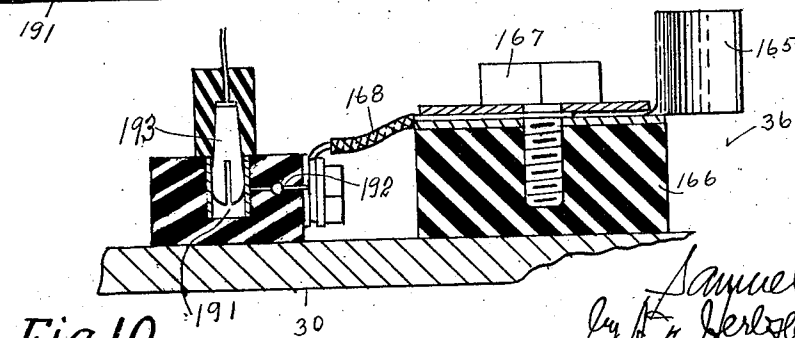


Fig. 10

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4 SHEETS—SHEET 4.

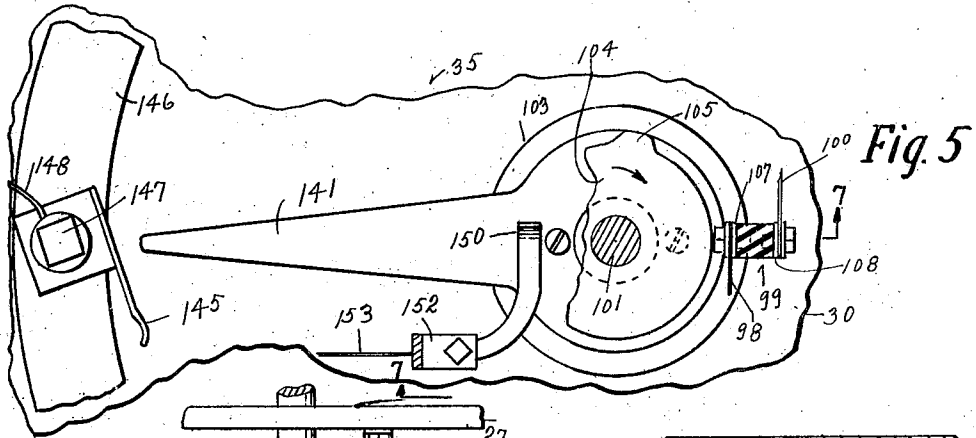


Fig. 5

Fig. 8

Fig. 7

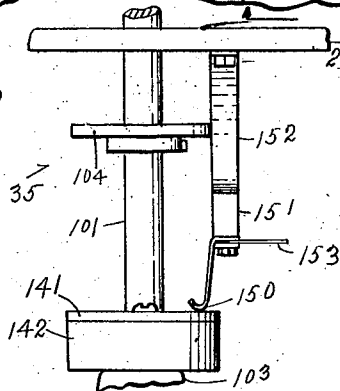
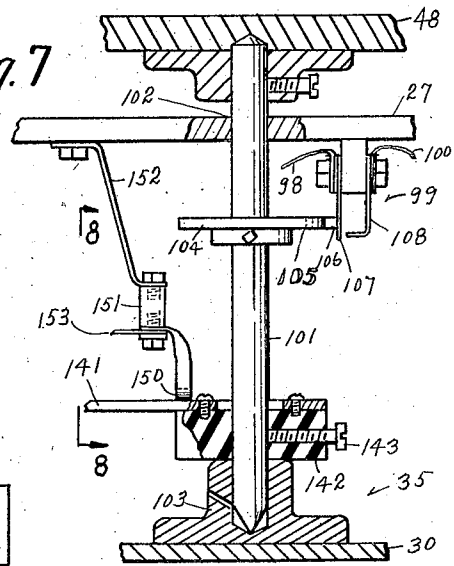


Fig. 11

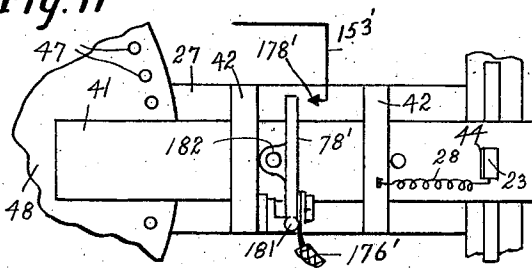
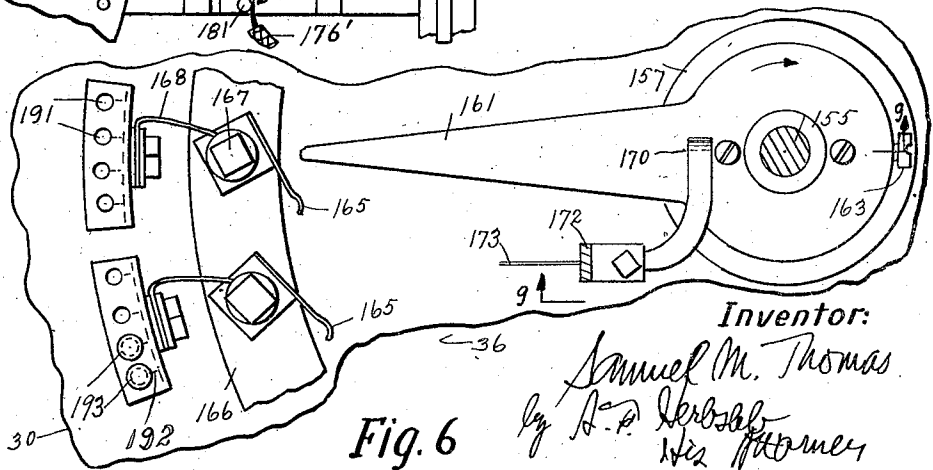


Fig. 6

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UNITED STATES PATENT OFFICE.

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SIGNALING SYSTEM.

1,369,146.

Specification of Letters Patent.

Patented Feb. 22, 1921.

Application filed June 28, 1920. Serial No. 392,230.

To all whom it may concern:

Be it known that I, SAMUEL M. THOMAS, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Signaling Systems; of which the following is a specification.

My invention relates to signaling systems, especially to signaling systems of the character of those intended to signal the times of beginning and of stopping work, for instance, in different departments of a factory, and other business establishments, of the times of the beginnings and endings of activities in departments or classes in institutions of learning, and for similar uses, and it is especially adapted for providing signaling means for different departments having different times for the beginnings and endings of activities.

It is the object of my invention to provide novel signaling mechanism; further, to provide a novel signaling system whereby a plurality of departments are served at different times by simple mechanism; further, to provide novel means whereby changes in times of service may be readily effected; further, to provide signaling mechanism of novel character comprising a plurality of time devices and signal control means, and electric connections between the latter and the respective time devices, whereby the circuits of the signaling devices are completed through said time devices; further, to provide novel circuit means whereby changes in times of signals in mechanism of the character mentioned are readily accomplished; and, further, to provide a plurality of signaling circuits for various departments arranged whereby various departments may be served through resistances connected in multiple, but whereby undesired energizing circuit between departments is avoided by the arrangement of said resistances in series.

The invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

Figure 1 is a diagrammatic representation of the electric circuits of an exemplification of my invention.

Fig. 2 is a plan view of the time devices and of the electric translating devices for actuating the same, partly broken away. 55

Fig. 3 is a side elevation, partly broken away, of the minute time device.

Fig. 4 is a side elevation, partly broken away, of the hour time device.

Fig. 5 is a horizontal section of the minute time device, taken on the line 5—5 of Fig. 3, partly broken away. 60

Fig. 6 is a horizontal section of the hour time device, taken on the line 6—6 of Fig. 4, and partly broken away. 65

Fig. 7 is an axial section of a detail of the minute time device, taken in the plane of the line 7—7 of Fig. 5.

Fig. 8 is a cross-section of a detail of the same, taken in the plane of the line 8—8 of Fig. 7.

Fig. 9 is an axial section of a detail of the hour time device, taken in the plane of the line 9—9 of Fig. 6.

Fig. 10 is an enlarged detail showing the releasable electric connection with the time device, taken in section on the line 10—10 of Fig. 2.

Fig. 11 is a detail of a modification showing a mechanical means for controlling the durations of signals. 80

Electric translating devices are exemplified as relays 21, 22, having armatures 23, 24, pivoted at 25, 26, to a framing 27, and normally retracted by springs 28, 29. The framing may comprise a base-plate 30, having suitable apertures 31 for receiving fastening screws, and a suitable cover not shown.

In the present exemplification the respective electric translating devices are of different time values. The electric translating device 21 is exemplified as of a minute value, and the electric translating device 22 is exemplified as of an hour value, for respectively actuating time devices 35, 36, exemplified respectively as a minute time device and as an hour time device. 90

The minute time device comprises a reciprocating bar 41, reciprocating in bearings 42 of a bearing-yoke 43, fixed to the framing, a pin 40 limiting movement of the bar in one direction. The bar has articulation 44 with the armature 23. Oppositely dis- 100

posed bevel teeth 45, 46, are fixed to the reciprocating bar, and are arranged to coact with pins 47, arranged about a wheel 48, designated as a pin-wheel. The teeth are
 5 arranged in off-set relation to each other, in planes parallel with their directions of movement, and the bevels thereof are arranged opposite to each other, so that, when the teeth are moved in one direction, for, in-
 10 stance, by attraction of the armature, the bevel of one of the teeth will engage the next pin in advance, and move the pin-wheel one-half of its time movement, cycle or reciprocation.

15 The time movement of the pin-wheel is completed by the engagement of the oppositely beveled tooth with the last engaged pin of the pin-wheel upon the reverse movement of the reciprocating rod, for completing the time movement of the pin-wheel.
 20 The teeth preferably fill the space between the pins, whereby the wheel is held in positive position between reciprocations of the teeth. The minute wheel is exemplified as
 25 having sixty pins, one for each minute of the hour, so that upon sixty complete actuations by the reciprocating teeth, one of which takes place each minute, a complete rotation of the minute wheel will have been
 30 accomplished in the duration of one hour.

The hour time device comprises a reciprocating bar 51, reciprocating in bearings 52 of a bearing-yoke 53, fixed to the framing, a pin 60 limiting movement of the bar, in
 35 one direction. The bar has articulation 54 with the armature 24. Oppositely disposed bevel teeth 55, 56, are fixed to the reciprocating bar and are arranged to coact with pins 57, arranged about a wheel 58. The
 40 teeth are similar to the teeth 45, 46, and are similarly arranged, so that by a complete cycle of movement or reciprocation of the reciprocating bar 51, the rotation of the pin wheel 58 is effected for the distance of one
 45 tooth. The scope of the hour wheel is represented as 24 hours, there being three pins for each hour, or 72 pins.

The electrical control for the electric translating devices is preferably obtained
 50 from a horological instrument, the second wheel of which is shown at 61, represented as an escapement wheel, with which a usual escapement ratchet 62 coacts. An insulating
 55 finger 63 is exemplified as rotating with the shaft 64 of this wheel. It is arranged to engage a finger 65, once during each revolution thereof, represented as of a duration of one minute, so as to control an electric circuit in which there is a translating device for in-
 60 turn controlling an electric circuit for the translating devices 21, 22.

It may be here stated that the electric circuits of the exemplification of my invention are represented as open circuits, the arma-
 65 tures of the translating devices acting to

close the circuits, although it is obvious that the reverse of this arrangement may be provided by the employment of closed circuits, arranged to be opened at the stated intervals by the movements of the respective arma- 70
 tures, or other movable elements of translating devices, and that other obvious changes in electrical connections or directions of flow of electricity may be provided without departing from the spirit of my invention 75
 within the scope of the appended claims.

The horological circuit may be exemplified as comprising a battery 68, an electric translating device, exemplified as a relay 69, comprising an armature 70, normally re- 80
 tracted by a spring, and coacting with a contact 72, to form a switch, and a switch 73, comprising the finger 65.

An electric conductor 75 connects the battery 68 with one of the terminals of the elec- 85
 tric translating device 69. An electric conductor 76 connects the other terminal of the electric translating device 69 with one of the terminals of an electric translating device, shown as a relay 77, comprising an armature 90
 78, normally retracted by a spring, and hereinafter more fully described, an electric conductor 80 connecting the other terminal of the electric translating device 77, with the
 switch 73, and an electric conductor 81 con- 95
 necting the latter with the battery.

The switch 73 comprises the finger 65 and an arm 83. The finger 65 and the arm 83 are supported by an insulating block 84, suitably supported, a binding post 85 connecting the 100
 electric conductor 80 and the arm 83 with said insulating block, and a binding post 86 connecting the electric conductor 81 and the finger 65 with said insulating block, in
 such manner that said arm and finger are 105
 normally insulated from each other. The finger 65 is preferably a thin narrow plate of electro-conductive resilient metal arranged to be readily moved to close the
 switch by means of the finger 63, so as not 110
 to interfere with the operation of the horological instrument.

The duration of closing of the switch is determined by the duration of contact of the finger 63 with the finger 65, and the space 115
 between the finger 65 and the arm 83. In the present exemplification the space is normally due to resilient retraction of the finger 65 upon movement of the finger 63 past the same. If desired, the switch may be an ad- 120
 justable switch, accomplished by providing a contact-screw 87, adjustable in a bearing 88 in the arm 83. The closing of the switch is preferably for comparatively short duration, for instance from two to four seconds, 125
 as may be desired.

The electric translating devices 21, 22, are exemplified as served from a battery 91. An electric conductor 92 connects one pole of the battery with one of the terminals of the 130

relay 21. An electric conductor 93 connects the other terminal of said relay with the armature 70, of the electric translating device 69, the armature coacting with a contact 72 to form a switch. An electric conductor 95 connects the latter contact with the other pole of the battery 91.

The relay 22 is connected with the battery 91 by means of an electric conductor 97, which connects with one of the poles of the battery, as with the electric conductor 92, and with one of the terminals of the relay 22. An electric conductor 98 connects with the other terminal of said relay and with one of the terminals of a switch 99. An electric conductor 100 connects the other terminal of said switch with the other pole of the battery, for instance by means of the electric conductor 93.

The switch 99 is controlled by the minute time device in such manner that the relay 22 is in actuatable condition at only a predetermined time during each hour or complete revolution of the wheel of the minute time device. Thus the wheel 48 of the minute time device is supported on a shaft 101, rotating in a bearing 102 and a step bearing 103, a disk 104, instanced as of insulating fiber, is secured to the shaft so as to rotate therewith. The disk is provided with a cam 105, arranged to contact a toe 106 on a finger 107 of the switch 99, for moving this finger into contact with an arm 108 of said switch, to close said switch. The finger 107 and arm 108 are of electro-conductive material, the finger 107 being preferably resilient, in the present instance to normally cause open relation of said switch.

The duration of dwell of the cam 105 on the toe 106 for causing closing of the switch 99, is preferably throughout only a small fraction of angular movement of the wheel 48, and preferably just in advance of the completion of the rotation or of the hour of said minute wheel. The dwell is exemplified as an angular distance on the wheel of three minutes, completed one minute in advance of the completion of the hour or revolution by the minute wheel.

With this exemplification, there is an actuation in the hour time device at each closing and opening of the switch 70, 72, while the switch 99 is closed, represented as a duration of three complete reciprocations of the teeth 45, 46, and 55, 56, representing a movement on the hour wheel of one hour. The object is to effect the movement of the hour wheel by a series of actuations, represented as six partial actuations, or three cycles of movement, or reciprocations of the teeth 55, 56, to effect easy and graduated rotation of the hour wheel.

The minute time device and the hour time device are each exemplified as provided with complementary electric contact devices for

causing closing of a circuit at predetermined times, representing respectively, for instance, the time of commencement of activity in the morning, completion of activity at noon, the time of commencing activity at noon, and the time of cessation of activity in the evening.

Electric translating devices are controlled by said time devices, and these in turn control signal devices in the various departments which are being served. The number of such electric translating devices is optional, preferably one being provided for each time at which a signal is to be given, and the number of departments served is also optional, and may be increased or decreased from time to time as conditions may warrant.

Thus electric translating devices, exemplified as control relays 111 to 126 inclusive are provided, and departments exemplified at 131 to 138 inclusive are provided. One of the terminals of each of the relays is preferably connected by a partial circuit with one of the time positions of the hour time device, the other of the terminals of each of the relays being by a partial circuit connected with a time position of the minute time device. The time devices are provided with means whereby said partial circuits are electrically connected for causing control of the relays.

Each of the control relays may be for a particular time, as noted for convenience in Fig. 1, in which the relays are respectively designated 7:00, 7:30, 7:45, 8:00, 11:00, 11:30 and 11:45 o'clock a. m., 12:00 o'clock noon; and 12:15, 12:30, 1:00, 4:00, 4:30, 4:45, 5:00 and 5:15 o'clock p. m.

The means exemplified for connecting the partial circuits of the control relays just described with the time devices comprise preferably similar mechanisms for the minute time device and for the hour time device. Referring to the minute time device an electro-conductive arm 141 is fixed to a block of insulation 142, in turn fixed to the shaft 101 by a set-screw 143. At each of the time positions which it is desired to employ, provision is made for an electric contact, with which the arm 141 is adapted to connect, forming a switch device. I have exemplified such a contact at each five-minute position, four positions at the minute time device, respectively at the even hour, and at fifteen minutes, thirty minutes and forty-five minutes past the hour, being employed in the present exemplification.

At each of these time positions there is a contact 145, with which the arm 141 is arranged to make contact during the revolution of the arm, at the time when said arm is in complementary radial position. These contacts are of bent electro-conductive metal, the contacts being respectively se-

cured to an insulating ring 146 by means of screws 147, which also form binding posts for electric conductors 148, having connection as hereinafter described, respectively with one of the terminals of the control relays to impart to said relays a minute time value corresponding to the minute time position of the electric contact from which the electric conductor projects.

A wiper 150 is arranged to contact a suitable part of the arm 141 to make preferably continuous electric connection therewith. This wiper is shown as a finger, which is of resilient electro-conductive metal, supported on an insulating block 151, so as to insulate said wiper from the frame. The insulating block has support from the frame by means of a hanger 152. An electric conductor 153 has electric connection with said wiper.

The hour time device comprises an electro-conductive arm 161, fixed to a block of insulation 162, in turn fixed to a shaft 155 by a set screw 163. The shaft rotates in an upper bearing 156 and a step bearing 157. At each of the time positions which it is desired to employ, provision is made for an electric contact, with which the arm 161 is adapted to connect, forming a switch device. I have exemplified such a contact at each hour position, seven positions on the hour time device, respectively at 7 o'clock, 8 o'clock, and 11 o'clock a. m., at 12:00 o'clock noon, and 1 o'clock, 4 o'clock and 5 o'clock p. m., being employed in the present invention.

At each of the time positions there is a contact 165, with which the arm 161 is arranged to make contact during the revolution of the arm, at the time when said arm is in complementary radial position. These contacts are of bent electro-conductive metal, the contacts being respectively secured to an insulating ring 166 by means of screws 167, which also form binding posts for electric conductors 168, having connection, as hereinafter described, respectively with the other of the terminals of the control relays to impart to said relay an hour time value corresponding to the hour time position of the electric contact from which the electric conductor projects.

A wiper 170 is arranged to contact a suitable part of the arm 161 to make preferably continuous electric connection therewith. This wiper is shown as a finger which is of resilient electro-conductive metal, supported on an insulating block 171, so as to insulate said wiper from the frame. The insulating block has support from the frame by means of a hanger 172. An electric conductor 173 has electric connection with said wiper.

There is preferably a partial circuit between the arms 141, 161, so as to connect the partial circuits from the respective control relays, when the arms of the respective

hour time device and minute time device make contact with the time contacts with which said respective relays connect. This last-named partial circuit comprises the electric conductors 153, 173, and an electric conductor 176, and is shown as including a battery 177, and a switch comprising the armature 78 and a coacting contact 178. When the switch 70, 72, is closed, and the arms of the respective hour time device and minute time device make contact with the time contacts connecting with a given control relay, the signal at the department or departments corresponding to said control relay is actuated for causing operation of the signal.

This actuation of the signal would ordinarily continue throughout the time that the arms are in contact with said respective time contacts, which would be for the duration of a minute. It is desirable to shorten the duration of actuation of the signal, for which purpose I have exemplified the switch 78, 178, which is controlled by the relay 77, the attraction of the armature 78 of said relay causing contact thereof with the point of the switch, for closing the switch, in the present exemplification. The relay 77, as hereinafter explained, is controlled by the switch 73, the attracted condition of the armature 78 lasting only as long as the switch 73 is closed, and the switch 78, 178, opening upon the opening of switch 73, in the present exemplification, which is shown as an open circuit, but is not limited thereto. As soon as the switch 78, 178, opens, the signal ceases, so that the duration of the signal will be the duration of the closed condition of the switch 78, 178, which is determined by the actuated condition of its finger 65 by means of the finger 63 and adjustment of the screw 87.

If desired, the controlling of the circuits for the control relays may be effected by mechanical means, for instance as shown in the modification depicted in Fig. 11, in which the electric conductors 153', 176', connect respectively with the terminals of a switch comprising an arm 78' and a contact-point 178'. The arm is pivoted at 181 to a suitable part of the frame, but insulated from the frame, and has articulation 182 with the bar 41. The switch is arranged to be closed by the actuation in one direction of the bar 41, which supports the actuating teeth of the minute time device, the switch being closed momentarily upon the initial actuation of said bar, and again opened upon the retraction of said bar, which movements are controlled as hereinbefore explained by the arm 63 of the horological instrument, and the switch 73, having effect to close the switch 70, 72, the switch 70, 72, opening upon release of the switch 73. When a mechanical movement is employed, the relay 77 would be dispensed with, and the electric conductor

76 make direct connection with the electric conductor 80.

The various electric conductors connecting with the control relays of a given minute time value may be electrically connected with each other, and connect with the contact 145 of equal time value of said minute time device, and the electric conductors of equal hour time value from said respective control relays, may be connected together, and connect with the contact 165 of corresponding time value of the hour time device. I prefer to connect each of said electric conductors leading from said relays releasably and selectively with said time values of said minute time device and of said hour time device, so as to provide for ready time adjustments of the various control relays, and to provide for ready and convenient change of time relations of said control relays from time to time, as may be desired.

For this purpose I have provided each of the time positions of the minute time device with a series of sockets 185, the sockets of each series being connected with the contact 145 of corresponding time value by means of electric conductors 186. The end of each of the electric conductors 187 extending from the minute terminals of the respective control relays is provided with an electro-conductive plug 188, arranged to be received in any of the sockets 185. It is placed in the socket of the minute time value which it is desired that the control relay shall have. Each of the time positions which it is desired to use of the hour time device is provided with sockets 191 connected with the contact 165 of corresponding hour time value by means of electric conductors 194. The end of each of the electric conductors 192, extending from the hour terminals of the respective control relays, is provided with an electro-conductive plug 193, similar to the plug 188, arranged to be received in any of the sockets 191 of equal time value, to impart to the control relay the hour time value which it is desired to have.

In the present exemplification eight departments are shown as served by my invention, although the number of departments may be increased or diminished, as may be desired. In each department there is a signal, shown as an electric bell 195. The bells are in a series of circuits, respectively representing different time values, and respectively connecting with control relays of corresponding time values. There is a resistance in each of the circuits. The resistances are shown so connected in the various departments that the circuits may effectively pass through the resistances to cause operation of the signal, if said resistances are connected in multiple, but will prevent the operation of any signal if there is a circuit therewith connecting with a plurality of re-

sistances in series. The resistances in the respective departments are exemplified at 196, 197, 198, 199, time values thereof being for convenience designated in Fig. 1, as an example. An electric conductor 201 connects one end of each of the resistances in a department, with an electric conductor 202, connecting with one of the binding posts of the signal therein.

Each of the control relays is provided with an armature 205, coacting with a contact 206 for forming a switch. The armature and contact are respectively connected with the resistances and with the battery 207 of the signal circuit. The contact for each control relay is instanced as connected with a series of sockets 208 by means of electric conductors 209. The armatures are shown electrically connected together and with the battery by means of an electric conductor 210. Each of the signals is connected by means of an electric conductor 211 with a common electric conductor 212.

Electric conductors 215, 216, 217 and 218, connect with the respective resistances at the respective stations. Resistances of a given time value are connected with the control relays of corresponding time value, provision being made for readily changing said connections so as to change the time of operation of the signals in the departments when desired. The respective electric conductors 215, 216, 217 and 218 are provided with plugs 219, similar to the plug 188, arranged to be selectively received in the sockets 208 of any of the contacts of the control relays.

As an exemplification it will be noted that the point of the switch controlled by the control relay for 7 o'clock a. m. time, is electrically connected with the electric conductors 215 and the resistances 196 in departments 131 and 138, the electricity flowing through these resistances in multiple, when the switches controlled by the armatures of the control relays are closed, for completing the circuits through the electric signals, and operating the signals.

At the same time 7:00 o'clock a. m. resistance of department 131 is electrically connected with the 11:00 o'clock a. m. resistance, the 12:00 o'clock noon resistance and the 4:00 o'clock p. m. resistance of said department by means of the electric conductor 201. The 11:00 o'clock a. m. resistance of department 131 is connected with the 11:00 o'clock resistance of department 132, by means of the electric conductors 216 and the sockets and plugs having electric connection with the contact 206 of the 11:00 o'clock control relay. The 12:00 o'clock noon resistance at department 131 is electrically connected with the 12:00 o'clock resistances of stations 132 and 133, by means of the electric conductors 217 and the sockets and plugs having electric connection with

the contact 206 of the 12:00 o'clock relay. The 4:00 o'clock p. m. resistance of department 131 is electrically connected with the 4:00 o'clock resistance of department 138
 5 by means of the electric conductors 218 and the sockets and plugs having electric connection with the contact 206 of the 4:00 o'clock control relay.

These circuits are completed through the
 10 respective signals of said given time values and the common electric conductor 212 of the signal battery 207, but said circuits are each through a plurality of resistances, arranged in series, there being three resist-
 15 ances in series in each instance, these resistances in series interrupting the actuation of all of the signals, except the ones intended to be operated when the 7:00 o'clock a. m. relay is energized, namely, the 7:00
 20 o'clock a. m. signals in departments 131 and 138, the resistances of which are arranged in multiple.

Instancing the operation of my invention, and assuming the relation of parts shown
 25 in Fig. 1, and that the 7:00 o'clock a. m. signal is the next one to be sounded for signaling the beginning of activity in departments 131 and 138: The horological instrument is running. At the completion of each
 30 minute, the arm 63 moves the arm 65 to momentarily close the switch 73; thereby completing the circuit of relays 69 and 77, for operating the armatures 70 and 78, and closing the switches controlled thereby. The
 35 closing of the switch 70, 72, in turn closes the circuit in which the relay 21 is located, thereby causing attraction of its armature 23 for moving the bar 41 and the bevel-teeth 45, 46, thereon, in one direction, these teeth
 40 coacting with the pins 47 of the minute time device for advancing the minute wheel 48 one-half a complete or cycle of movement.

The movement of the finger 63 past the finger 65 causes retraction of the finger 65
 45 and opening of the switch 73, resulting in retraction of the armatures 70 and 78, the deenergizing of the relay 21, and the retraction of the armature 23, the latter causing movement of the minute bar 41 and of
 50 the teeth 45, 46, thereon, thereby completing the reciprocation of said bar, and completing the cycle of movement of the minute wheel for that given minute.

These operations are repeated each minute,
 55 until the cam 105 of the minute time device coacts with the toe 106 for closing the switch 107, 108, at the fourth minute preceding the completion of the hour, the switch remaining closed for the duration of
 60 a three minute interval, which is completed one minute before the completion of the hour.

During this three minute interval, whenever the switch 73 is closed, the relay 22, as
 65 well as the relay 21 is energized, the cir-

cuit of the relay 22 being battery 91, 92, 97, 22, 98, 99, 100, 93, 70, 72 and 95, back to battery. The energizing of the relay 22 causes retraction of its armature 24, for
 70 moving the hour bar 51 and the bevel teeth 55, 56, thereon, in one direction, thereby advancing the hour wheel one-half an intermittent cycle of movement. The opening of the switch 73 deenergizes the hour relay 22, as well as the minute relay 21, whereby
 75 the hour armature 24 is retracted, for completing the reciprocation of the hour bar 51 and the cycle of movement of the hour wheel 58. This is repeated at each cycle of movement of the minute wheel throughout three
 80 cycles of movement, and causes advancement of the hour wheel for the time space of one hour.

These operations are repeated until the parts are in the relation of one minute in
 85 advance of 7:00 o'clock a. m. This relation is that the hour arm 161 is in contact with the 7:00 o'clock a. m. contact 165 of the hour time device. At the completion of the
 90 next movement of the minute time device, the arm 141 thereof will be in contact with the contact 145 of zero or even hour value of the minute time device, the hour time device and minute time device thereby having
 95 moved to a time position of 7:00 o'clock a. m.

The electric conductor 192, having connection with one of the terminals of the 7:00
 o'clock control relay, also has connection by means of its plug and socket with the 7:00
 100 o'clock a. m. contact 165 of the hour time device. The electric conductor 187 has electric connection with the other terminal of said 7:00 o'clock control relay, and, by means of its plug and the socket, has connection
 105 with the contact 145 of zero time value of the minute time device. The contacts 165 and 145 just mentioned are, in such relation of parts, connected together through the arms 141, 161, the battery 177, the electric
 110 conductors 173, 176 and 153, and the switch 78, 178, which is closed owing to the energized condition of the relay 77, during closed relation of the switch 73, the duration of this closed relation being short, ex-
 115 emplified as from two to four seconds.

During this short interval, the armature 205 of the 7:00 o'clock a. m. control relay is attracted for closing the switch 205, 206,
 120 thereof, closing each of the signal circuits employing a 7:00 o'clock resistance, which resistances are in multiple, in the present instance affecting departments 131, 138, in which the signals will ring, for indicating
 125 the commencement of activity in these departments. The duration of this ringing is only throughout the duration of the time that the switch 73 is closed, when the switch 78, 178, or a mechanical movement as described, is employed.
 130

Actuations of the signals in all other departments having electric connection with the 7:00 o'clock a. m. resistances in departments 131, 138, at the time the 7:00 o'clock signals are being given in departments 131, 138, are prevented, owing to the fact, as hereinbefore explained, that the resistances therefor are at the time arranged in series, the resistances thus arranged being sufficient to prevent energizing circuit in all the electric signals thus connected.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is:

1. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values controlled thereby, electric translating devices for controlling signals, partial circuits respectively having connection with the respective terminals of said last-named translating devices, and a complemental partial circuit between said time devices, said time devices including means for controlling the electric connection between said partial circuits.

2. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values controlled thereby, electric translating devices for controlling signals, signals controlled thereby, and partial circuits respectively having connection with the respective terminals of said last-named translating devices, said time devices including means for controlling the electric connection between said partial circuits.

3. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values controlled thereby, electric translating devices for controlling signals, partial circuits respectively having connection with the respective terminals of said last-named translating devices, said time devices including means for controlling the electric connection between said partial circuits, and means for changing the duration of said last-named control.

4. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values controlled thereby, electric translating devices for controlling signals, electrically operated signals controlled thereby comprising terminals, means for connecting said terminals selectively with said second-named electric translating devices, and partial circuits respectively having connection with the respective terminals of said second-named translating devices, said time devices including means for controlling the electric connection between said partial circuits.

5. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values controlled thereby, electric translating devices for controlling signals, partial circuits respectively having connection with the respective terminals of said last-named translating devices, electrically controlled signaling means controlled by said last-named electric translating devices, electric circuits for said respective electrically controlled signaling means, and releasable means for selectively electrically connecting said last-named circuits with said last-named electric translating devices, said time devices including means for controlling the electric connection between said first-named partial circuits.

6. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values controlled thereby, electric translating devices for controlling signals, partial circuits respectively having connection with the respective terminals of said last-named translating devices, electrically controlled signaling means controlled by said last named electric translating devices, electric circuits for said respective electrically controlled signaling means, releasable means for selectively electrically connecting said last-named circuits with said last-named electric translating devices, and releasable means for selectively connecting said first-named partial circuits in different time values with said respective time devices, said time devices including means for controlling the electric connection between the respective time values of said respective time devices.

7. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values intermittently controlled thereby, means affecting the durations of said control, electric translating devices for controlling signals, partial circuits respectively having connection with the respective terminals of said last-named translating devices, electrically controlled signaling means controlled by said last named electric translating devices, electric circuits for said respective electrically controlled signaling means, releasable means for selectively electrically connecting said last-named circuits with said last named electric translating devices, and releasable means for selectively connecting said first-named partial circuits in different time values with said respective time devices, said time devices including means for controlling the electric connection between the respective time values of said respective time devices.

8. In a signal system of the character de-

scribed, the combination of a horological instrument, an electric circuit, means controlled by said horological instrument for controlling said electric circuit, said electric circuit including an electric translating device, time devices of different time values, electric translating devices of different time values, controlling the latter, electric circuits for said respective electric translating devices of different time values including interrupting means controlled by said first-named electric translating device, one of said time devices provided with means controlling said electric circuit for the other time device at predetermined time periods, electric translating devices for controlling signals, and partial circuits for the latter respectively having terminals respectively for said respective time devices, said time devices respectively including means for controlling the electric connections between said terminals.

9. In a signal system of the character described, the combination of a horological instrument, an electric circuit, means controlled by said horological instrument for controlling said electric circuit, said electric circuit including an electric translating device, time devices of different time values, electric translating devices of different time values, controlling the latter, electric circuits for said respective electric translating devices of different time values including interrupting means controlled by said first-named electric translating device, one of said time devices provided with means controlling said electric circuit for the other time device at predetermined time periods, electric translating devices for controlling signals, signals controlled by said last-named electric translating devices, means for selectively connecting said signals with said respective last-named electric translating devices, and partial circuits for said last-named electric translating devices respectively having terminals respectively for said respective time devices, said time devices respectively including means for controlling the electric connections between said terminals.

10. In a signal system of the character described, the combination of a horological instrument, an electric circuit, means controlled by said horological instrument for controlling said electric circuit, said electric circuit including an electric translating device, time devices of different time values, electric translating devices of different time values controlling the latter, electric circuits for said respective electric translating devices of different time values including interrupting means controlled by said first-named electric translating device, one of said time devices provided with means controlling said electric circuit for the other

time device at predetermined time periods, electric translating devices for controlling signals, and partial circuits for the latter respectively having terminals respectively for said respective time devices, said time devices respectively including means for controlling the electric connections between said terminals, and said first-named circuit including additional interrupting means qualifying the durations of said signals.

11. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values controlled thereby, electric translating devices for controlling signals, signals controlled thereby, partial circuits respectively having connection with the respective terminals of said last-named translating devices, said time devices including means for electrically connecting and disconnecting said partial circuits, and means for interrupting the circuit formed by such connecting of said partial circuits in advance of the interruption therein by such disconnecting of said partial circuits.

12. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values controlled thereby, each of said time devices including time positions of different time values, electric translating devices for controlling signals, and partial circuits between the respective terminals of selective ones of said last-named translating devices and selective ones of said time positions of different time values of said respective time devices, said time devices including means for controlling the electric connection between said partial circuits.

13. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values controlled thereby, each of said time devices including time positions of different time values, electric translating devices for controlling signals, and partial circuits between the respective terminals of selective ones of said last-named translating devices and selective ones of said time positions of different time values of said respective time devices, including releasable electrical connections for readily selectively changing the time values of said respective last-named electric translating devices, said time devices including means for controlling the electric connection between said partial circuits.

14. In a signal system of the character described, the combination of electric translating devices of different time values, time devices of different time values controlled thereby, each of said time devices including time positions of different time values, elec-

tric translating devices for controlling signals, partial circuits between the respective terminals of selective ones of said last-named electric translating-devices and selective ones of said time positions of said respective time devices, said time devices including means for electrically controlling the electric connection between said partial circuits to control said second-named electric translating devices for a duration of time, and means for qualifying said duration of time.

15. In a signal system of the character described, the combination of electric translating devices of different time values, a pair of time devices of different time values controlled thereby, each of said time devices including time positions of different time values, pluralities of electric terminals of similar polarities complementary to said time positions of one of said time devices, pluralities of electric terminals of opposite polarities complementary to said time positions of the other of said time devices, electric translating devices controlling signals, partial circuits respectively having electric connection with the respective terminals of said last-named translating devices, and means whereby to selectively electrically connect said partial circuits respectively with said terminals of similar polarities and with said terminals of opposite polarities, said time devices including means for selectively controlling the electric connection between said first-named electric terminals and said second-named electric terminals.

16. In a signal system of the character described, the combination of a horological instrument, electrically controlled time-device mechanism, time value devices therefor, an electric circuit for controlling said time-device mechanism, control mechanism for said circuit controlled by said horological instrument, electric translating devices, circuits therefor embracing mechanism controlled by said time-value devices, signals, and electric circuits therefor embracing mechanism controlled by said electric translating devices.

17. In a signal system of the character described, the combination of a horological instrument, electrically controlled time-device mechanism, time value devices therefor, an electric circuit for controlling said time-device mechanism, control mechanism for said circuit controlled by said horological instrument, electric translating devices, circuits therefor embracing mechanism controlled by said time-value devices, signals, electric circuits therefor embracing mechanism controlled by said electric translating

devices, and means changing the duration of said last-named control.

18. In a signal system of the character described, the combination of an hour time device, a minute time device, an intermittently actuated device for each of said time devices comprising an electric translating device, and an intermittently movable element controlled thereby arranged to move said time device, a circuit control operated by said minute time device arranged to control the circuit for the electric translating device of said hour time device, and a horologically controlled circuit for said electric translating devices.

19. In a signal system of the character described, the combination of a series of electrically controlled signals, a series of partial electric circuits for each of said signals, a series of interrupting means for said partial electric circuits, and an electric resistance in each of said partial circuits, said electric resistances for each of said signals being connected in multiple, and arranged whereby connection between the resistances of different series of resistances places said connected resistances in series.

20. In a signal system of the character described, the combination of a minute time device and an hour time device, each of said time devices comprising a pin-wheel, an intermittent device for actuating said pin-wheel, and an electric circuit for said intermittent device, said electric circuit for said hour intermittent device comprising an interruption, and mechanism actuated by said minute pin-wheel for controlling said interruption.

21. In a signal system of the character described, the combination of a minute time device and an hour time device, each of said time devices comprising a pin-wheel, an intermittent device for actuating said pin-wheel, an electric circuit for said intermittent device, electric terminals arranged about the axis of said pin-wheel, a coacting electric terminal therefor, and means whereby to cause rotary movement between said first-named electric terminals and said coacting electric terminal, said electric circuit for said hour intermittent device comprising an interruption, and mechanism actuated by said minute pin-wheel for controlling said interruption.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

SAMUEL M. THOMAS.

In presence of—

G. S. HAWKE,

DELMA WERNING.