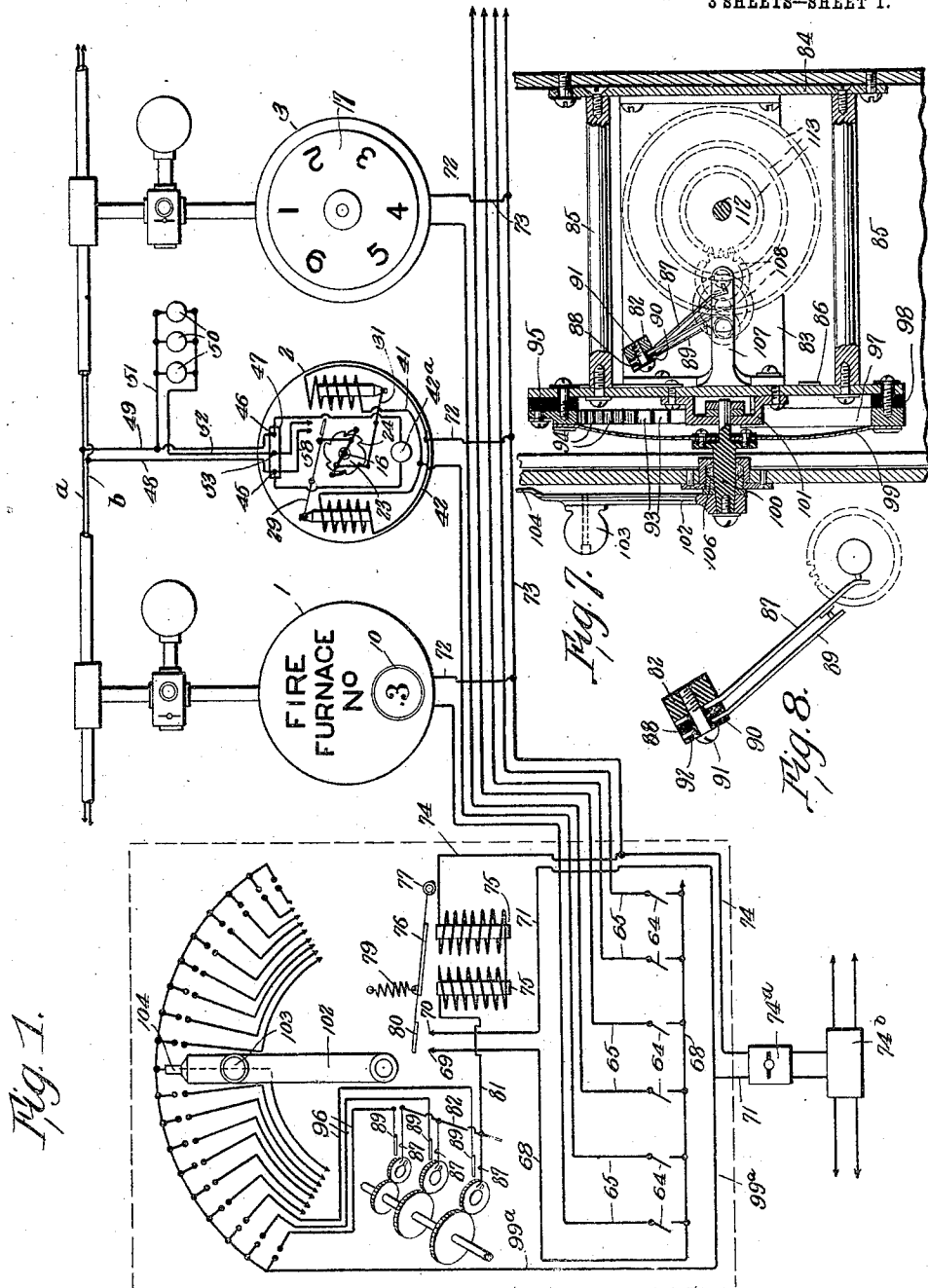


F. W. WOOD.
TIME CONTROLLED AND ELECTRICALLY OPERATED SIGNALING SYSTEM.
APPLICATION FILED AUG. 25, 1905.

960,761.

Patented June 7, 1910.

3 SHEETS—SHEET 1.



Witnesses

Chester Purdine
C. A. Lyman

Inventor

FRANK W. WOOD.

By

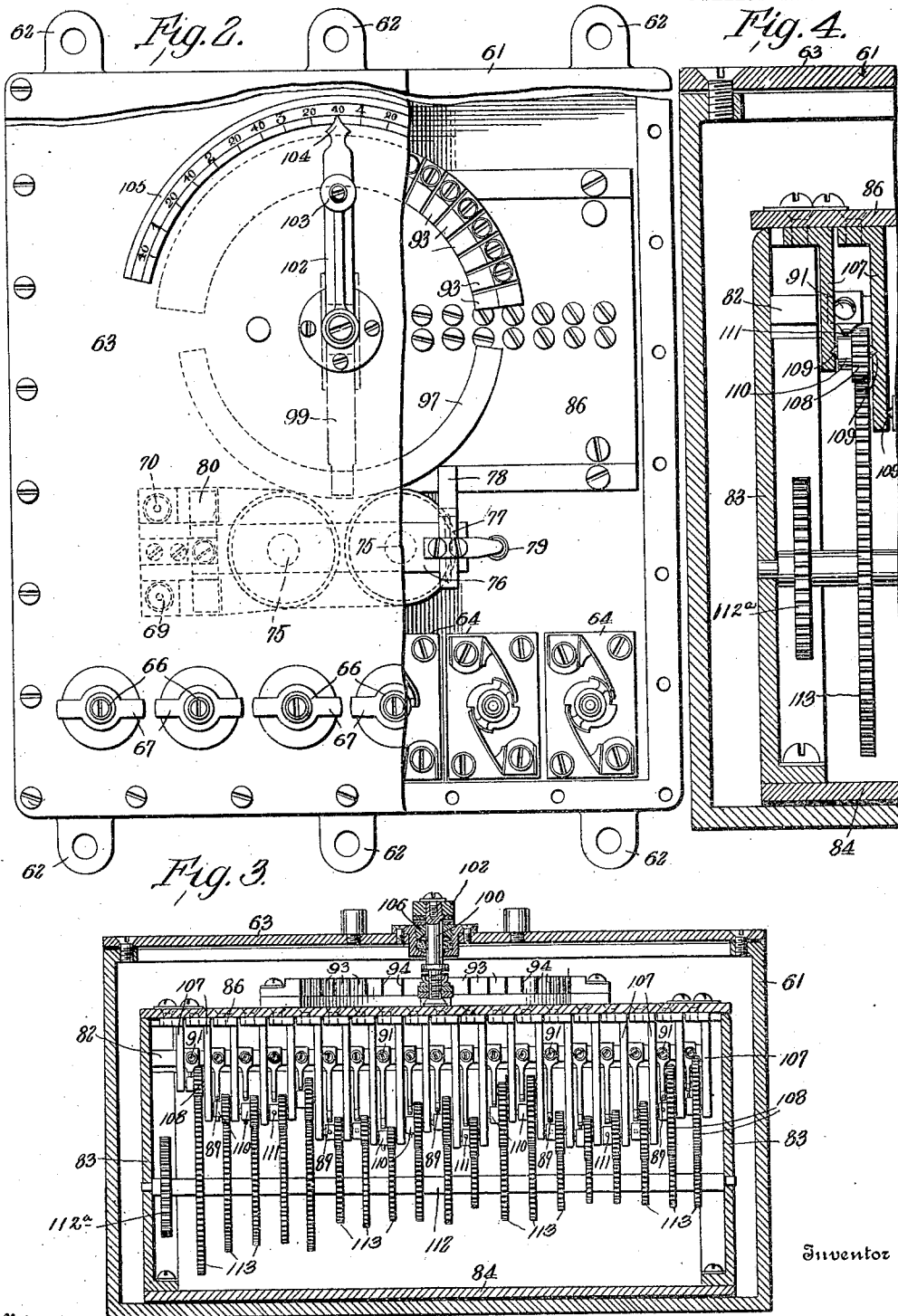
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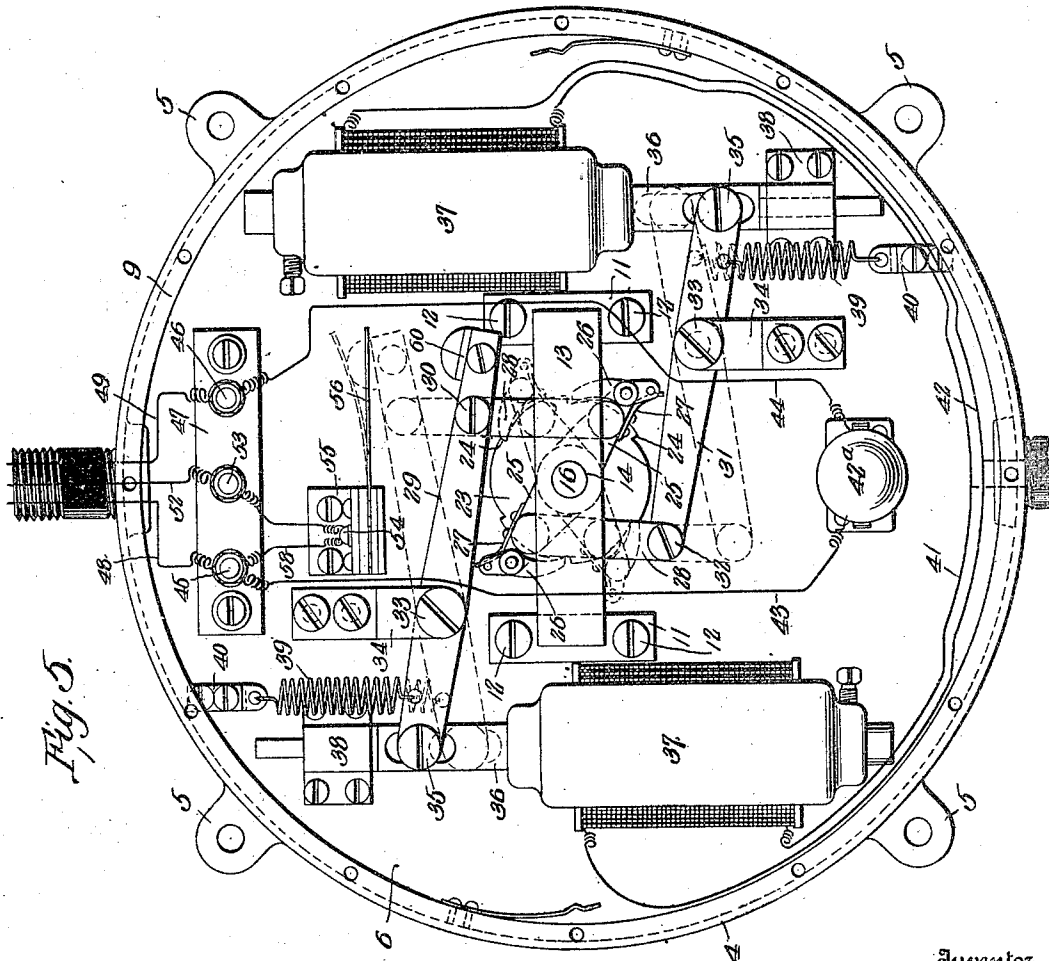
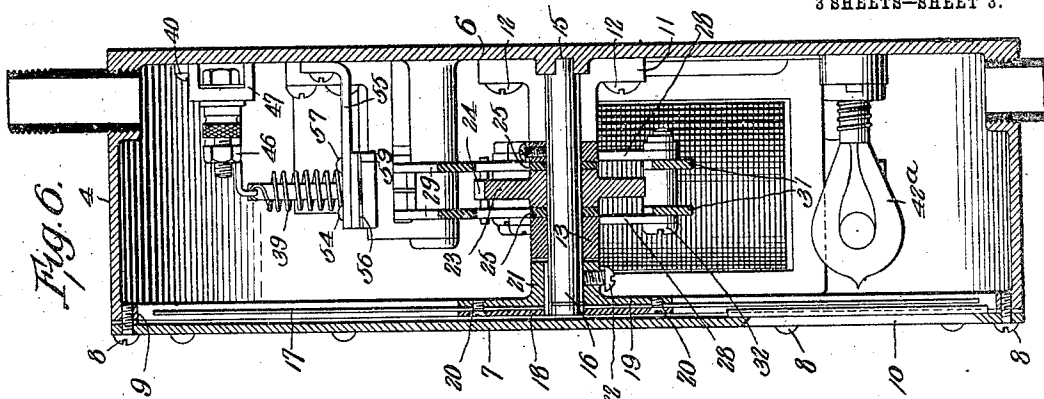
By *J. Francis Meyers* Attorney
 FRANK W. WOOD.

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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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TIME-CONTROLLED AND ELECTRICALLY-OPERATED SIGNALING SYSTEM.

960,761.

Specification of Letters Patent.

Patented June 7, 1910.

Application filed August 25, 1905. Serial No. 275,731.

To all whom it may concern:

Be it known that I, FRANK W. WOOD, a citizen of the United States, residing at Newport News, in the county of Warwick and State of Virginia, have invented new and useful Improvements in Time-Controlled and Electrically-Operated Signaling Systems, of which the following is a specification.

My invention has relation to new and useful improvements in time controlled and electrically operated signaling systems, of the general character or type embodying an annunciator or indicator which is electrically operated to successively display orders or signals, time controlled mechanism being provided to close the circuit through the annunciator or indicator, and also including manually operable means under the control of an operator for selecting and establishing the time intervals at which the annunciator shall display or announce its orders or signals.

The present invention is especially devised for use in connection with steam boilers of steamship lines, which generate steam for the propelling engines, so as to provide for the regular and systematic firing of the boilers to assure the maintenance of steam pressure adequate for the consumption of the engines. It is well known that the present system for the firing of the boiler furnaces, which depends upon judgment largely of the stokers, is not altogether satisfactory for the reason that all of the boilers in action are not always fired successively at constant intervals, sometimes being fired at shorter intervals than the consumption of steam requires, and at other times not fired often enough to maintain the head of steam necessary.

It is, therefore, the main object of my invention to provide means under the control of the engine attendant whereby he may transmit to the boiler room or rooms, intelligences indicating which boiler or furnace is to be fired, the succession in which the boilers are to be fired, and at what interval of time, so that the systematic firing is at all times assured.

A further object is to provide a signaling system including an electrically operated indicator situated at the point of location of the boilers to indicate successively the order in which the boilers are to be fired, and

a controlling instrument embodying time operated means for rendering the indicator operable at constant intervals of time and manually operated means for varying at will the time interval.

The invention embodies an electrically operated indicating instrument having means for displaying indicia corresponding to the several boiler furnaces, which indicia are displayed to indicate the boiler to be fired, time-controlled means for rendering said indicator active, and manually controlled means under the control of the operator for determining the time intervals at which the instrument displays its indicia.

I have fully and clearly illustrated my invention in the accompanying drawings, to be taken as a part of this invention, and wherein—

Figure 1 is a diagrammatic view of the system embodying my invention; Fig. 2 is a view in front elevation of the manually operated instrument for selecting or varying the time intervals at which the indicator or indicators operate; Fig. 3 is a horizontal transverse section through the time operated controlling means for closing the circuit through the indicator; Fig. 4 is an enlarged sectional view through the time controlling means, showing in detail one of the circuit controlling devices and the operating means therefor; Fig. 5 is a view in front elevation of the indicating instrument, the face plate and dial being removed in order to disclose the interior working parts; Fig. 6 is a vertical central section through the indicating instrument; Fig. 7 is a vertical detail section through the central portion of the manually operated instrument for varying the time interval for the operation of the indicator and Fig. 8 is a detail view of a circuit closer associated with the time operated controlling means for closing the circuit through the indicating instrument.

Referring to the annexed drawings, I will now proceed to describe in detail an apparatus embodying my present invention.

Located adjacent each set or battery of boilers or in each boiler room, is an electrically operated indicator, three of said indicators being shown in Fig. 1, at 1, 2 and 3, these indicators being constructed to display indicia corresponding to the several furnaces in connection with which the indicator is associated, the indicia preferably

consisting of consecutive numbers such as 1, 2, 3, 4, 5, 6, which numbers are exhibited one at a time to indicate the furnace to be fired.

5 The indicating instrument above generally referred to, comprises a suitable circular casing 4, provided with perforated projecting ears 5, by means of which the casing may be securely supported in vertical position. This casing is closed at its rear portion by a wall 6 and at its front portion by a face plate 7 secured in position by means of screws 8, passing through said plate and engaging an inwardly projecting circumferential flange 9 on the casing, said face plate being opaque throughout its general area, but formed with an opening 10 preferably adjacent its lower portion, said opening being for a purpose to presently appear.

20 Located within the casing just described, is a supporting bracket or element consisting of legs 11, 11, spaced apart from each other a suitable distance and bolted at their rear ends as at 12, to the rear wall 6 of the casing, the front ends of said legs being connected by a horizontal cross piece 13. Formed in the cross piece is a bearing 14, and in alinement therewith on the wall 6 of the casing is a bearing 15, a horizontally disposed shaft 16 being journaled in said bearings and disposed with its longitudinal axis coincident with the axis of the casing, the end of the shaft toward the face plate 7 projecting beyond the cross-piece 13, and carrying thereon a transparent plate 17, disposed in a vertical plane, and bearing on the front face thereof suitable indicia as above stated, which, when the shaft and plate are rotated, as hereinafter described, are successively displayed before the opening 10 to indicate the furnace to be fired. This transparent plate 17 is rigidly secured to the shaft 16 by a hub comprising plates 18 and 19 between which the plate is clamped by means of screws 20, the plate 19 having a sleeve 21 which fits over the shaft 16 and is secured thereto by a set screw 22.

Suitable electrically actuated means is provided for imparting a step-by-step movement to the shaft 16, so as to bring the indicia on the plate 17 successively into register with the opening 10, to indicate the furnace to be fired, and this means will now be described.

55 Upon the shaft 16 at a point intermediate its ends, is rigidly mounted a ratchet disk 23, having teeth 24 on its periphery corresponding in number to the number of indicia on the transparent plate 17, so that when said disk is rotated the distance of one tooth, the said plate will be correspondingly rotated to bring one of the indicia thereon into register with the opening 10 in the plate 7. Loosely mounted upon the shaft 16, and disposed respectively on opposite sides of

the disk is a pair of parallel arms 25, between the opposite ends of which are pivotally mounted pawls 26, the noses of which are arranged normally in engagement with the periphery of the disk 23, being urged into such position by means of springs 27, engaging the tails of the pawls, all as clearly shown in Fig. 6 of the drawings.

Pivotally connected to the ends of the arms 25 are links 28, there being two of said links attached to each arm, one at each end of the latter, the links at one end of the arms being extended upward and pivotally connected each to one of a pair of levers 29, as at 30, the other pair of links extending downwardly, and each connected to one of a pair of levers 31, as shown at 32. The pairs of levers 29 and 31, are each fulcrumed at a point intermediate their ends, as at 33, to brackets 34, to swing vertically and the ends of said levers opposite the links 28 are each pivotally connected as at 35, to a longitudinally movable core 36 of a solenoid 37, said cores being provided with suitable guides 38. Each of said levers 29 and 31 has connected thereto one end of a contractile spring 39, the opposite end of said springs being anchored to brackets 40 in the casing, and the function of the springs being to normally maintain the cores 36 withdrawn from the solenoids when the latter are not energized. The solenoids are energized in a manner to be presently set forth through electrical connections 41, 42, and when said solenoids are made active, it will be seen that their cores will be attracted and operate through the levers to swing the pawl carrying levers whereby the ratchet disk 24 is rotated the distance between two of the teeth 25, so as to correspondingly rotate the shaft 16 and plate or dial 17 to present one of the indicia thereon to the opening 10. In order to properly adjust the pawls and their operating means so that the ratchet disk will only be rotated the distance between two teeth, the solenoid cores 36 are slotted at the point at which the pairs of levers 29 and 31 are connected thereto, whereby the point of connection may be varied to attain the result mentioned.

As heretofore stated, the plate 17 is transparent, and the indicia are marked thereon in some dark color or black, so as to be readily discerned through the opening 10, and in order that the indicia may be clearly seen, I mount in the casing, preferably upon the rear wall thereof, an incandescent lamp 42^a, which is in circuit with the main lighting circuit of the boiler room, through wires 43, 44, which lead to binding posts 45, 46, on a plate 47 located within the casing, said posts being also connected to the conductors *a*, *b*, of the main lighting circuit by leads 48, 49. Through these connections it will be apparent that the lamp 42^a will glow when-

ever the main lighting circuit is active. The indicating instrument is also provided with a suitable alarm signal to operate whenever the plate 17 is rotated, which signal may be either audible or visual as may be desired. For the purpose of this application I have shown this signal as consisting of one or more incandescent lamps 50, located at a point to be easily seen by the furnace stokers. These lamps are connected on one side by a wire 51 to the wire 49, and on the other side by a wire 52 to a binding post 53, said wire 52 extending beyond the said post and engaging a second binding post 54 mounted upon a bracket 55 located within the casing, said post being in electrical connection with a spring contact finger 56 also secured on said bracket 55. Also mounted on the bracket 55 is a binding post 57, which is connected by a wire 58 with the binding post 45, the post 57 being connected to a spring contact finger 59 mounted on the bracket 55, said contact 59 being in the same plane as the contact finger 56, but suitably insulated therefrom. Means is provided for closing the circuit through the lamps 50, whenever the indicator is operated and a simple and effective manner of accomplishing this object consists in extending the ends of the levers 29 beyond their connection with the links 28, and mounting on said ends a conducting bridge-piece 60, which, when the solenoids are engaged, is moved into engagement with the contact fingers 56 and 59, to close the circuit and light the signal lamps. It will be apparent that when the solenoids are deenergized after the disk 17 has been rotated, the bridge piece 60 moves away from the contact fingers 56 and 59, so that the circuit through the signal lamps, is broken.

I will now proceed to describe the means for closing the circuits through the indicator or indicators, and also the means for varying the time interval elapsing between the times the indicators are operated. This means comprises an instrument located preferably in the engine room, both the circuit closing means and the means for varying the interval of operation being preferably for economy in space embodied in a single structure, although it will be evident that said parts may be separated if desired.

Referring particularly to Figs. 2, 3, 4, 7 and 8, of the drawings, 61 designates a casing preferably rectangular in form, provided with integral ears 62, by means of which it may be secured in suitable position, the front of said casing being closed by a suitable face plate 63, secured in position by any suitable means. Located in the lower portion of this casing are a plurality of rotary switches 64, of any suitable form to one of the terminals of each of which is connected a conductor 65, leading to the indi-

cating instrument associated with a battery of furnaces. Each of the switches proper is provided with an operating shaft 66, which projects beyond the front face plate at which end it is provided with a suitable operating handle 67, by means of which the switches are opened and closed. Connected to the other terminals of said switches, is a conductor 68, the opposite end of which is connected to a terminal 69 of an automatic switch, which will be presently described, from the other terminal 70 of which extends a conductor 71 leading to any suitable source of electrical current.

Each of the wires 65, as shown in Fig. 1 of the drawings, is connected to the conductor 41 in each of the indicating instruments, while each of the wires 42 in said instruments are connected by branch wires 72 to a common return wire 73, which connects to a main wire 74 leading to the source of current by way of a suitable switch 74^a and junction box 74^b. This wire 74 also is connected to the coils 75 of the magnetic switch heretofore referred to, said coils being compound wound to prevent sparking, and when energized operating to attract an armature 76 pivotally mounted, as at 77, on a bracket 78 in the casing, and provided with a spring 79 engaging it near one end, to normally hold the armature away from said coils 75. At its end opposite from that engaged by the spring 79, the armature carries a transverse bridge-piece 80, which when the magnet is energized, and the armature is attracted, contacts the terminals 69, 70, to close the circuit through the wires 68 and 71, and thereby energize the solenoids on the respective indicators to rotate the dials bearing the indicia.

The time controlled means for closing the circuit through the magnets 75 will now be described. From the magnets 75, 75, the energizing circuit therefor is continued as at 81, said conductor 81 being connected to a metallic bar 82, located within the casing and extending transversely thereof, said bar being supported at its end portions by horizontally projecting bracket plates 83, supported by a plate 84 mounted on and suitably insulated from the rear wall of the casing 61. Extending from the plate 84 at each end thereof, are upper and lower horizontal bars 85, which at their outer ends are secured to a vertical plate 86, the purpose of which will be presently described. Arranged on the bar 82 and disposed parallel to each other, are a plurality of spring contact fingers 87, said fingers being in electrical contact with said bar and projecting downward in an inclined direction, as clearly shown in Fig. 7, and over said fingers is disposed a strip of insulating material 88, upon which is arranged a plurality of independent contact fingers 89, over which is placed a

second strip of insulating material 90. The strip of insulating material, and the contact fingers 87 and 89, are secured to the bar 82 by means of screws 91, which are respectively surrounded by insulating sleeves 92, to insulate the spring contact fingers from each other. As shown in the drawings, the fingers 87 and 89 are arranged in pairs, there being one of the contacts 87 for each of the contacts 89, and disposed directly over the latter, each pair of contacts being normally disposed parallel to each other and separated throughout their entire length, but adapted to be placed in contact with each other, as hereinafter stated.

Disposed on the outer face of the plate 86 in a curved line, are a plurality of contact blocks 93, suitably insulated from each other, as at 94, said blocks corresponding in number to the pairs of contacts 87 and 89, heretofore described, said blocks being properly insulated from the plate 86 by an interposed insulation shown at 95. These contact blocks 93 are each connected by a suitable wire 96 with one of the spring contact fingers 89, and disposed below the contact blocks and in a curved line the reverse of the arrangement of the blocks is a contact strip 97, insulated from the plate 86 by proper insulation, as at 98, said plate being connected by a conductor 99^a with the wire 71 heretofore referred to. It will, therefore, be seen that when contact is established between any one of the blocks 93, and the strip 97, it will be possible to establish the current through the magnets 75 by closing the circuit at the contacts 87, 89, which corresponds to the block 93, electrically connected to the strip 97. The means for electrically connecting the blocks 93 and said strip 97, comprises a spring member having oppositely disposed arms 99, the end of one of said arms contacting the strip 97, and the end of the other arm being in position to engage anyone of the blocks 93. This member consisting of the arms 99, is rigidly secured at its central portion to a spindle 100, the inner end of which is rotatably mounted in a suitable bearing 101, carried by the plate 86, and the forward portion of said spindle projecting through the face-plate 63, and carrying on its outer end, exterior to the casing 61, a hand-operating lever 102, provided with a suitable knob 103 to be grasped when it is desired to swing the arms 99. The lever 102 carries at its free end a pointer 104, which traverses a circular scale 105, bearing indicating marks of a character to be presently set forth, there being one of said indicators for each of the contacts 93. It will be seen that by swinging the lever 102 to bring its pointer to any one of said indicating marks, the operator may select the contact block 93 to be placed in electrical connection with the strip 97.

The spindle 100 is surrounded by a bearing 106 at the point at which it passes through the plate 63, said bearing being preferably in the form of a stuffing box.

Arranged within the casing 61 and projecting inwardly from the rear face of the plate 86, to which they are secured, are a plurality of arms 107, one arm being located between each of the pairs of contacts 87, 89, and between said arms are located a plurality of rotating contact makers, arranged to move the spring contact 87 into engagement with the contact finger 89. These contact makers consist of pinions 108, corresponding in number to the pairs of contacts 87, 89, one pinion being arranged between each two adjacent arms 107, each of said pinions being formed with journals 109, seated in sockets in the vertical faces of said arms, and said pinions are also formed with hubs 110 located over the respective fingers 87. Projecting from the hub 110 on each of the pinions, is a pin 111 which, when the pinion is rotated, engages the end of the contact fingers 87 to move the same into electrical contact with the finger 89, to complete the circuit through the magnets 75 at that point.

Running parallel to the axis of rotation of the contact makers and journaled in the bracket plates 83, is a shaft 112, upon which is mounted to turn therewith a plurality of gear-wheels 113, corresponding in number and arranged in mesh with the respective pinions 108, so that when said shaft is rotated the pinions 108 will all be simultaneously rotated to move the pins carried thereby into engagement with the fingers 87 to move them into contact with the fingers 89.

The shaft 112 carries on one end a gear 112^a, which is geared to a clock-work or other suitable motor, so that said shaft will be rotated thereby, each rotation of the shaft being in a constant interval of time, say five minutes for each rotation.

It will be noted upon reference to Fig. 3 of the drawings, that the pinions 108, and the gear-wheels 113, are of varying sizes and this arrangement is provided in order that the interval elapsing between the closing of each pair of contacts 87, 89, will vary from each and all of the remaining pairs of contacts. In the drawings I have shown the device as including nineteen pairs of contacts, and a corresponding number of gear-wheels and pinions for operating the same, so that the embodiment of the invention as shown, provides for nineteen variations of time interval between which the magnets 75 are energized to operate to close the circuit at the terminals 69, 70, and in consequence thereof operate the several indicators to change the indicia displayed thereby. In the present instance the time intervals begin at forty seconds, as indicated on the

curved scale 105, and run up to ten minutes with such fractions thereof as may be desirable. It will therefore be seen, that when the lever 102 is moved to bring the arms 99 on the first contact block, the circuit will be closed at that point, which circuit includes the first pair of contacts in the series, and it is apparent that every time the pinion for that pair of contacts is rotated, the circuit will be closed through the magnets 75, 75, to complete the circuit through the indicator to rotate the plate 17 thereof to change the indicia displayed before the opening 10. As long as the arm 99 contacts the block 93 mentioned, the contacts 87 and 89 connected to said block, will be closed every forty seconds, and the dial 17 of the indicator rotated at the same interval, which will indicate to the fireman or furnace attendant which furnace should be fired. It is apparent that while the arm 99 engages any one of the blocks 93, that the circuit to the magnets 75 will be closed only through the fingers 87 and 89, corresponding to said block, and the engagement of the other pairs of fingers will not affect the magnet as the circuit through the other pairs of fingers is broken at their respective blocks.

The operation of the invention may be rehearsed as follows: If it is desired to have the furnaces fired—say at intervals of forty seconds—the lever 103 is moved to the left until the pointer 104 is over the point marked “40” on the scale, which corresponds to the first block 93 in the series. This operation establishes or selects the interval of time at which the indicator or indicators shall be operated, and it will be seen that the circuit is closed between the strip 97 and the first block 93, by means of the arms 99. It will be premised that before setting the lever 103 the operator closes the switches 64 of all the indicators, which he desires to be active, leaving the other switches open.

The time interval having been selected, as above set forth, the rotation of the shaft 112 causes the rotation of all of the pinions 108, but as the circuit is completed through only one of the pairs of contacts, that operating at forty seconds interval, the circuit to the magnets 75 will be closed by the first pair of contacts, and when the latter engage each other, the current flows from the source through the junction box 74^b and switch 74^a, by way of the conductor 74 to the magnets and energizing the same, thence by the conductor 81 to the bar 82 across the first pair of contacts 87, 89, by the wire 96 to the strip 97. From the strip 97 the current continues by way of the arms 99 and block 93, engaged by the arms to the wire 99^a, which is connected to the wire 71 leading back to the junction box.

The energization of the magnets 75, 75,

when the circuit is completed at the selected contacts 87 and 89, attracts the armature 76 and moves the bridge-piece 80 into engagement with the contacts 69, 70, which completes the circuit through the indicating instruments for which the switches are closed. This circuit includes the wire 71, the contacts 69, 70 and bridge piece 80, the wire 68, such of the switches 64 as may be closed, the wires 65, to their respective indicating instruments, and by way of the wires 41 to the solenoids 37. From the solenoids the circuit continues by the wires 42 to the wires 72, to the common return conductor 73, which connects to the wires 74.

The solenoids being energized, the cores 36 thereof are attracted which operates to swing the pawl carrying arms to rotate the shaft 16 through the engagement of the pawls 26 with the ratchet disk 24, the rotation of the shaft imparting a corresponding movement to the plate 17 to bring the indicia thereon before the opening 10, and this operation takes place each time the selected contacts 87 and 89 are moved into engagement with each other.

Simultaneously with the rotation of the plate 17, the bridge-piece 60 is moved into contact with the fingers 56 and 59, which closes the circuit through the signal lamps 50, to call the stoker's attention to the fact that the indicia on the indicating instrument has been changed.

The face 7 of the casing 5 may bear any suitable inscription expressing the proper order, as “Fire furnace No. —” the order being completed by the indicia displayed on the plate 17 before the opening 10.

While I have described and illustrated the invention as being particularly useful in connection with furnaces, it is evident that it is readily adapted for use in any situation where it is desired to transmit orders, or other intelligences, at determined time intervals.

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

1. In a system of the character described, an electrically operated indicator constructed to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of normally open circuit closers in the last named circuit, each circuit closer being provided with electrically operated means to close the circuit at definite time intervals different from that of the other closers, and selective means to render any one of said closers effective, to close the circuit through said electrically operated means.

2. In a system of the character described, an electrically operated indicator constructed to indicate successive intelligences, a cir-

circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of normally open circuit closers in the last-named circuit, independent operating means for each of said closers to close the circuit at definite time intervals different from that of the other closers, and means whereby the circuit is completed through only one of said closers.

3. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of circuit-controllers any one of which may operate to close the last-named circuit, and time-controlled means to operate said controllers to close the circuit, the period of operation of any one of the controllers being different from all the other controllers.

4. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of circuit-controllers any one of which may operate to close the last-named circuit, time-controlled means to operate said controllers to close the circuit, the period of operation of any one of the controllers being different from all of the other controllers, and means to render any one of the several controllers operative to close the circuit.

5. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of circuit-controllers any one of which may operate to close the last-named circuit, time-controlled means to operate said controllers to close the circuit, the period of operation of any one of the controllers being different from all of the other controllers, and manually operated means to render any one of the several controllers operative to close the circuit.

6. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of circuit-controllers any one of which may operate to close the last-named circuit, time-controlled means to operate said controllers to close the circuit, the period of operation of any one of the controllers being different from all of the other controllers, and a selective switch to select and render operative any one of the controllers to close the circuit.

7. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of circuit-controllers any one of which may operate to close the last-named circuit, time-controlled means to operate said controllers to close the circuit, the period of operation of any one of the controllers being different from all of the other controllers, and means to render any one of the several controllers operative to close the circuit, and to simultaneously render the remaining controllers ineffective.

8. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of time controlled circuit controllers any one of which may operate to close the last-named circuit, the period of operation of any one of said controllers differing from all of the remaining controllers, and means to select and render operative any one of the controllers to close the circuit.

9. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of open branches in said last-named circuit, manually operable means for closing the circuit through any one of said branches, and a plurality of time controlled circuit controllers, one of which is located in each of said branches, the period of operation of any one of said controllers differing from all of the remaining controllers.

10. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a selective switch in said circuit, one terminal of which consists of a continuous element, and the other terminal of which comprises a plurality of independent contacts, a switch member bridging said terminals, and movable to engage any one of said contacts, and a plurality of time-controlled circuit-controllers in said last-named circuit, and having independent electrical connections with the independent contacts of the selective switch, said controllers having different periods of operation.

11. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of circuit

controllers any one of which may operate to close said last-named circuit, a rotatable element for each controller to operate the latter to close the circuit, and time-controlled means to rotate said elements, the period at which one rotatable element operates its controller varying from the other elements.

12. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of circuit controllers any one of which may operate to close said last-named circuit, each controller comprising a pair of normally separated contacts, a rotatable element for each controller to move the contacts into engagement to close the circuit, and time-controlled means to rotate said elements, the period at which one rotatable element operates its controller varying from the other elements.

13. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of circuit controllers any one of which may operate to close said last-named circuit, each controller comprising a pair of normally separated contacts, a pinion associated with each controller and provided with means to move the contacts into engagement to close the circuit, and time-controlled means to drive said pinions, the period at which one of said pinions operates its controller varying from the other.

14. In a system of the character described, an indicating instrument including a rotatable element bearing indicia, electrically operated means to rotate said element, a circuit including said means, electrically operated means for closing said circuit, a circuit including said last-named means, a plurality of normally open circuit-controlling devices any one of which may be operated to close said last-named circuit, time-controlled means for operating said controllers the period of operation of any one of the controllers being different from the others, and selecting means for determining which one of the controllers shall operate to close the circuit.

15. In a system of the character described, an electrically operated indicator to indicate successive intelligences, a circuit including said indicator, electrically operated means for closing said circuit, a circuit including said means, a plurality of circuit controllers any one of which may operate to close said last-named circuit, each controller comprising a pair of normally separated contacts, a rotatable element for each

controller to move the contacts into engagement to close the circuit, and continuously moving time controlled means to rotate said elements, the period at which one rotatable element operates its controller varying from the other elements.

16. In a system of the character described, an indicating instrument including a rotatable element bearing indicia to be successively displayed, electrically operated means to rotate said element, a signal and signal circuit normally broken, means whereby the operation of said electrically operated means closes the signal circuit, a circuit including the said means, electrically operated means for closing said last-named circuit, a circuit including said closing means, a plurality of normally open circuit-controlling devices any one of which may be operated to close said last-named circuit, and time-controlled means for operating said devices, the period of operation of any one of the controllers being different from the others.

17. In an electrical signaling system, electrically operated signaling mechanism constructed to successively display or announce a plurality of signals or orders and to periodically repeat the same in regular sequence, a plurality of mechanically operated circuit controllers each adapted to be placed in circuit with said signaling mechanism, time-controlled means running practically at a constant speed, common to all said controllers, for operating the latter at regular time intervals, the time interval for each controller being different from all the others, and selective means for placing any desired circuit controller in controlling relation with the signaling mechanism, independent of all the other controllers.

18. In a system of the character described, a plurality of electrically operated indicating instruments, circuits for each of said instruments, switches for opening and closing said circuits, a plurality of circuit controllers in circuit with all of the above circuits, and time-controlled means for operating said controllers to close said circuits, the period of operation of any one of the controllers differing from that of all the others.

19. In a system of the character described, a plurality of electrically operated indicating instruments, circuits for each of said instruments, switches for opening and closing said circuits, a plurality of circuit controllers in circuit with all of the above circuits, time-controlled means for operating said controllers to close said circuits, the period of operation of any one of the controllers differing from that of all the others, and selective means to render any one of the controllers operative to close the circuits to the indicating instruments.

20. In a system of the character described, an electrically operated indicator, a circuit

including said indicator, a plurality of circuit controllers in said circuit, time-controlled means for operating said controllers to close the circuit, the period of operation 5 of any one of the controllers differing from that of all of the others, and selective means to render any one of the controllers operative to close the circuit to the indicator.

21. In a signaling system, electrically operated signal display means, a plurality of 10 mechanically operated circuit controllers, time controlled means running practically at a constant speed, common to all said controllers for operating the latter at regular 15 time intervals, the time interval for each controller being different, and selective means for placing any circuit controller in controlling relation with the signal display means.

22. In a signal system, electrically operated signal display means, a plurality of mechanically operated circuit controllers each 20 in a normally open circuit, time controlled means running practically at a constant speed for periodically operating each circuit 25 controller at predetermined intervals of

time, the time interval for each controller being different from that of all the others, and means for closing the circuit through any desired controller to cause the same to 30 operate said signal display means.

23. In combination, a plurality of circuit controllers, time controlled means running practically at a constant speed for operating 35 each controller at regular recurring intervals of time, each circuit controller having a different time interval, said time controlled means being common to all the controllers, signal display means adapted to respond to 40 each closing of its circuit, and manually operable selector means for causing any desired circuit controller independently of all the others to periodically close the circuit of said signal display means.

In testimony whereof I have hereunto set 45 my hand in presence of two subscribing witnesses.

FRANK W. WOOD.

Witnesses:

J. E. WARREN,

J. GRANVILLE MEYERS.