May 9, 1933. A HILL 1,908,424

SIGNALING SYSTEM AND MEANS

Filed Jan. 20, 1931

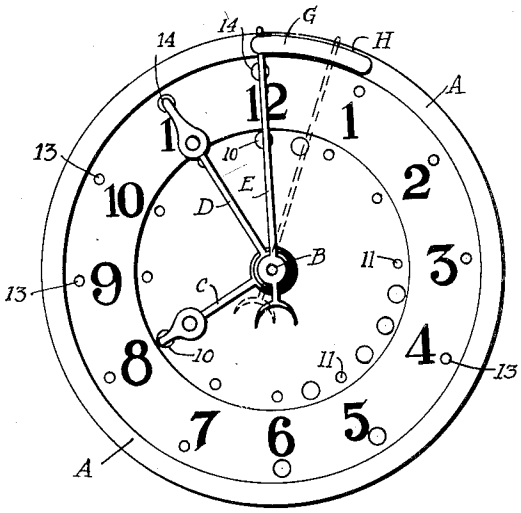

Fig. 1

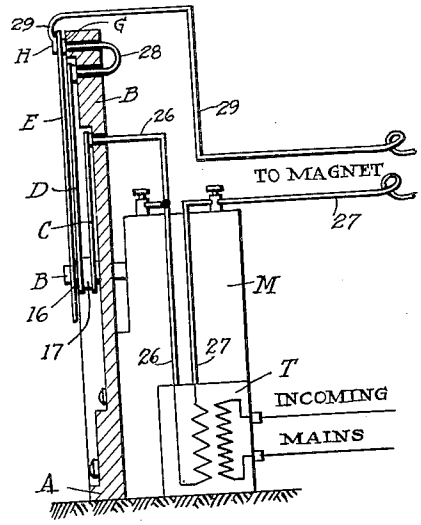

Fig. 2

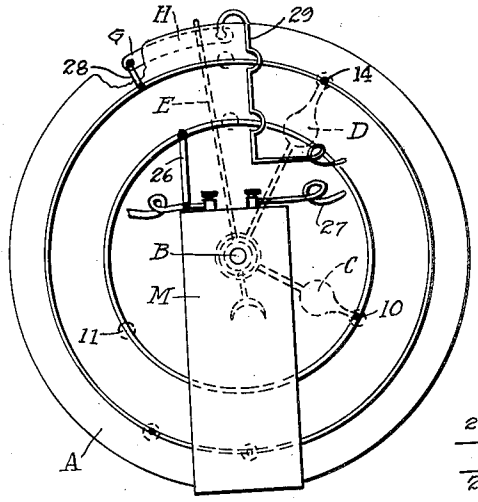

Fig. 3

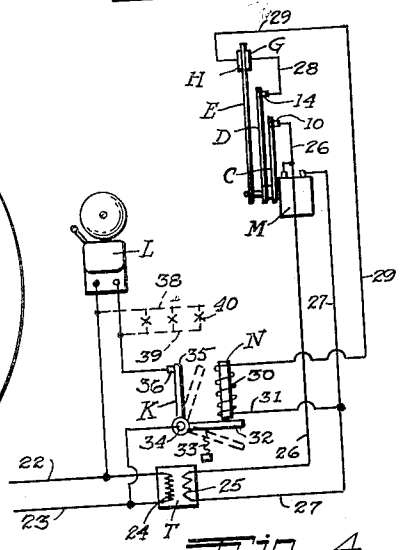

Fig. 4

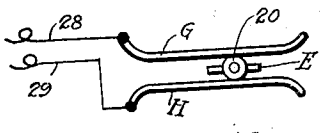

Fig. 5

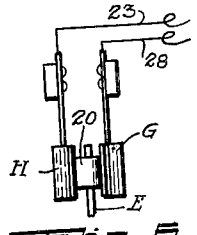

Fig. 6

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UNITED STATES PATENT OFFICE

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SIGNALING SYSTEM AND MEANS

Application filed January 20, 1931. Serial No. 509,908.

This invention relates to time signaling, and more particularly to that class in which one signal is succeeded by a second one, there being a comparatively short time interval between the two, and to means for such signaling.

The objects of this invention are to provide a specific cycle of signaling means for such signaling operated by a timing means which may be adjusted for signaling at any desired time which has parts and members adapted to cause signals to be continued over some predetermined time period; produce a secondary signal within some predetermined period subsequent to the first signal, which two signals and their interval of separation will constitute a cycle to provide this timing device with a rapid moving member in order to insure accuracy of timing, exactness of duration of signals and the time interval between the signals of a single cycle and which will operate a quick break switch for an electric circuit to operate the signal means, so that this may be connected directly with the time piece switch and its circuit-opening member without interposition of a relay, and in which current flow is neither started nor interrupted by either the hour or minute hand. Further objects are to produce a signaling device which can be made at a low cost, which will be reliable and substantial, without complexities wherefrom disarrangements might occur, and which is suitable for any use to which such signal may be applied, and more specifically for factories and workshops where a number of employes are required to begin and terminate a daily task at specified hours of the day.

Other objects of this invention will appear as this description proceeds.

Briefly, this method of signaling is especially designed to meet a condition with which all operators of factories and employers of workmen are familiar, viz: the comparative unrest and the slowing down of work as the noon hour or the end of the working day approaches. The workmen are waiting and expecting a signal indicating that one of these hours has been reached, and they desire to quit work immediately, and in many cases must make some preparation for stoppage of work, such as stopping machines at certain points in their operation, replacing tools in tool rooms, putting away personal effects, and such other activities prior to actually leaving their work. Among all groups of work people, there is a certain proportion which is known throughout the manufacturing world as "clock watchers". A device made to produce signals in accordance with this invention will serve to eliminate the time losses and periodic inefficiencies arising from these conditions. At some fixed time, say at five minutes before the hour of stopping, an initial signal is given which may be of any kind, if it be observable or audible to all of the workmen. After the lapse of a short period of time, say five minutes, the second signal is given. The first signal indicates that work may be gradually stopped, machines may be slowed down and their operation terminated at some specific or desired point. Tools may be laid away and the usual preparatory activities for stopping may begin. All operatives know that a certain time interval is allowed for these activities and that the second signal will be given at the exact time when all work is to stop and the employee is released from any of his normal duties.

Obviously each occurrence of signaling requires a complete cycle including an initial signal, a period of intermission and a second signal, each of said signals and the intermission between them, having definite, predetermined time intervals, the sum of the three periods constituting the period of one cycle. Successive identical cycles may be provided for at desired intervals elapsing between the end of one cycle and the beginning of the next one. In many forms of time-piece operated members, in which the hands make and break current flow, difficulties have been experienced in opening the contacts due to their very slow movement away from and toward fixed contacts. Also, by reason of this slow movement exact time periods of make and break become practically impossible. These difficulties are eliminated by the high-speed element and quick-

break contact plates used in the signal timing device disclosed in this invention, by action of which current flow may be passed directly to the signal itself, and successfully interrupted without necessity of relays to do the actual switching of the signal current, the latter being too large for interruption by a clock hand contact.

With the foregoing and other objects in view, the invention consists in the novel and useful formation, construction, interrelation and combination of parts, members and features, as well as mode and methods of use thereof, and steps and performances taken and had, all as hereinafter described, shown in the drawing and finally pointed out in claims.

In the drawing:

Fig. 1 is a front elevation of a time indicating device showing the indicating pointers, electrical contacts with which they cooperate, and openings variously placed, into which the contacts may be shifted for changing the time period of signaling.

Fig. 2 is a side elevation in section of same, showing a portion of the electrical apparatus.

Fig. 3 is a rear elevation of same.

Fig. 4 is a diagrammatic showing of the essential parts and electrical connections.

Fig. 5 is a sectional plan of one pair of electrical contacts and the contacting member between them.

Fig. 6 is an end elevation of same.

In the drawing, "A" is a disc or flat member, preferably vertical; "B" is a spindle passing through the surface of said member "A" and at the center thereof; moving members "C", "D" and "E" all turn about "B" as a center. The main spindle "B" is surrounded by a concentric sleeve "16", and sleeve "16" is surrounded by a second concentric sleeve "17". Moving member "E", which is preferably in the form of a pointer, is affixed directly to shaft "B" and turns therewith. Moving member "D", which likewise is preferablv in the form of a pointer or indicator, is affixed to sleeve "16", while moving member "C" similar to the other two moving members is attached to sleeve "17". Spindle "B" and sleeves "16" and "17" are geared, or mechanically connected, so that they and their respective pointers turn around central point "B" at different speeds. This character of clock mechanism, including the two clock hands forming no portion of the invention and being well-known, is not here depicted.

Pointers or clock-hands "C" and "D" are electrical conductors and electrically connected together at their pivots. Member "E" is preferably insulated from members "C" and "D" and is not an electrical conducting member. Buttons "10", which are electrical contacts, are attached to one face of member "A" in any convenient manner, as by using a shouldered button or screw, the head whereof projects from the surface of member "A" and the shank passing through any one of a number of holes "11" arranged around said center "B" in circular formation and at such distance from "B" that the member "C" contacts with any buttons placed in any one of this said group of holes when the member in its rotation around "B" reaches the button or contact "10". A similar series of holes, "13", is formed on the surface of member "A", but in a different plane from that whereon contact members "10" are placed. The plane for holes "13", in which contact members "14" are placed, extends outwardly from the plane of the contact members "10" by a sufficient distance to enable member "D" to pass over member "C" and its accompanying contacts freely and without either of said members touching when they lie in the same radial line. A pair of contact plates "G" and "H", fastened in some predetermined position on member "A", are arranged to be electrically connected when moving member "20" mounted on the end of the member "E" passes between them, as indicated more clearly in Figs. 5 and 6, the said plates and member being so positioned that members "C" and "D" cannot touch them in any part of the complete revolution of any of the members. As shown, the contact buttons for members "C" and "D" are preferably placed in the front face of the member "A", which likewise is divided into twelve parts, each of said parts being numbered to resemble a clock face, and the moving members are geared and driven to simulate the hands of a clock, and at the same relative speeds, to wit: the revolving member "C" moves through 1/12th of a revolution in one hour, the revolving member "D" moves twelve times as fast as member "C", and revolving member "E" moves much faster, at least 360 times as fast as moving member "C". At the rear face of member "A", all the holes of each group, as "10", are electrically connected together; hence, when member "C" touches one of the buttons "10" and member "D" touches one of the buttons "14", there is an electrical connection from contact "10" through the clock-hand "C" to pointer "D" and through pointer "D" to contact "14".

From the common electrical connection for holes "14" is a wire leading to the contact plate "G" which in parallel with and identical in shape and size with similar contact plate "H". These two plates are either of thin metal or spring supported and attached to any portion of the structure of flat member "A" or a casing surrounding it, but is diagrammatically indicated in the figures as being attached to the member "A". These members or plates are separated by a small

space or gap, and mounted to be slightly sprung further apart by means of a small conducted member or friction-reducing roller, "20", attached to the end of member "E" which electrically connects the two members "G" and "H" as long as member "20" remains between them. Member "E" having a definite angular speed, the length of time that plates "G" and "H" remain electrically connected is fixed by the length of this pair of contact plates. The hand "E" is not a conductor and no current passes through or along it, the contact being made directly between plates "G" and "H" by interposition of the metal member "20". If these plates are of such length as to subtend an angle of 30 degrees, and member "E" moves 360 degrees in one minute, then plates "G" and "H" will be electrically connected through 1/12th of one minute, or for five seconds. Obviously no such definite and short time period of contact is possible with any time-piece having only the usual hour and minute hands.

Fig. 4 shows diagrammatically one manner of operation of a device constructed in accordance with this invention. Incoming electric lines "22", "23", pass to the primary winding "24" of transformer "T" where the voltage of the current is stepped down and secondary winding "25" of transformer "T" becomes the immediate source of operating current. From winding "25", current passes via wires "26" and "27" to electrical timing device "M". This rotates spindle "B" and the thereto connected and driven parts before described. Also, current passes from wire "26" to contact "10" and when member "C" touches contact "10" and member "D" simultaneously touches contact "14", there is an electrical path from winding "25" to plate "G" through contacts and members previously described and wire "28", leading from contact group "14" to plate "G". If member "20", moved by indicator "E" bridges the gap between "G" and "H" by the previously described means, current will flow through winding "30" of magnet "N" via wire "29" to one terminal of winding "30" and wire "31" to wire "27", and thereby to the other side of secondary winding "25". Current flow through magnet winding "30" will pull limb "32" of bellcrank "K" upward against the counter-pull of spring "33" so that arm "35" rotating about pivot "34" will contact with member "36". In this position an electric circuit is formed from wire "22" through electric bell "L" back through contact "36", arm "35" and pivot "34", to the opposite side of the incoming circuit "23". Hence, when members "C", and "D" and "E" are in specific positions, any signal such as "L" will be actuated, and when member "20" travels away from between its cooperating contact members "G" and "H", the circuit to and through magnet winding "30" is opened, magnet pull ceases and spring "33" pulls arm "32" of bellcrank "K" downward, opening the circuit between arm "35" and contact member "36' and stopping the signal. This latter may be visual as shown by dotted lines in Fig. 4.

Obviously contact is made and broken only at plates "G" and "H" when current flow is begun or stopped. The much greater angular velocity of the high speed member "E" permits the close time regulation obtainable with this device, so that the circuit is established from contacts "10" to plate "G" before member "20" is passed into the gap between plates "G" and "H", and the circuit still remains so connected at the end of the period of signaling and the current flow is interrupted by the departure of member "20" from the ends of the plates. Hence contacts "10" and "14" only prepare the circuit for closing by member "20" at some time approximately near that for the beginning of the cycle of signaling, and they maintain their connections a sufficiently long time to permit the signaling at the exact time required by the opening and closing of the gap between the two plates "G" and "H". Obviously no exact successive short cyclical periods of signaling, interruption, and again signaling is possible by contact made by a hand traveling at the rate of only 6 degrees per minute, or one degree in ten seconds.

In practical use in a factory which begins work at 8 A. M., stops at 12, resumes work at 1 P. M., and stops at 6, the arrangement of the device would be as follows:

A contact of group "10" would be set at, say, 8 o'clock. A contact of group "14" would be set at approximately five minutes before the 12 numerical point or fifty-five minutes after the beginning of the hour, so that just prior to 7:55, electrical contact would be formed, running from the source of electrical current to contact group "14" and plate "G". At exactly 7:55, member "20" enters between plates "G" and "H", completing the circuit, so that the signal begins as, and through the means, previously described and will continue until member "20" passes from plates "G" and "H", so that the period of signaling is just five seconds. This signal is notification to all workmen to make preparations for beginning actual work, and they are informed that within five minutes each operator must be at his place and have his tools or machines ready for commencing the work of the day. Since member "20" moves at a high velocity, and passes out from between spring-pressed contacts, the current is quickly broken without drawing a visible arc or pitting the contacts.

Subsequent to this initial signal, and within a short time, say ¼ to ½ minute, member "D" has moved from the contact set at fifty-five minutes after the beginning of the hour.

Within one minute after said first signal, member "20" will again pass between plates "G" and "H", connecting them together, but the circuit is no longer continuous because member "D" makes no contact with any of its group.

After a period of five minutes, member "D" will have moved to the next succeeding contact of this group, which is at the hour mark or co-incident with the number 12 as shown in Fig. 1. Member "C" travels so slowly that at the end of five minutes it has moved only 2½ degrees theoretically and actually much less, due to the resistance to movement of the hand caused by friction of rubbing against the contact so that usually the hour hand moves less than 1½ degrees in five minutes. Hence at the end of five minutes it still touches the contact on which it was when the initial signal was given. Therefore, when the five minute period has passed, the electrical path through the magnet winding "30" is again completed by electrically joining plates "G" and "H" and the second signal for beginning of work, and which will again continue for five seconds, is given.

Subsequent to this second, or terminal, signal, of the cycle, the motion of the three members "C", "D" and "E" has no effect and completes no circuit through the magnet winding because no contacts are placed in any of the groups "10" or "14" whereby the electrical circuit may be completed. At 11:55, however, the cycle previously described is repeated, there being a contact for member "C" at about the 12 o'clock point, the same fifty-five minute contact previously described for member "D" serving to close one part of the electrical path while connecting of plates "G" and "H", completes the circuit through the magnet winding "30", thus giving the initial signal preparatory to stopping five minutes before the actual hour of ceasing work, just as has been set forth in describing the beginning of the work day. The time between successive cycles will be at least 30 times as long as the time of a cycle.

In brief, this invention provides for a system and an apparatus which will give a preparatory signal, and which has the duration of indication limited to a comparatively short period as five seconds, and which will, a few minutes thereafter, give a second signal, the length of the second signal being a short predetermined time, and which will automatically make these signals at exact predetermined hours, minutes and seconds of the twenty-four hours of any day and maintain them for equally exact predetermined periods. In practice, it has been found that this appliance produces an efficiency and smoothness of operation in factories and the like, at initial and terminating periods of work which avoid confusion, increase production, and which show a definite value in both earnings and satisfaction of the workmen themselves, which make it a desirable, in fact, almost necessary, instrument in any plant where the number of operatives exceeds five or six.

Applicant is aware of the existence of electrical time clocks which have a plurality of settings, but to his knowledge, no such complete apparatus as he has devised and here described has ever been produced or marketed.

Having described my invention in connection with illustrative embodiments, forms and arrangements of parts, it will be understood that many variants thereof are possible to those skilled in the art, and my invention, in its broader aspects, is not limited to the particular construction or application herein shown and described, as changes in size, proportions, configurations, arrangements, assemblage, interaction, juxtaposition and mechanical relations, as well as additions, omissions, substitutions, combinations and alterations of forms, parts, members, features and in the kind and order of operations and successive steps may be made without departing from the broad spirit of this invention.

I claim as my invention:

1. A time-controlled electrical switching apparatus, including a time piece, hour and minute hands thereon, two independent groups of electrical contacts, each group adapted to cooperate with one of said hands; a third revolving member insulated from said time piece, a conducting element mounted on said third member, gearing between said third member and the time piece to drive said member with its conducting element faster than the minute hand, a fixed electrical contact adapted to cooperate with said conducting element, said contact having a length such that it is traversed by said element within a predetermined time, a conductor from one of said groups of contacts to said fixed contact, said groups of contacts with the hour and minute hands and the conductor and conducting element comprising a series electrical circuit adapted to be closed at predetermined times and so maintained while said conducting element continues to touch said fixed contact.

2. A time-controlled electrical switching apparatus, including a time piece, an hour hand and a minute hand moved thereby; angularly spaced electrical contacts adapted to contact with said hour hand; angularly spaced electrical contacts adapted to contact with said minute hand; a third rotating member, gearing thereto from said time piece to revolve said member at a higher velocity than that of the minute hand, means insulating said third member from said hour and

minute hands, a conducting element mounted on said third member, two fixed contacts adapted to cooperate with said conducting element to be periodically bridged thereby and having a predetermined length, an electrical work circuit including said contacts, said hands and groups of contacts and fixed contacts and conducting member completing said electrical work circuit when the hands and said moving member are simultaneously in engagement with their respective contacts.

3. A time-controlled electrical switching apparatus including a time piece, an hour hand and a minute hand thereon, each providing an electrical path along its length and electrically connected at their spindle ends, a group of angularly spaced electrical contacts adapted to contact with said hour hand; a second group of angularly spaced electrical contacts adapted to contact with said minute hand; a third member insulated from the apparatus and adapted to revolve, gearing between said member and the time piece whereby it is moved faster than the minute hand; a conducting element mounted on said third member, two fixed contacts cooperative with said conducting element to be periodically bridged thereby and having a predetermined length, an electrical connection joining one of the fixed contacts and a group of said hand contacts, said hands and contacts and connection forming a continuous electrical circuit from one group of contacts through the hands to the other group and thence to the moving conducting element when said moving members and their respective contacts are all simultaneously in engagement, said circuit being maintained through the time period required for the said conducting element to travel between its said fixed contacts.

4. In a timed electrical circuit closing and opening apparatus, the combination of a time-piece, an hour hand, a minute hand and a third hand, all mounted on and driven by said time-piece, said hour and minute hands constituting electrical conducting paths and electrically connected at their spindle ends; a plurality of contacts electrically connected and angularly spaced around the axis of the time-piece adapted to cooperate with the hour hand, said contacts being adjustably mounted; a similar group of contacts adapted to cooperate with the minute hand, a conducting member mounted on said third hand and insulated from the other hands, and a third contact adapted to cooperate with the said moving conducting member, an electrical conductor between one of said groups of contacts and said third fixed contact, said parts and connections establishing a continuous electric circuit from one group of contacts through said hands to the other group and thence to said fixed contact through the conducting element when all three moving members engage respectively with a cooperating contact.

5. Means for closing an electrical circuit at predetermined time periods and for maintaining it closed during a fixed predetermined time interval and for opening said circuit, including a time-piece, an hour hand thereon, a group of individual contacts cooperating therewith, a minute hand on the time-piecce, and a second group of individual contacts cooperating therewith, and a third hand; gearing between the third hand and said time-piece to turn the hand at a higher speed than the minute hand; a conducting member mounted on said third hand, means for insulating said member, a pair of fixed, parallel, separated co-extensive contact elements adapted to accommodate said conducting member between them, thereby electrically connecting them throughout the time period fixed by the length of said elements and the speed of said third hand.

6. Means for closing an electrical circuit at predetermined time periods and for maintaining it closed during a very short predetermined time interval and for opening said circuit, including a time-piece, an hour hand driven thereby, a group of individual contacts cooperating therewith, a minute hand driven by the time-piece and a second group of individual contacts cooperating therewith, the said two hands being electrically conducting and connected, a third hand driven by the time-piece at a higher speed than the minute hand and insulated from the first-named hands, a pair of fixed, parallel, co-extensive contact elements, a conducting member operated by said third hand and adapted to be moved between said paired elements, thereby electrically connecting them throughout the time period fixed by the length of said elements and the speed of said third hand, an electrical work circuit, a connection from one of said groups of contacts to one of said paired contact elements; an electrical connection from the other of said contact elements to the work circuit, the entirety providing a continuous electrical circuit from one contact through its contacting hand to the other hand connected therewith, through said latter hand to one of its contacts, through the said electrical connection to its said fixed contact element, across said moving conducting member to the other of said contact elements and thence to the work circuit when all three said contact closures are effected.

7. In a device of the character described, the combination of a time-piece, three coaxial members driven thereby, whereof two are electrical conductors and electrically connected together at the axis, a group of electrical contacts for each of said conducting members, each group positioned for the con-

tacts to engage with its member, a conducting element mounted on the third member and a fixed pair of similar contact elements positioned to engage simultaneously with said conducting element, and a conductor between one of said groups of contacts and one of said contact elements.

8. Time-controlled electrical switching means including a time-piece, three movable members driven thereby, two thereof being electrically conducting along their lengths, a conducting element mounted on the third member and insulated from the other two members; electrical contacts for each of said first two conducting members and positioned for respective engagement with each said member, a double contact positioned to engage with said conducting element on said third member, an electrical conductor from one of said first mentioned electrical contacts to one part of said double contact, said parts and members forming a continuous electrical path when all three moving members simultaneously engage with their respective contacts.

9. A timed switching mechanism including a time-piece, three hands driven thereby, each at a speed differing from that of the others, a group of electrical contacts for one of said hands, a similar group for another of said hands, a conducting element mounted on the third of said hands, and insulated from the other hands; a contact positioned to be engaged by said conducting element, and an electrical conductor between one of said groups of electrical contacts and said contact cooperative with said conducting element.

In testimony whereof, I have signed my name to this specification at Los Angeles, Calif., this 14th day of January, 1931.

AARON HILL.