G. FOX & T. M. JEWETT.

SIGNAL DEVICE.

APPLICATION FILED AUG. 29, 1913.

1,237,320.

Patented Aug. 21, 1917.

4 SHEETS—SHEET 1.

FIG. 1.

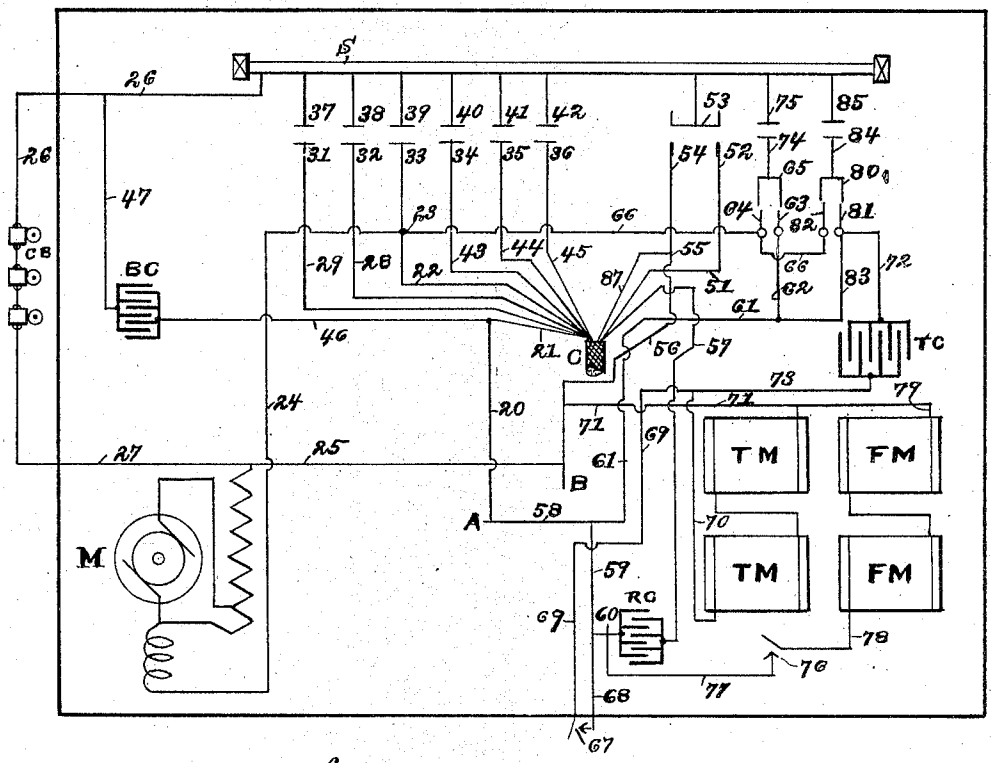

FIG. 2.

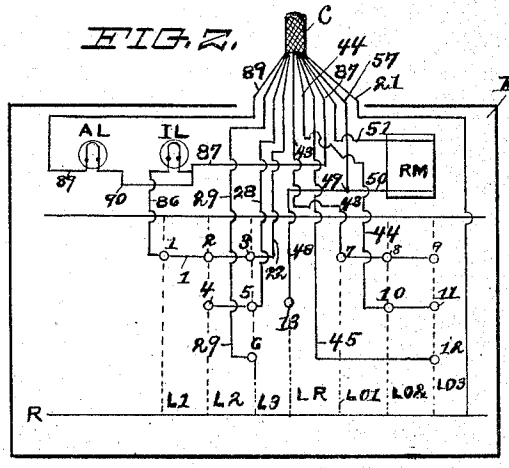

FIG. 3.

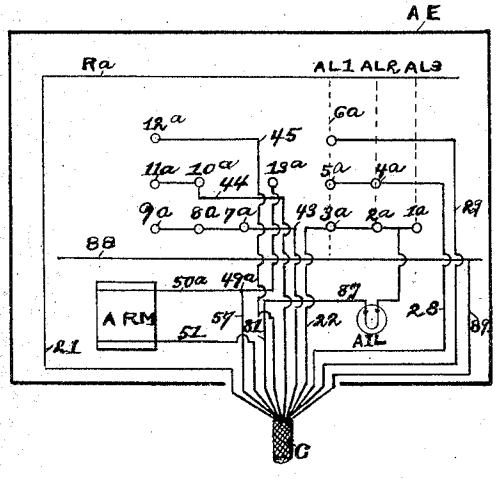

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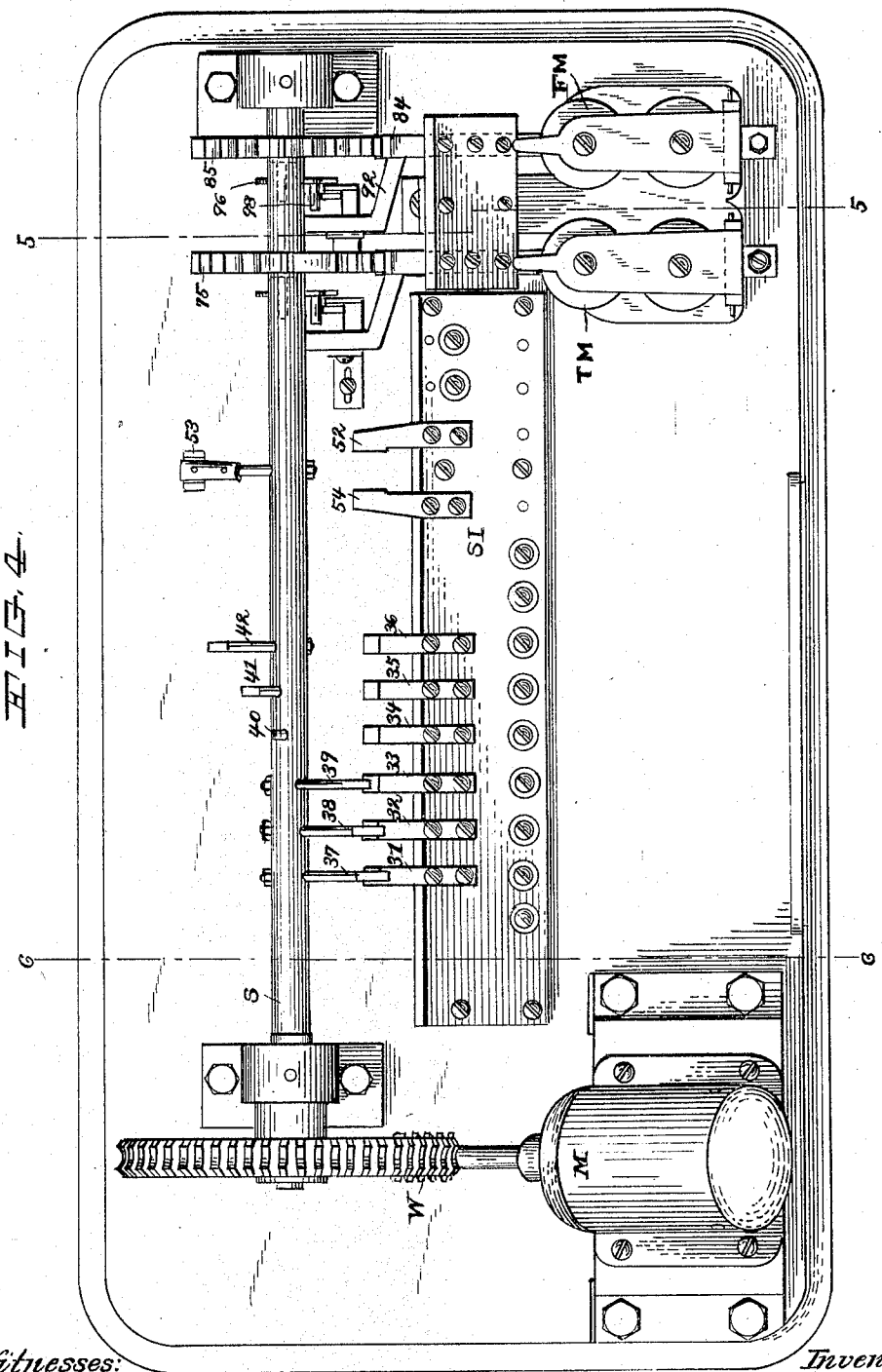
FIG. 4.



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4 SHEETS—SHEET 3.

FIG. 5.

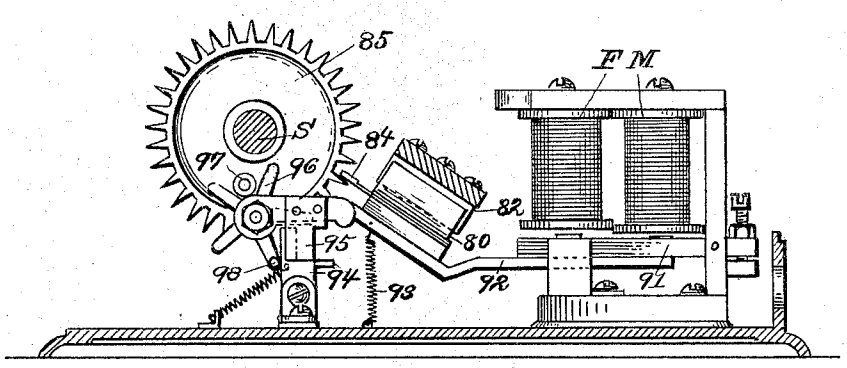
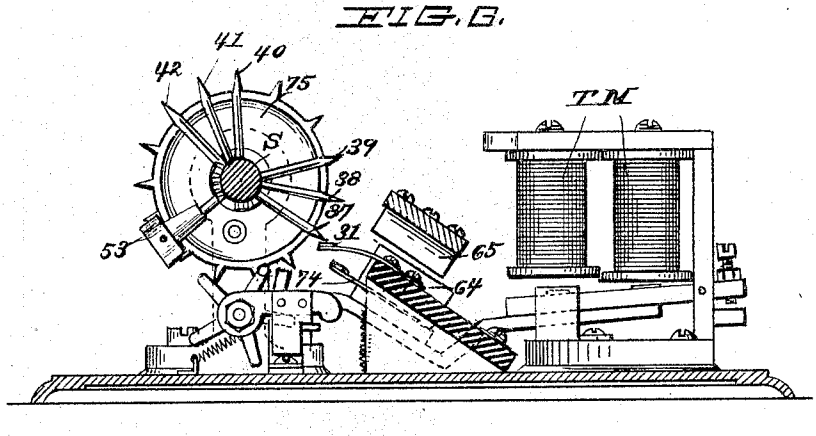


FIG. 6.



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4 SHEETS—SHEET 4.

FIG. 7.

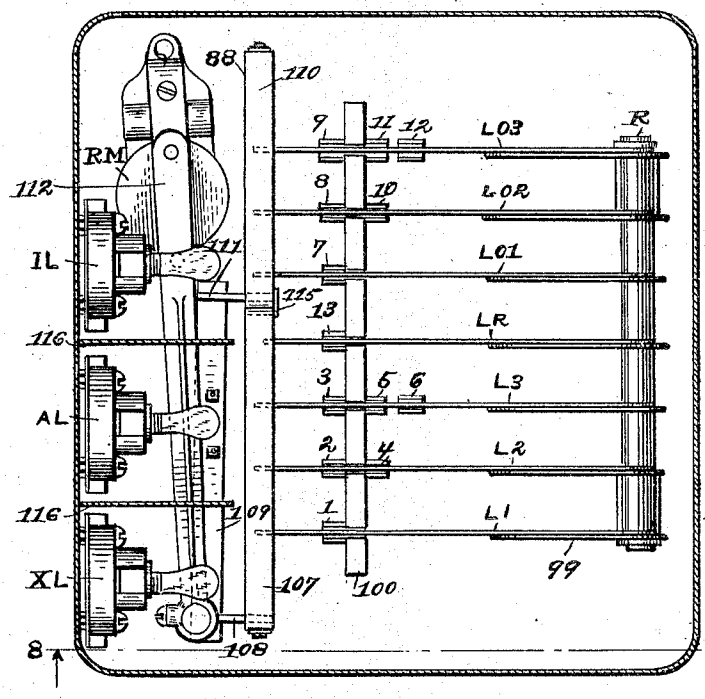


FIG. 10.

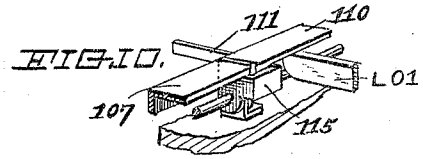


FIG. 9.

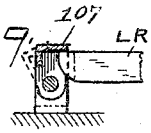
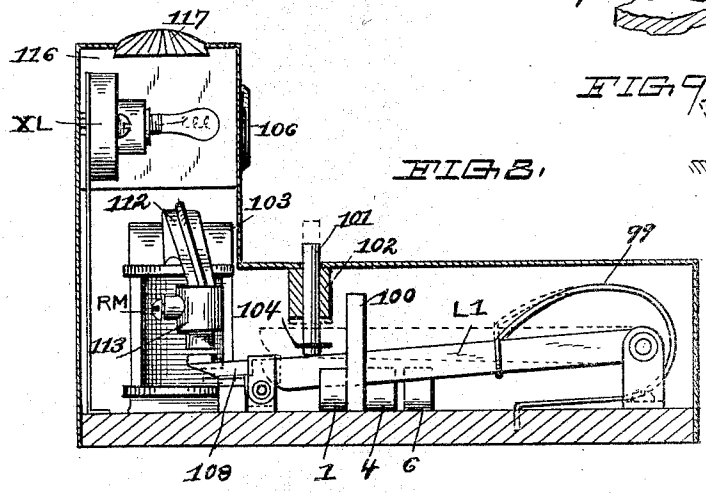


FIG. 8.



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UNITED STATES PATENT OFFICE.

GORDON FOX AND TONY M. JEWETT, OF CLEVELAND, OHIO; SAID FOX ASSIGNOR TO SAID JEWETT.

SIGNAL DEVICE.

1,237,320. Specification of Letters Patent. Patented Aug. 21, 1917.

Application filed August 29, 1913. Serial No. 787,267.

To all whom it may concern:

Be it known that we, GORDON FOX and TONY M. JEWETT, citizens of the United States, residing at Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Signal Devices, of which the following is a specification.

While not confined to such use, our invention is particularly adapted for use in factories, stores and similar places where it may be necessary or desirable to make, from one or more points of control, signals at a number of more or less distant stations and, for convenience, the invention will be described as applied to such use.

In factories, stores and similar institutions officials or employees are wanted from time to time on the telephone or at some specific point about the plant and although they may have permanent stations, they are often not at their stations when wanted nor is their exact location known. Under these conditions it is desirable that a signal be given at a number of points, often widely separated, throughout the plant to call the person desired. While various kinds of signals may be employed, for purposes of illustration the invention is shown as employing bells. In this particular scheme each person likely to be called is assigned a code number and the bells are caused to ring the code number of the person wanted at various stations simultaneously. Numbers of two or more digits may be conveniently sounded in the well known way by causing the number of strokes indicating the first digit to be made on the bells in rapid succession and then after a short interval causing the number of strokes indicating the second digit to be made on the bells in rapid succession and so on.

The bells at all the stations are connected together through a mechanism which causes them to be rung in accordance with the code number selected by a control board. One control board may be used or there may be a plurality of control boards, each at a different point and each acting to put into operation the mechanism for sounding the bells. Provision may be made for indicating that the control board is in use, and provision may be made at one or more of the control boards for indicating which of the control boards has been operated so that when the person called is located he may be promptly directed to the point at which he is wanted. For instance, the operator of the telephone switch board of the plant may also be placed in charge of the main signal control board and auxiliary control boards may be placed at other points, for instance, at the entrance to the plant, in the superintendent's office or at other points. One of the control boards, for instance at the entrance to the plant, may be operated to call a certain individual. The signals will be given simultaneously at the various signal stations throughout the plant and indication will immediately be made on the main control board (at the telephone switch board in this instance) that the person called is wanted at the entrance to the plant. The person called on perceiving his code number may at once get in communication with the main control board and be directed to the entrance to the plant.

In the specific device illustrated in the drawings, we have shown a mechanism which when it operates closes contacts in all the signal circuits, and associated therewith control boards each of which may select which of the closures of the signal circuits shall be effective to actuate the signals and so determine what code indication will be made at the various signal stations.

In addition to the code signals indicating individuals, provision may be made for indicating time such as the opening hour and the closing hour, etc., by means of a circuit which may be manually closed or automatically closed by a clock or other means. In addition there may be provided a call on the signals of a different character from the individual code calls and from the time call which may be caused either automatically or at will either as a fire alarm or to institute a fire drill or for any other purpose.

As shown in the drawings the mechanism for actuating the signals consists of a shaft on which are mounted contact arms and wheels. A motor is provided to rotate the shaft and as the shaft rotates the contact arms and wheels engage contact fingers. Control boards are provided on which are contact clips which are connected, through a cable, for instance, with some of the contact fingers and on the control board are contact levers, each of which engages a different combination of contact clips and se-

lects which of the contact fingers shall actuate the signals when the fingers are engaged by the contact arms, or one set of contact levers may be used to indicate one digit in a code number and another set of levers to indicate another digit in the code number. When any of one set of contact levers on a control board is closed circuit is made through the motor which rotates the shaft. A catch is provided for holding in closed position whatever contact levers have operated and so long as they are held in operative position the motor continues to run and the code number is repeated. When it is desired to stop the apparatus an additional lever arm on the control board is operated to engage a clip in circuit with magnets on the control boards and the magnets, through levers connected to their armatures, release the catches from the various lever arms and allow their springs to act to raise them. In order that this release operation may not occur when the signal is only partly given, and in order to prevent stopping the mechanism at any point other than the true initial point, an additional opening is provided in the magnet circuit which is bridged by a contact arm carried by the rotating shaft at one point in its rotation. This contact arm is arranged on the shaft so as to make contact only after all the signaling contact arms on the shaft have made contact so that when the motor is started again the initial contact will always be made by the first signal contact arm.

The time and fire alarm signals are in the present instance given by continuously ringing all the bells at regular intervals. The interval for the time alarm being longer than the interval for the fire alarm. Instead of a contact arm on the shaft which makes but a single contact in each rotation, there is, therefore, provided a wheel carrying a number of teeth disposed at regular intervals on its circumference so that it may make a number of contacts with its fingers in a single rotation. Of course, a wheel with a single tooth might be used in place of a contact arm or a plurality of contact arms arranged at short angular intervals might be used in place of a wheel. The time and alarm signals might be operated from lever arms on the control boards as are the code signals, but it is preferred to provide separate and different means for their operation. A signal contact device suitably located to be operated either automatically, as by a clock or other mechanism, or manually is provided and this contact energizes an electromagnet which attracts its armature and shifts an arm, carrying a contact finger and a pair of spring contacts, into position to cause the spring contacts to be bridged by a stationary contact and to place the contact finger so that it may be engaged by the teeth of the wheel on the shaft. Circuit through the motor for operating the shaft is made at the bridged spring contacts and circuit through the signals is completed through the bridged contact and at the contact finger when it is engaged by a tooth on the wheel. When the arm has been shifted it is caught and held against an attracting spring by a catch. A star wheel associated with the catch carries a pin which engages and releases the catch when the star wheel has completed a revolution. This allows the arm to be retracted and the circuit broken. The star wheel itself is carried by the arm and as the arm is shifted into operative position the star wheel is brought into position to be engaged, at each revolution of the contact wheel, by a pin carried by the contact wheel so that when the said wheel has completed a sufficient number of revolutions to cause the star wheel to complete a single revolution the circuit is broken and the mechanism and signals brought to rest.

In the accompanying drawings Figure 1 shows a wiring diagram of a portion of the mechanism particularly the rotating shaft and the parts mechanically associated therewith; Fig. 2 is a wiring diagram of a main control board; Fig. 3 is a wiring diagram of an auxiliary control board; Fig. 4 is a plan view of the rotating shaft and the parts mechanically associated therewith; Fig. 5 is a section on the line 5—5 of Fig. 4, showing the arm shifted into operative position; Fig. 6 is a section on the line 6—6 of Fig. 4, showing the arm in inoperated position; Fig. 7 is a plan view of a control board with the casing removed; Fig. 8 is a side elevation of a control board, the casing being shown in section and Figs. 9 and 10 are detail views showing the catch mechanism for the contact levers on the control board.

Referring first to Figs. 4, 5 and 6 there is a motor M which rotates a shaft S through worm gearing W. The shaft S is of conducting material and carries contact arms or wipers 37, 38, 39, 40, 41 and 42. These contact arms are arranged in sets. One set consists of the arms 37, 38, 39 and these arms are arranged at equal angular distances about the circumference of the shaft S. The second set 40, 41 and 42 are arranged at equal angular intervals and the internal intervals in each set is preferably the same. Between the last arm 39 of the first set and the first arm 40 of the second set is an angular interval greater than that between any two arms within a set. It will appear later that these arms cause the ringing of bells when they make contact and their arrangement is such as indicated above so that when contacts of the first set are used to cause the bells to ring a tens digit of a code number and those of the second set to ring a units digit, the code number may be

readily distinguished. For instance, if "23" is to be rung, 38 and 39 will make contact and the bells will ring twice with a short interval between, there will then be a longer interval until the arm 40 is rotated to make the proper contact and it in turn will be followed by 41 and 42 at shorter intervals. After this there will be a long interval and the code number may be repeated. In order that the interval between the sounding of the units and tens may be uniform for all numbers it is provided that "1" of the tens be rung by the third arm 39 of the first set and that when "2" is to be rung the second and third be used and when "3" is to be rung the first second and third are to be used, while in the units for "1" the first arm 40 of the second set is employed, the first and second for "2," and the first, second and third for "3." It will be observed that by this arrangement the interval between the tens digit and units digit is always uniform being represented by the angular interval between the last arm 39 of the first set and the first arm 40 of the second set. Carried by a strip of insulating material SI in juxtaposition with the shaft S are a series of contact fingers 31, 32, 33, 34, 35, 36 all on the same radius of the shaft S with which the contact arms engage respectively in succession as the shaft rotates. A bridging contact 53 is carried by an arm on the shaft S so as to bridge the contact fingers 52 and 54 also carried by the strip of insulation SI. The bridging contact 53 is so arranged angularly on the shaft S that it does not engage the fingers 52, 54 until after the last contact arm 42 has engaged and passed by its corresponding finger 36. It will appear hereinafter that when 53 bridges the contact fingers 52, 54 the apparatus is brought to rest and the arrangement just indicated is adopted so that it may be brought to rest only after the shaft S shall have completed a rotation. The shaft S also carries wheels 85 and 75 each provided with a number of teeth disposed at regular intervals on their peripheries. The wheel 85 is shown as having twice as many teeth as wheel 75 so arranged that each radius of the shaft S which has on it a tooth of the wheel 75 also has a tooth of the wheel 85 and the additional teeth of the wheel 85 are arranged midway between these radii. The arms 37 to 42 are placed on radii of the shaft S which carry teeth of the wheel 75 also. It will appear later that the teeth on the wheels 75 and 85 when they engage their respective fingers cause time or fire alarm signals, etc., and the arrangement just indicated is adopted so that these extraordinary and emergency signals shall predominate over and coincide with the code signals, which may be uncompleted when the extraordinary or emergency signals are to be given. The apparatus coöperating with wheels 75 and 85 are identical and it will be sufficient to describe one. The apparatus cooperating with the wheel 75 is shown in Fig. 6 in inoperated position and the mechanism coöperating with wheel 85 is shown in operated position in Fig. 5. The armature 91 of the magnet FM carries an arm 92 which is normally held down by a spring 93. When the magnets are energized the arm is attracted and raised and a spring actuated catch 94 is brought under a shoulder 95 of the arm 92. This holds the arm 92 in raised position after the circuit through the magnet FM has been opened. When the arm 92 is raised it brings a contact finger 84 carried by it in position to be engaged by the teeth of the contact wheel 85 when it rotates and also brings a bridge contact 80 carried by the arm in position to bridge the stationary contacts 81 (see Fig. 1) and 82. At its offset end the arm 92 carries a star wheel 96 which is lifted into position to be engaged by the pin 97 on the contact wheel 85 in a well known manner so as to cause the star wheel to make a partial rotation each time one of its arms is engaged by the pin 97 as the wheel 85 rotates. One arm of the star wheel 96 carries a pin 98 which when the star wheel has made a complete rotation engages the catch 94 and pushes it from under the shoulder 95 on the arm 92 allowing the latter to be attracted by the spring 93 thus opening the contacts to return the apparatus to a position of rest. The interrelation of the parts is such that the star wheel is moved to trip the arm 92 immediately after the shaft has rotated to cause the bridging contact 53 to leave its contact fingers so that the apparatus always stops so as to be in position to make first contact on restarting at the first arm 37 of the series.

Referring now to Figs. 7, 8, 9 and 10 the control board consists of an insulating base on which are mounted contact clips 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 and a rod R. Pivoted on the rod R are levers L^1, L^2, L^3, LR, LO^1, LO^2 and LO^3 adapted to engage the clips. Each contact lever is held in elevated position by a spring 99. A bar 100 of fiber, gutta percha or other insulating material is mounted on the base and provided with slots to act as guide ways for the various contact levers. The lever L^1 when depressed engages the clip 1; lever L^2, clips 2 and 4; lever L^3, clips 3, 5 and 6; lever LR, clip 13; lever LO^1, clip 7; lever LO^2, clips 8 and 10; lever LO^3, clips 9, 11 and 12. For each lever there is provided a push button 101 passing through a bearing 102 in the casing 103 and provided with a stop collar 104 engaging the bottom of the bearing 102 to limit its outward movement. An index plate 106 is provided on the cas-

ing and on this may be placed over the various buttons 101 insignia to indicate the connections made by the levers operated by the respective button. A catch 88 for holding the levers depressed is made in two parts, one part consists of a strap 107 which is held upright by a lateral arm 108 bearing against a leaf spring 109 mounted on the base of the board. The other portion consists of a similar strap 110 held upright in similar manner by an arm 111 also resting upon the leaf spring 109. The outer ends of the lever arms L^1, etc., are curved so that as the lever arms are depressed into engagement with the clips they press back the straps 107 or 110 against the pressure of the spring as indicated by dotted lines in Fig. 9 and when they have reached their depressed position the spring forces the strap back over the end of the levers to hold them down. The signal controlling levers are all of the same length so that after one has been depressed if another is depressed it will push back the strap and release the first lever. This is so as to the levers in any one set, that is between the levers L^1, L^2 and L^3 or the levers LO^1, LO^2 and LO^3. The levers L^1, L^2 and L^3 are used, when a two digit code number is to be given, to indicate the tens and the levers LO^1, LO^2 and LO^3 to indicate the units. It may, therefore, be necessary to hold two of the lever arms depressed at the same time and in order to let them be depressed separately but held down together the catch is made in two parts, the strap 107 holds down either of the first three levers and the strap 110 holding down either of the last three levers. The lever arm LR engages the clip 13 which is in the circuit of a release magnet RM. This lever is curved at the end like the signal levers L^1, etc., but is shorter than those levers so that it can be depressed and caught by the strap 107 without releasing the other levers. When so depressed it causes the circuit through the release magnet RM to be closed as soon as the bridge contact 53 on the shaft S bridges the contacts 52 and 54. When the magnet RM is energized it attracts its armature 112 which carries at its extreme end a hammer 113 which strikes the arm 108 extending from the strap 107 flexing the spring 109 and pushes the strap 107 back releasing the contact levers L^1, etc. Since the strap 110 is separate from the strap 107 the levers held by the strap 110 would not be released, but there is a lug 115 extending from the end of the strap 107 into engagement with the strap 110 so that when the strap 107 is forced back to release the levers it also forces back the strap 110 and so all the levers are released. It will be observed, however, that the lug 115 does not interfere with the independent operation of the strap 110 to catch one of the levers LO^1, LO^2 or LO^3 after one of the levers L^1, L^2 or L^3 has been depressed. Indicating lights IL, AL and XL are shown separated from each other by darkening partitions 116 and each may be provided with a crown light 117 in the top of the casing for the control board. Only one light may be used on an auxiliary control board while a main control board may have as many lights as there are control boards in the system.

The mechanical construction of the control board and contact mechanism has now been made clear. Attention is directed to Figs. 1, 2 and 3 which show the electrical connections between the various portions of the apparatus. At CB are indicated diagrammatically bells which may be located at various places throughout the plant where it may be desired to have the signal heard. In the drawing are shown three bells in series and it is to be understood that each bell represents a separate signal station, it being necessary to have but one bell at each station. Of course, the invention is not limited to the use of three bells since any number of signal stations may be served, there being one bell at each station and if desired the bells may be arranged in parallel or they may be arranged series-parallel in groups. The cable C connecting the various control boards to the contact mechanism is shown as broken away in the three figures, but it is to be understood that the cable is continuous between the various mechanisms and that a wire bearing a reference numeral in Figs. 1 or 2 or 3 is a continuation or branch of the wire bearing the same numeral in another figure or figures. For instance, the wire marked 21 in Fig. 1 is connected with 21 in Fig. 2 and 21 in Fig. 3. There is shown a main control board in Fig. 2 and an auxiliary control board in Fig. 3 and there may be one or more of either of these, each being a reproduction of these and the connections being the same. The various lever arms of the control boards are indicated in Figs. 2 and 3 by dotted lines running from the supporting rods to the clips and indicating the connections which are made when the lever arms are closed. It is to be understood, of course, that the lever arms are not all closed at the same time. To cause a signal of a single digit one of the arms L^1, L^2 or L^3 will be used and to cause a signal of two digits there will be used in addition one of the lever arms LO^1, LO^2 or LO^3. For purposes of illustration it may be assumed that the lever arm L^3 has been closed.

The motor circuit may be traced from one side of the line A by the wires 20 and 21 through the cable C to the rod R through the lever arm L^3 to the clip 3 by the wire 22 through the cable C to the point 23 and by the wire 24, through the motor M and the wire 25 to the other side of the line B. The

clips 1, 2 and 3 are all connected to the wire 22 so that if instead of the lever arm L^3 the lever arm L^1 or L^2 is in use the motor circuit will be made in the same way.

The signal circuit may be traced from one side of the line A by the wire 20 and the wire 21 through the cable C to the rod R and through the lever arm L^3, from which the circuit branches, one branch passing through the clip 3 and the wire 22 through the cable C to the contact finger 33. When the arm 39 engages the contact finger 33 the circuit will continue through the shaft S and by the wire 26 through the call bells CB and by way of the wires 27 and 25 to the other side of the line B. Another branch of this circuit from the contact lever L^3 goes through the clip 5 and the wire 28 through the cable C to the contact finger 32. When the contact arm 38 makes contact with the finger 32 this branch circuit will proceed to the shaft S where it joins the path of the first branch passing through the call bells CB to the other side of the line. The third branch of the circuit passes from the lever arm L^3 to the clip 6 and through the wire 29 and the cable C to the contact finger 31. When the contact arm 37 engages the contact finger 31 this branch circuit will continue through the shaft S where it joints the path of the two other branches and passes through the call bells CB to the other side of the line. If the lever arm L^2 be closed instead of the arm L^3, only two of the branches above traced, namely those through the wires 22 and 28 will be closed since the lever arm L^2 engages the clips 2 and 4 connected with those lines, but engages no clip corresponding to the clip 6 connected to the line 29 so that no circuit will be completed when the arm 37 engages its corresponding contact finger 31. In like manner if the lever arm L^1 be closed instead of the lever arm L^3, only one branch will be closed, namely that through the clip 1 and the wire 22 so that the circuit will not be made when the contact arms 37 and 38 engage their respective contact fingers 31 and 32. If the lever arm LO^3 be also closed three additional branches of the signal circuit will be closed from the rod R to the shaft S from which they pass through the bells CB to the other side of the line. One of these three branches passes through the clip 9 and the wire 43 and cable C to the contact finger 34 and when the contact arm 40 makes contact with the finger 34 the circuit continues through the shaft S. Another branch proceeds through the clip 11 and the wire 44 through the cable C to the contact finger 35 and when the contact arm 41 engages the finger 35 the current continues through the rod S. The third branch passes through the clip 12 and the wire 45 through the cable C to the contact finger 36 and when the contact arm 42 engages the finger 36 the circuit proceeds through the shaft S. If the lever arm LO^2 be closed instead of the arm LO^3, only two of these branches, namely those through the wires 43 and 44 will be closed through the clips 8 and 10, which are connected to the wires 43 and 44 as are the clips 9 and 11, there being no clip engaged by the arm LO^2 corresponding to the clip 12 connected to the wire 45 so that no circuit will be completed when the contact arm 42 engages its finger 36. If the contact lever LO^1 be closed instead of the contact lever LO^3 only one of the three branches will be closed, namely that through the wire 43 since the lever arm LO^1 engages only clip 7, which is connected with the clips 8 and 9 to the wire 43 but does not engage any clips corresponding to 10, 11 and 12 connected to the wires 44 and 45 so that no circuits will be completed when the contact arms 41 and 42 engage their fingers 35 and 36. These various branches are closed in succession by the contact arms on the shaft S and the bells caused to ring in accord with the code selected by the lever arms on the control board.

When the circuit is opened by the lever arms 37, 38, 39, 40, 41 or 42 leaving their respective fingers 31, 32, 33, 34, 35 and 36 an undesirable spark might be produced, but to avoid this I connect in the bell circuit and parallel to said opening a condenser BC. It will be remembered that the contact fingers 31 to 36 are connected through the control board E to the A side of the line by the wire 21 and that the shaft S carrying the contact arms 37 to 42 is connected by the wire 26 through the bells to the B side of the line. One side of the condenser BC is, therefore, connected to the wire 21 by the wire 46 and the other side of the condenser is connected to the wire 26 by the wire 47. Any spark which might otherwise occur between the contact arms and contact fingers is, therefore, avoided.

It will be remembered that the wires from the auxiliary control board AE also are connected to the cable C and, therefore, the corresponding wires on Fig. 3 are marked with the same reference numerals as on Fig. 2. It will thus be readily seen that the same signal circuits may be made by operating the corresponding contact levers on an auxiliary call board.

When either of the contact levers L^1, L^2, L^3 are closed a branch circuit is made from the clips 1, 2 or 3 through the wire 86 and the indicating lamp IL thence through the wire 87 and the cable C to the point 55 and thence through wire 56 to the B side of the line. Another branch is also closed through wire 22 cable C to auxiliary control board AE through the lamp AIL and wire 87 and by cable C to point 55 and thence by wire 56 to the B side of the line. Thus lamps

on all the control boards are lighted whenever any control board is operated.

When one of the lever arms AL^1, AL^2 or AL^3 of the auxiliary control board is in operation an additional branch circuit is made from the lever arm through the catch bar 88 and the wire 89 which passes through the cable C to the control board E and through the lamp AL and by the wire 90 to the wire 87 which passes through the cable C to the point 55 and thence through the wire 56 to the B side of the line. In Fig. 2 only one lamp AL has to show but obviously one may be added for each auxiliary control board in use and may be connected up with its respective board as is the lamp AL into the board AE.

To stop the apparatus the release lever LR or ALR, etc., may be closed. The circuit for the release magnets may be traced from one side of the line A through the wire 20 and the wire 21 through the cable C to the rod R and the lever arm LR, to the clip 13, which it engages, through the wire 48 to the point 49 where the circuit branches, one branch passing by the wire 50 through the release magnet RM and the wire 51 through the cable C to the contact finger 52 through the bridge contact 53, when the rotation of the shaft S has brought it in the proper position, through the contact finger 54 to the point 55 and through the wire 56 to the B side of the line. From the point 49 the other branch passes through the wire 57 and the cable C to the point 49^a on the control board AE and by the wire 50^a through the release magnet ARM and the wire 51 through the cable C where it joins the other branch passing through the contact mechanisms 52, 53 and 54 to the B side of the line. All the release magnets on all the control boards are thus energized and all the lever arms released when the bridge piece 53 is brought into contact with the fingers 52 and 54 by the rotation of the shaft S. A similar releasing circuit may be made by closing the lever ALR on an auxiliary control board.

In order to avoid an undesirable spark passing between the lever arm LR and the clip 13 when the lever arm is released there is provided a condenser RC connected across the opening. It will be remembered that the lever arm LR is connected to the A side of the line through the rod R and the wire 21 passing through the cable C, while the clip 13 is connected to the B side of the line through the wires 48, 50 and the magnet. One side of the condenser RC is, therefore, connected to the A side of the line by the wires 58, 59 and 60 and the other side of the condenser is connected through the wire 57 to the point 49 between the wires 48 and 50. This prevents the spark which might otherwise pass between the clip 13 and the contact lever LR.

When the time contact 67 is closed a circuit is completed from the A side of the line through the wires 58, 59 and 68 through the time contact 67 and the wires 69 and 70 through the time magnets TM and the wire 71 to the B side of the line. This lifts the arm 92 and causes the bridge 65 to connect the spring contacts 63 and 64. When the arm is raised it is held elevated by the catch 94 until it is mechanically released by the pin 98 after the shaft S has made the predetermined number of revolutions.

In order to avoid a spark at the time contact 67 when it is opened a condenser TC is placed in the circuit parallel with the contact 67. On the one side the condenser is connected by the wires 72, 83, 61, 59 and 68 with the stationary portion of the time contact, while the other side of the condenser TC is connected by the wires 73 and 69 to the movable portion of the time contact 67 thus avoiding the spark which might otherwise form at the opening of the contact.

The circuit through the motor when the time signal is in operation may be traced from the A side of the line through the wires 58, 61 and 62 to the spring contacts 63 and 64 bridged by the raised bridge piece 65 and through the wires 66 and 24 through the motor M and by the wire 25 to the B side of the line.

The signal circuit when the time contact is in operation may be traced from the A side of the line through the wires, 58, 61 and 62 to the spring contact finger 74 which is engaged by the projections on the time wheel 75 as it rotates from which the circuit passes through the shaft S to the wire 26 to the signals CB and thence through the wires 27 and 25 to the B side of the line.

The circuit through the fire contact 76 may be traced from the A side of the line through the wires 58, 59, 60 and 77 through the fire contact 76 and the wire 78 through the fire magnets FM and by the wires 79 and 71 to the B side of the line. This raises the arm 92 and causes the bridge 80 to connect the spring contacts 81 and 82 in which position it is held until it is mechanically tripped after the shaft S has made the predetermined number of revolutions. The motor circuit may then be traced from the A side of the line through the wires 58, 61 and 83 through the contacts 81, 80 and 82 and through the wires 66 and 24 through the motor M and the wire 25 to the B side of the line. The signal circuit may be traced from the A side of the line through the wires 58, 61 and 83 through the contacts 81 and 80 to the contact finger 84 which engages the fire alarm wheel 85 as the shaft S rotates from which the circuit continues through the wire 26 and the signals CB through the wires 27 and 25 to the B side of the line.

The operation of the device will be readily understood. One of the levers L^1, L^2 or L^3 on one of the control boards may be depressed and held down by the catch 88. This will close the circuit through the motor M which will immediately begin to rotate the shaft S. At the same time the indicating lights IL on the various control boards will be lighted and if an auxiliary control board is operated, its corresponding light AL on the main control board will be lighted. In connection therewith one of the levers LO^1, LO^2, LO^3 may or may not be depressed. The shaft S as it rotates will bring the contact arms 37 to 42 carried by it in contact with their respective contact fingers, thus completing one or more of the branch circuits through the signals and causing signals at the various stations in accordance with the selection made on the control board. This operation will continue and the signal be repeated until after a lever RL on one of the control boards has been depressed and the bridging piece 53 has been brought, by the rotation of the shaft, into contact with its fingers 52, 54 when the release magnets will operate to release the lever catches and open all the circuits bringing the motor and apparatus to rest and extinguishing the lights on the various control boards. Either of the extraordinary or emergency signals may be brought into operation at any time by closure of the circuit through the corresponding magnets TM or FM and the motor started by the bridging contacts carried by the armatures of the magnets. The rotation of the shaft by the motor will cause the teeth on the wheels to engage the contact fingers and close the signal circuits. This operation will continue until the circuit is opened by the mechanical trip when the star wheel has been rotated.

The control board has been illustrated as made up of two sets of contact levers each set containing three levers. It is obvious, however, that the invention is not limited to this number as there may be more or less than three levers in each set and there may be only one or more than two sets on each control board. Numerous other changes and alterations may be made without departing from the invention.

One form which the invention may take has been shown and described in detail but obviously the invention is not confined to such details and the claims are intended to relate to equivalent construction as well as to the particular structural details illustrated in the drawings.

We claim as our invention:

1. Signals, a shaft, means for electrically connecting the signals and shaft, a source of current, means for electrically connecting the signals to one side of a source of current, contact fingers, means for selectively connecting the fingers to the other side of the source of current, and means for connecting the shaft to the fingers one after the other.

2. Signals, a shaft, means for electrically connecting the signals and shaft, a source of current, means for electrically connecting the signals to one side of a source of current, contact fingers, means for selectively connecting the fingers to the other side of the source of current, a motor for rotating the shaft to connect it with the fingers one after the other, means for closing the motor circuit before the shaft contacts with any finger, and means for opening the motor circuit only after the shaft has contacted with all the fingers.

3. Signals, a shaft, means for electrically connecting the signals and shaft, a source of current, means for electrically connecting the signals to one side of a source of current, contact fingers, means for selectively connecting the fingers to the other side of the source of current, a magnet for causing the motor circuit to open, and means carried by the shaft to energize the magnet circuit only after the shaft has contacted with all the fingers.

4. Signals, a shaft, means for electrically connecting the signals and shaft, a source of current, means for electrically connecting the signals to one side of a source of current, contact fingers, means for selectively connecting the fingers to the other side of the source of current, wipers on the shaft, and means for contacting the wipers and the fingers one after the other.

5. Signals, a shaft, means for electrically connecting the signals and shaft, a source of current, means for electrically connecting the signals to one side of a source of current, stationary contact fingers, means for connecting the fingers to the other side of the source of current, and means for connecting the shaft to the fingers.

6. Signals, a shaft, means for electrically connecting the signals and shaft, a source of current, means for electrically connecting the signals to one side of a source of current, contact fingers, means for selectively connecting the fingers to the other side of the source of current, a motor for rotating the shaft to connect it with the fingers one after the other, and means for closing the motor circuit before the shaft contacts with any finger.

7. Signals, a shaft, means for electrically connecting the signals and shaft, a source of current, means for electrically connecting the signals to one side of a source of current, contact fingers, means for selectively connecting the fingers to the other side of the source of current, a magnet for causing the motor circuit to open, and means carried by the shaft to energize the magnet circuit.

8. A motor, a shaft rotated by the motor,

contact arms carried at different angular positions on the shaft, stationary contact fingers all on one radius of the shaft and engaged by the contact arms as the shaft rotates, a source of current, means for connecting one or more of the contact fingers to one side of a source of current, signals, and means for connecting the shaft to the other side of the source of current through the signals.

9. A motor, a shaft rotated by the motor, contact arms on the shaft, contact fingers engaged by the contact arms as the shaft rotates, a source of current, means for connecting the contact fingers to one side of a source of current, signals, and means for connecting the shaft to the other side of the source of current through the signals.

10. A motor, a shaft rotated by the motor, contact arms carried at different angular positions on the shaft, stationary contact fingers engaged successively by the contact arms as the shaft rotates, a source of current, means for connecting the contact fingers to one side of a source of current, signals, and means for connecting the shaft to the other side of the source of current through the signals.

11. A motor, a shaft rotated by the motor, contact arms carried at different angular positions on the shaft, stationary contact fingers all on one radius of the shaft and engaged successively and respectively by the contact arms as the shaft rotates, a source of current, a plurality of means for selectively connecting the contact fingers to one side of a source of current, signals, and means for connecting the shaft to the other side of the source of current through the signals.

12. Signal circuits, a plurality of successively acting contact devices in the circuits, means for repeatedly actuating said contact devices, other contact devices in the circuits, and selective means for closing the other contact devices to determine which of the successively acting contact devices shall energize the circuits.

13. Signal circuits, a plurality of contact devices in the circuits, means for repeatedly actuating said contact devices, other contact devices in the circuits, means for closing the other contact devices, and means for holding them closed.

14. Signal circuits, a plurality of successively acting contact devices in the circuits, means for repeatedly actuating said contact devices, other contact devices in the circuits, and means for closing the other contact devices, and means for stopping said actuating means.

15. Signal circuits, a plurality of successively acting contact devices in the circuits, means for repeatedly actuating said contact devices, other contact devices in the circuits, and means for closing the other contact devices.

16. A motor, a shaft rotated by the motor, contact arms carried at different angular positions on the shaft, stationary contact fingers all on one radius of the shaft and engaged by the contact arms in succession as the shaft rotates, a plurality of control boards, clips on each board, means for electrically connecting each contact finger to one or more clips on each board, a source of current, a rod on each board connected to one side of a source of current, spring restrained contact levers on each rod each to engage one or more of the clips, a catch on each board to hold the levers when in contact with a clip, magnets for releasing the catch on each board, a circuit for the magnets, a clip on each control board and in the magnet circuit, a lever carried by each rod to engage the last mentioned clip without releasing the catch, a contact carried by the shaft engaging a contact finger in the magnet circuit to close it after all the arms have engaged the fingers, a circuit for the motor passing through some of the clips and levers, signals, and means for connecting the shaft through the signals to the other side of the source of current.

17. A motor, a shaft rotated by the motor, contact arms carried at different angular positions on the shaft, stationary contact fingers all on one radius of the shaft and engaged by the contact arms as the shaft rotates, a plurality of control boards, clips on each board, means for electrically connecting each contact finger to one or more clips on each board, a source of current, a rod on each board connected to one side of a source of current, spring restrained contact levers on each rod each to engage one or more of the clips, a catch on each board to hold the levers when in contact with a clip, magnets for releasing the catch on each board, a circuit for the magnets, a clip on each control board and in the magnet circuit, a lever carried by each rod to engage the last mentioned clip, a contact carried by the shaft engaging a contact finger in the magnet circuit, means on the control boards to indicate that a board is operated, a circuit for the motor passing through some of the clips and levers, signals, and means for connecting the shaft through the signals to the other side of the source of current.

18. A motor, a shaft rotated by the motor, contact arms carried at different angular positions on the shaft, stationary contact fingers all on one radius of the shaft and engaged by the contact arms as the shaft rotates, a plurality of control boards, clips on each board, means for electrically connecting each contact finger to one or more clips on each board, a source of current, a rod on each board connected to one side of a source

of current, spring restrained contact levers on each rod each to engage one or more of the clips, a catch on each board to hold the levers when in contact with a clip, magnets for releasing the catch on each board, a circuit for the magnets, a clip on each control board and in the magnet circuit, a lever carried by each rod to engage the last mentioned clip, a contact carried by the shaft engaging a contact finger in the magnet circuit, means to indicate that a board is operated, and means to indicate which board is operated, a circuit for the motor passing through some of the clips and levers, signals, and means for connecting the shaft through the signals to the other side of the source of current.

19. A motor, a shaft rotated by the motor, contact arms on the shaft, stationary contact fingers engaged by the contact arms as the shaft rotates, a plurality of control boards, means for electrically connecting each contact finger to each board, a source of current, a spring restrained contact lever on each board to connect it to one side of a source of current, magnets for releasing the contact levers on all the boards, a contact on each control board in the magnet circuit, a contact carried by the shaft engaging a contact finger in the magnet circuit, a circuit for the motor passing through the control boards, signals, and a conductor leading from the shaft through the signals to the other side of the source of current.

20. A motor, a shaft rotated by the motor, contact fingers, means carried by the shaft to engage the contact fingers, a plurality of control boards, means on each board for completing a circuit through the various contact fingers, means on each board to hold closed the circuit completing means, a magnet for releasing the holding means on each board, means on each control board for closing a contact in a circuit through all the magnets, a contact carried by the shaft engaging a contact finger in the magnet circuit, a circuit for the motor passing through the control boards, signals, and a circuit for the signals passing through the contact fingers and boards.

21. Signals, a circuit for the signals, means for closing a plurality of contacts in the circuit, a plurality of control boards for the means each comprising means for selectively closing contacts in the signal circuits, and means for indicating which of the control boards is operated.

22. Signals, a circuit for the signals, means for closing a plurality of contacts in the circuit, a plurality of control boards for the means each comprising means for selectively closing contacts in the signal circuit, means on each control board for indicating that a control board is operated, and means for indicating which of the control boards is operated.

23. Signals, a circuit for the signals, a plurality of contacts in the signal circuit, means for closing each of certain contacts at uniform time intervals and leaving longer time intervals between certain contacts, means for selecting which contacts shall be effective to operate signals.

Signed at Cleveland, this 27th day of August, 1913.

GORDON FOX.
TONY M. JEWETT.

Witnesses:
KARL FENNING,
FLORINE EVANS.