C. E. BEACH.

SIGNALING SYSTEM.

APPLICATION FILED DEC. 18, 1916.

1,250,769.

Patented Dec. 18, 1917.

3 SHEETS—SHEET 1.

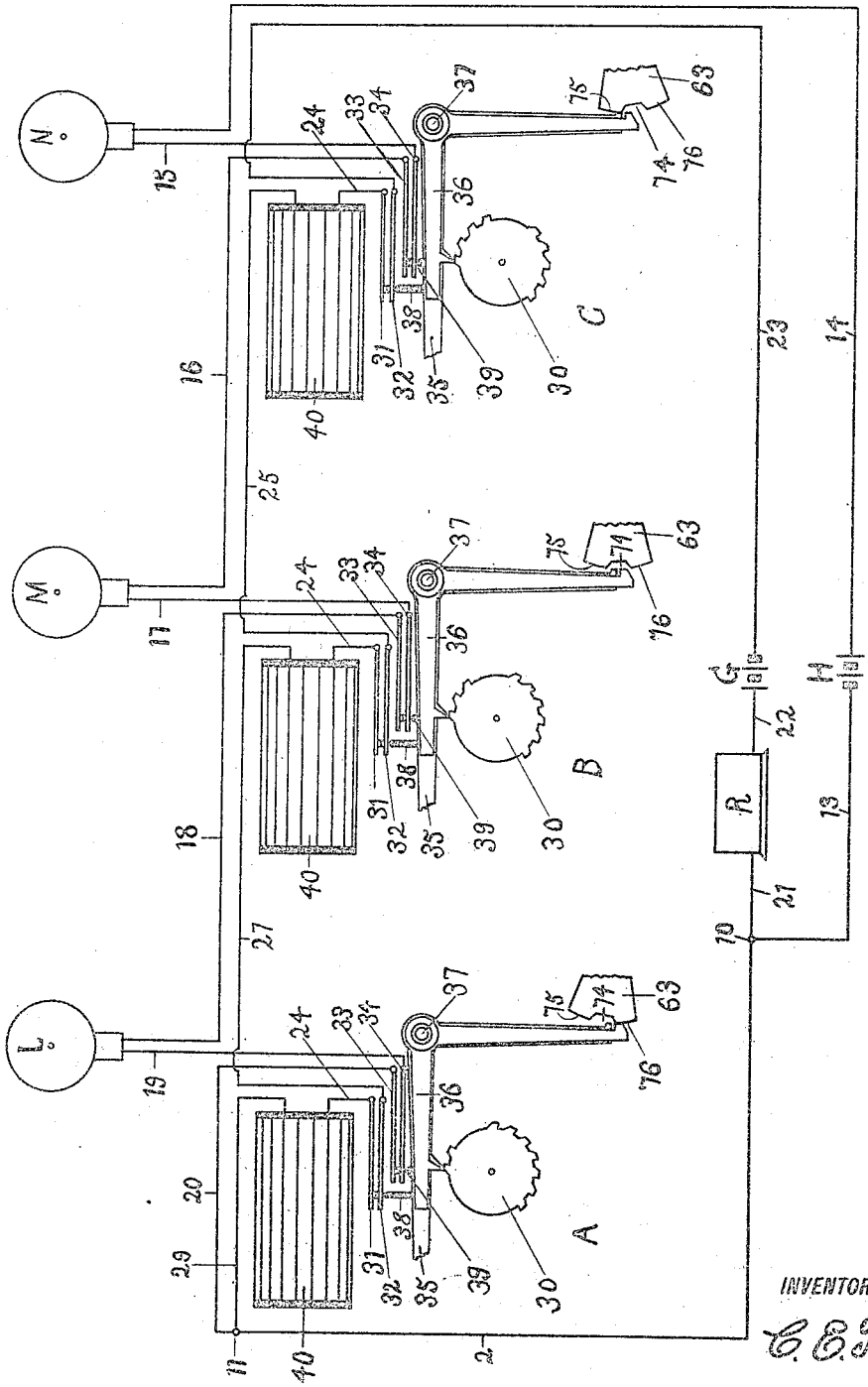


Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 2.

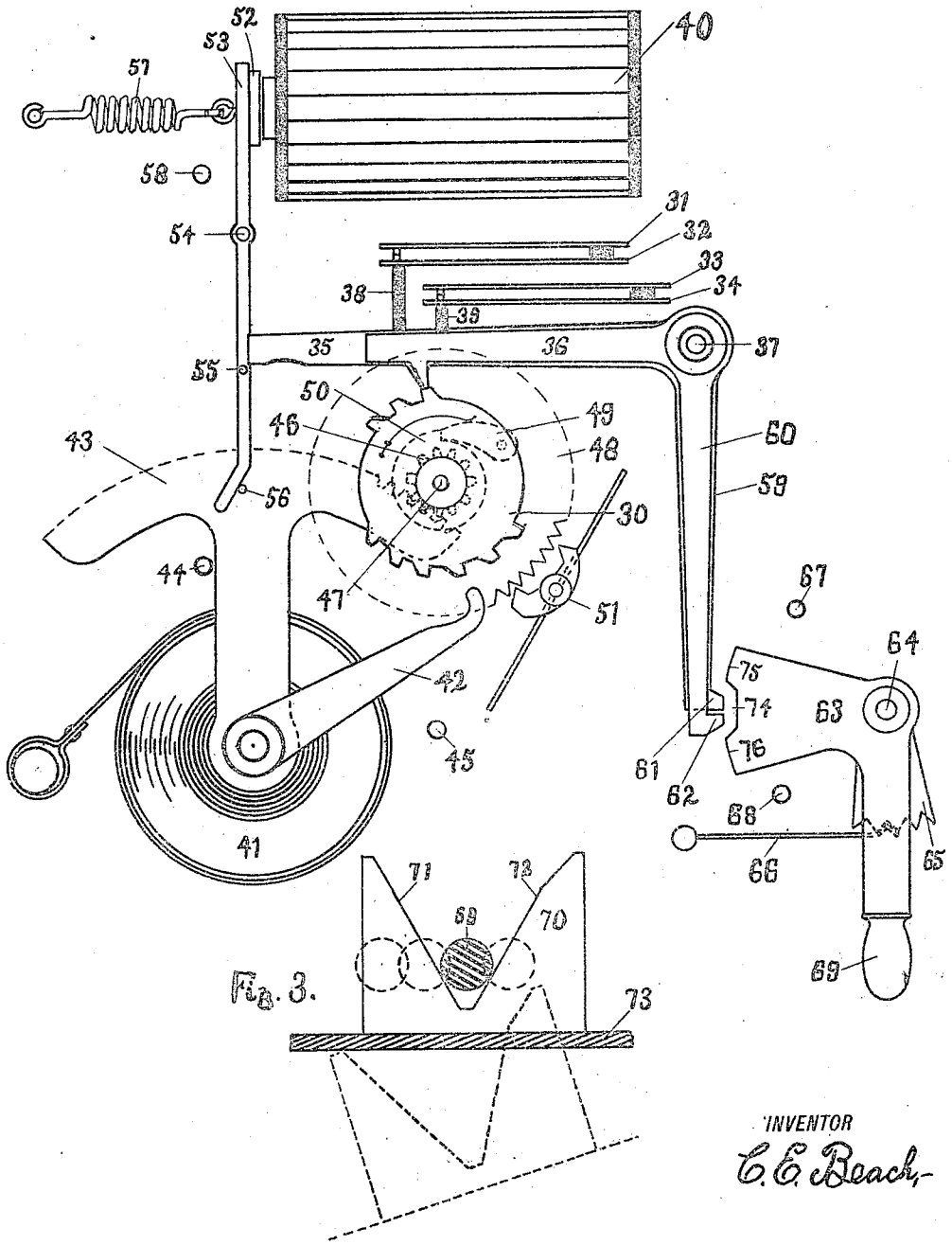


Fig. 3.

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3 SHEETS—SHEET 3.

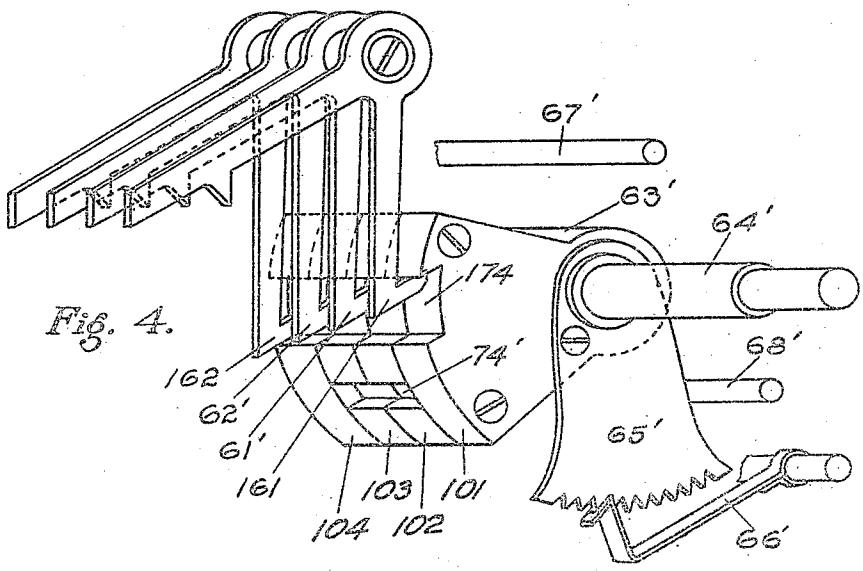


Fig. 4.

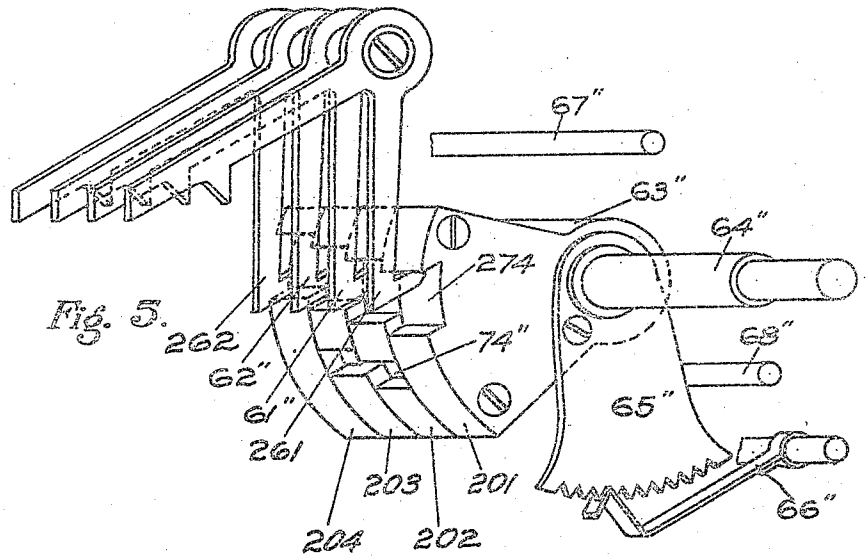


Fig. 5.

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UNITED STATES PATENT OFFICE.

CLARENCE E. BEACH, OF BINGHAMTON, NEW YORK.

SIGNALING SYSTEM.

1,250,769. Specification of Letters Patent. Patented Dec. 18, 1917.

Application filed December 18, 1916. Serial No. 137,608.

To all whom it may concern:

Be it known that I, CLARENCE E. BEACH, a citizen of the United States, residing at Binghamton, in the county of Broome and State of New York, have invented certain new and useful Improvements in Signaling Systems, of which the following is a specification.

This invention relates to signaling systems having two or more classes of translating devices, suitable conductors connecting said devices with signal initiating stations, and means at signal initiating stations for selectively governing the response of the various classes of signal translating devices.

Signaling systems of this character may be advantageously employed as combination fire alarm and police signaling systems, as combination watchman's time detector and fire alarm systems, as combination watchman's time detector, fire alarm and police call systems, and as combination fire dismissal and fire alarm systems adapted for use in factories and buildings where many persons congregate.

Signaling systems have heretofore been devised embodying two classes of signaling circuits each including signal translating devices, and both classes of circuits including circuit controlling mechanism at signal initiating stations, each signal initiating station being provided with clock-work mechanism for suitably actuating the circuit controlling mechanism for both classes of circuits, and with so-called "alarm-controllers" comprising switches so connected with such signaling circuits that the circuit-controllers at any signaling station may be selectively shunted.

This multiplicity of contact points and connections, which is inherent to the shunting switches heretofore used, has impaired the reliability of such systems because of the liability of corrosion of contact surfaces seldom used and the liability of accumulation of dirt and dust thereon. When such switches have been used for the purpose of shunting out a controller of a given class after a substantial period of disuse, the contact surfaces so employed have offered such resistance to the passage of the signaling current therethrough as to cause response of some or all of the signaling devices in the circuit associated therewith. The manufacture and maintainance of signal boxes embodying such switches has also been found to be expensive and to require the exercise of much skill and care.

An important object of this invention is to so minimize the number of contact surfaces employed in such a system, that the effectiveness of the transmission of intended signals will be in no wise impaired or affected by the condition of any contact surface other than the transmitting contacts which are under constant test.

Other objects are to provide a system which can be more economically and conveniently manufactured and maintained than similar systems heretofore devised.

Still other objects together with their inherent advantages will be in part obvious and in part specifically set forth in the following specification and more fully pointed out in the claims.

In constructing this invention,—circuits, loops or branches are arranged in any well known or suitable manner so that the openings or closings (as the case may be) of any given circuit, loop or branch will cause the translating devices included therein to produce the desired signal manifestations.

Signal initiating stations are provided, each having mechanism adapted, when actuated, to operate circuit-controllers to cause desired openings and closures in signaling circuits, and each having a separate circuit-controller for each circuit, loop or branch to be controlled by such station. Governing or holding mechanism is provided at signal initiating stations whereby the various circuit-controllers thereat may be individually, in groups, or collectively, rendered mechanically responsive or mechanically unresponsive to the operation of the contact actuating means provided at such stations. The term "alarm-controller" will be hereinafter employed in referring to such governing mechanism.

In applying this invention to a combination fire dismissal and fire alarm system adapted for use in a factory, local alarm devices included in one of the signaling circuits should be suitably distributed throughout the various buildings, floors and rooms where signals should be sounded for warning occupants of danger and directing emergency dismissals or drills, while suitable general alarm mechanism included in another signaling circuit should be so situated as to call assistance from public or private

fire department stations. In applying this invention to a combination fire alarm and police signaling system, translating devices included in one of the signaling circuits should be located so as to suitably summon police aid, and translating devices included in another circuit should be so situated as to call fire department aid.

In applying this invention to a combination watchman's time detector and fire alarm system, translating devices included in one of the signaling circuits should be provided for recording and manifesting the watchman's report signals, and translating devices included in another signaling circuit should be provided for manifesting fire alarm signals.

In applying this invention to a signaling system in which three or more classes of signals are required, such as watchman's report signals, fire alarm signals, and police call signals, a separate alarm circuit should be provided for each class, together with suitable circuit-controllers and actuating mechanism therefor at each signal station.

If it is desired to avoid mutilation of the signals of any given class or classes in the event of two or more signal-boxes being set in motion at or about the same time for the transmission of signals of that class, non-interference magnets and suitable mechanism responsive thereto should be supplied at each signal-box for controlling the operation of the circuit-controllers provided for the initiation of signals in the circuit or circuits of such class or classes.

For the purpose of enabling this invention to be more readily understood, an embodiment thereof is shown in the annexed drawings and hereinafter described, but this invention is not limited to the particular arrangement shown, and hereinafter described, as many changes in construction and arrangement and insertions or omissions of parts may be made without departing from the spirit of this invention.

In the accompanying drawings—

Figure 1 diagrammatically represents a typical signaling system embodying this invention.

Fig. 2 is an enlarged elevation of mechanism used at signal initiating stations.

Fig. 3 is a plan view of a detail to be referred to.

Figs. 4 and 5 are isometric projections of alternate forms of alarm-controller mechanism adapted for signal initiating stations which control four circuits.

Like reference characters denote similar parts throughout.

Signal initiating stations are indicated at A, B and C, and in the interest of briefness these stations will be hereinafter referred to by the use of the conventional term "signal-boxes."

Translating devices are indicated by the reference characters L, M, N and R. The devices L, M and N being shown connected in the circuit or loop which also includes the current source H. For convenience, this circuit or loop will be hereinafter referred to as the "local alarm circuit," and the translating devices L, M and N will be generally hereinafter referred to as "local alarm mechanism." The local alarm mechanism is diagrammatically indicated in the form of gongs or bells which, for convenience, will be hereinafter individually referred to as "gongs."

The second current source G is included in another circuit or loop which also includes the translating device R. For convenience this second named loop will be hereinafter referred to as a "general alarm circuit" and the translating device R will be hereinafter referred to as "general alarm mechanism."

The ends of the local and general alarm circuits are joined at 10 and 11 respectively; said joined ends being connected by the conductor 12.

It is preferable to employ the two batteries G and H as shown, but a suitable single current source serially included in the conductor 12 may be employed in the place of the two current sources G and H under conditions understood by those skilled in this art.

Each signal-box has signal formulating mechanism comprising a signal wheel 30 and two circuit-controllers consisting of the coöperating contact springs 31 and 32 and the coöperating contact springs 33 and 34. Tracer levers 35 and 36 are pivoted at 37 and carry projections adapted to rest upon the periphery of the signal wheel 30 so as to be suitably influenced by the rotation thereof. The movement of the lever 35 is imparted to the contact 32 by means of the insulating spacer 38, and the movement of the lever 36 is correspondingly imparted to the contact 34 by means of the spacer 39. The contacts 31 and 32 of each signal-box are serially included in the general alarm circuit. The contacts 33 and 34 of each signal-box are serially included in the local alarm circuit.

The current path for the local alarm circuit is as follows:—from joint 10, through conductor 13, current source H, and conductor 14 to gong N; from gong N, through conductor 15 to contact 34 of signal box C; from contact 33 of signal-box C through conductor 16 to gong M; from gong M, through conductor 17, to contact 34 of box B; from contact 33 of box B, through conductor 18, to gong L; from gong L, through conductor 19, to contact 34 of box A; from contact 33 of box A, through conductor 20, to joint 11. From joint 11 two return cur-

rent paths are provided for the local alarm circuit to joint 10, one path through conductor 12 and the other path through the general alarm loop or circuit.

The current path through the general alarm circuit is as follows: from joint 11, through conductor 29 and magnet 40, conductor 24, and contact 31, to contact 32 of signal-box A; thence through conductor 27 and magnet 40, conductor 24, and contact 31, to contact 32 of signal-box B; thence through conductor 25 to magnet 40, conductor 24, and contact 31, to contact 32 of signal-box C; thence through conductor 23, current source G and conductor 22 to general alarm mechanism R, thence through conductor 21 to joint 10.

From the foregoing, it will be seen that interruptions of the general alarm circuit will result in the deënergization of the magnets 40 of the signal-boxes and cause responsive action of the general alarm mechanism R. Interruptions of the local alarm circuit will similarly cause responsive action of the local alarm mechanism L, M and N. Interruption of but one of these circuits will not cause responsive action of the translating devices included in the other of said circuits, as the continuity of either circuit may be independently maintained through the common return conductor 12, but if both the local and the general alarm circuits are interrupted, all of the translating devices will respond. Non-interference magnets are shown in the general alarm circuit only in the accompanying drawings, but it is evident that similar magnets and contact locking mechanism could be provided for the local alarm circuit, and if more than two circuits were provided, similar mechanism could be correspondingly supplied for each of such circuits.

Referring to Fig. 2, the mechanism provided at signaling stations comprises,—the actuating main spring 41, the manual winding handle 42 therefor, the sector 43 moving with the winding handle 42, the stops 44 and 45 for suitably limiting the travel of the sector 43, the pinion 46 engaged by the sector 43 and carried by the shaft 47, the escape wheel 48 mounted on the shaft 47, adapted to move independently of the pinion 46 and carrying a spring click 49, the ratchet wheel 50 moving with the pinion 46 and adapted to be engaged by the click 49 for the purpose of driving the escape wheel 48, and the escapement governor 51 for regulating the speed of rotation of the wheel 48.

The signal wheel 30 moves with the escape wheel 48 and acts through the tracers 35 and 36 to suitably operate the contacts 32 and 34 in a well known manner.

The armature 52 is carried by the lever 53, said lever is pivoted at 54 and carries a pin 55 which is so located that, when said armature 52 is in its attracted position, said pin 55 is withdrawn from the path of the tracer 35, and so that, when the said armature is in its retracted position, said pin is carried into the path of the tracer 35 and serves to prevent such movement of said tracer as will permit the contact 32 to move away from engagement with the contact 31.

A projection 56 carried by the sector 43 normally engages the lever 53 and serves, while the sector 43 is resting against the stop 44, to hold said lever in such position that the armature 52 is in attracted position, and so that when said sector is moved by the actuation of the handle 42, the projection 56 will be withdrawn so as to permit the lever 53 to carry the pin 55 into the path of the tracer 35 and withdraw the armature 52 from attracted position.

A retractile spring 57 is provided for moving the lever 53 to carry the armature 52 away from its attracted position upon deenergization of the magnet 40 while the projection 56 is withdrawn from engagement with said lever, and the limit 58 is provided in the path of the lever 53 for arresting the movement of said lever, in response to the spring 57, when it has moved far enough to withdraw the armature 52 from the effective field of the magnet 40.

The tracer 35 is arranged to coöperate with the pin 55 in a well known manner,—so that the lever 53 will be locked against movement to carry the armature 52 toward a retracted position whenever the tracer 35 occupies a position which permits the contact 32 to leave the contact 31; and so that, while the tracer 35 is supported by the signal wheel 30 in position to prevent the contact 32 from moving away from the contact 31, the lever 53 will be free to so move as to carry the armature toward its retracted position and to carry the pin 53 to a position where it will hold the tracer 35 against such movement as to permit the contact 32 to move away from the contact 31.

The arms 59 and 60 move with the tracers 35 and 36 respectively, the arm 60 being somewhat longer than the arm 59, so that the projection 61 carried at the free end of the arm 59 is somewhat above the projection 62 carried at the free end of the arm 60.

The cam 63 is pivoted at 64 and is provided with suitable locking mechanism, comprising the sector 65 and the spring-dog 66 engaging therewith, for the purpose of establishing four positions or stopping places for said cam. The stops 67 and 68 are provided for limiting the movement of the cam 63, and the handle 69 is provided for manually moving said cam from one position to another.

The restoring block 70 (see Fig. 3) is mounted on the door or other movable part of the box, and is provided with the cam

faces 71 and 72 which are adapted to engage the handle 69 when the door 73 is in closed position, but permits the handle 69 to be moved as desired when the door is open.

In the interest of clearness, the restoring block 70 and door 73 are not shown in Fig. 2, and the handle 69 and door 73 are shown in section in Fig. 3.

The cam 63 is mounted in the path of the projections 61 and 62 and is provided with a notch 74 which is so positioned that when the cam is in the position shown in Fig. 2, said notch will lie in the path of both of said projections and thus permit such movement of the arms 59 and 60 as will permit the tracers 35 and 36 to withdraw the spacers 38 and 39 from the support of the contacts 32 and 34 respectively. The face 75 of the cam 63 bears such relation to the notch 74 that, when said cam is moved into engagement with the stop 68, said face will lie in the path of the projection 61 and thus hold the arm 59 and tracer 35 against such movement as would permit the contact 32 to move away from contact 31, while maintaining a portion of the notch 74 in the path of the projection 62 so as to enable the arm 60 and the tracer 36 to permit the contact 34 to move away from the contact 33. The face 76 of the cam 63 bears such relation to the notch 74 that when said cam is moved toward the stop 67, from the position shown in Fig. 2, a distance represented by one tooth of the sector 65, said face will be carried into the path of the projection 62 and thus hold the arm 60 and tracer 36 against such movement as would permit the contact 34 to move away from the contact 33, while maintaining a portion of the notch 74 in the path of the projection 61 so as to permit such movement of the arm 59 and tracer 35 as will allow the contact 32 to move away from the contact 31. The face 76 is of such width and bears such relation to the projections 61 and 62 that, when the cam 63 is moved into engagement with the stop 67, said face will lie in the path of said projections 61 and 62 and thereby prevent such movement of the arms 59 and 60 and the tracers 35 and 36 as would permit the contacts 32 and 34 to move away from the contacts 31 and 33 respectively.

It is evident that if more than two circuits are to be thus controlled, additional arms like 59 and 60 should be provided, each arranged to properly engage with a suitably notched cam similar to cam 63 having a sector similar to 65 arranged to provide for the desired number of stop positions.

It is also evident that the desired number of projections, similar to 61 and 62, may be either spaced around the periphery of the cam as shown or that said projections may be arranged in a line parallel to the axis of said cam, and that one or more notches located in the path of the different projections may be so formed and angularly spaced from one another that the portions of the cam faces and notches affecting the projections of different arms will support and release such projections at the desired points in the travel of the cam.

For example, in a signal initiating station having either three sets or four sets of circuit controllers, a notch, such as the notch 74′ shown in Fig. 4, may be provided for the projections of two of the circuit controller arms, and be arranged to so coöperate with the projections carried by said arms as to control said two arms in the varying combinations provided for the two corresponding arms by the structure shown in Fig. 2, together with an additional notch, as for example the notch 174 in Fig. 4, arranged to so coöperate with all of the projections as to enable the additional arm or arms to be controlled in various combinations with the first pair of arms, and, if there are two additional arms, with each other. Five or six arms may be similarly controlled, so that any one, two, three, four, five or all of said arms may be held against operative actuation, or may be released so as to permit of their operative actuation, by providing a cam having three notches, one of said notches being so formed therein as to provide, with relation to the projections carried by two of said arms, the functions of the notch 74 of Fig. 2 or the notch 74′ of Fig. 4 or the notch 74″ of Fig. 5, a second one of said notches bearing such relation to the projections carried by said first named two arms and two other arms, as to provide such control thereof as is afforded by the notch 174 of Fig. 4 or the notch 274 of Fig. 5, and the third of said notches bearing such relation to the projections carried by all of said arms as to provide for the successive control thereof in a manner similar to that effected for four of said arms by said second named notch.

By providing additional notches and correspondingly arranging them with relation to the projections of larger numbers of arms, any number of arms may be thus controlled.

Referring now in greater detail to Fig. 4, it will be noted that the cam 63′ is pivoted at 64′ and that the sector 65′ moves with said cam and is engaged by the springdog 66′.

The projections 161, 61′, 62′, and 162 are spaced around the periphery of the cam 63′, having an angular displacement corresponding to that of the teeth of the sector 65′; the projection 161 being positioned above the other projections, the projection 61′ being below the projection 161, the projection 62′ being below the projection 61′, and the pro-

jection 162 being below the other projections.

For convenience in description, the cam 63′ will be herein referred to as if comprising distinct sections 101, 102, 103 and 104 for coöperation with the projections 161, 61′, 62′ and 162, respectively, although it is evident that said cam may be made either integral or in sections without departing from the spirit of this invention.

A notch 74′, is formed in the cam sections 102 and 103, but does not extend into the sections 101 and 104, said notch being of such width that the projections 61′ and 62′ may be simultaneously received thereby. Said notch bears such relation to the teeth of the sector 65′ that, if said cam is moved toward the stop 67′ from the position where said notch lies in the path of the projections 61′ and 62′ a distance represented by one tooth of said sector, said notch 74′ will be withdrawn from the path of the projection 62′, while a portion of said notch will lie in the path of the projection 61′; and if said cam is moved a corresponding distance in the opposite direction, said notch 74′ will be withdrawn from the path of the projection 61′ and a portion of said notch will remain in the path of the projection 62′.

The notch 174 extends through all of the sections of the cam 63′ and is situated at such a distance from the notch 74′ that all of said projections may be simultaneously held by said cam against operative actuation while a portion of the face of the cam section 103 situated intermediate of said notches lies in the path of the projection 62′.

Said notch 174 is of such width that, when the cam 63′ is in the position shown in Fig. 4, portions of said notch will be disposed in the path of all of the projections, and that movement of said cam in either direction a distance represented by a tooth of the sector 65′ will carry said notch out of the path of one of the projections, and movement of said cam for distances representing additional notches will withdraw said notch from the path of a corresponding additional number of the projections.

From the foregoing it is apparent that when the cam 63′ is in the position shown in Fig. 4 it permits the operative actuation of all of the arms associated therewith; that when said cam is moved toward the stop 68′ from the position shown in Fig. 4, a distance represented by one tooth of the sector 65′, said cam will serve to hold the arm associated with the projection 161 against operative actuation, while permitting such actuation of the other arms; that when said cam is so moved a distance represented by two teeth of said sector, said cam will serve to hold the arms associated with the projections 161 and 61′ against operative actuation, while permitting such actuation of the arms associated with the projections 62′ and 162; that when said cam is so moved a distance represented by three teeth of said sector, thus bringing said sector into engagement with said stop 68′, said cam will serve to hold the arms associated with the projections 161, 61′ and 62′ against operative actuation, while permitting such actuation of the arm associated with projection 162; that when said cam is moved toward the stop 67′ from the position shown in Fig. 4, a distance represented by one tooth of said sector, said cam will serve to hold the arm associated with the projection 162 against operative actuation, while permitting such actuation of the arms associated with the other projections; that when said cam is so moved a distance represented by two teeth of said sector, said cam will serve to hold the arms associated wth the projections 162 and 62′ against operative actuation, while permitting such actuation of the arms associated with the projections 61′ and 161; that when said cam is so moved a distance represented by three teeth of said sector, said cam will serve to hold the arms associated with the projections 162, 62′ and 61′ against operative actuation, while permitting such actuation of the arm associated with the projection 161; that when said cam is so moved a distance represented by four teeth of said sector, said cam will serve to hold the arms associated with all of the projections against operative actuation; that when said cam is so moved a distance represented by five teeth of said sector, said cam will permit operative actuation of the arm associated with the projection 62′, while serving to hold the other arms against such actuation; that when said cam is so moved a distance represented by six teeth of said sector, said cam will permit the operative actuation of the arms associated with the projections 62′ and 61′, while serving to hold the other two arms against such actuation; and that when said cam is so moved a distance represented by seven teeth of said sector, thus bringing said cam into engagement with said stop 67′, said cam will permit the operative actuation of the arm associated with the projection 61′, while serving to hold the other arms against such actuation.

Referring now in detail to Fig. 5, it will be noted that the cam 63″ is pivoted at 64″ and that the sector 65″ moves with said cam and is engaged by the spring-dog 66″.

The projections 261, 61″, 62″ and 262 are disposed along a line parallel to the axis of the cam 63″, all of the arms carrying said projections being of substantially the same length.

For convenience in description, the cam 63″ will be herein referred to as if comprising the sections 201, 202, 203 and 204 for co-

operation with the aforesaid projections, respectively. A notch 74'' is formed in the cam sections 202 and 203 but does not extend into the sections 201 and 204, said notch being of such width, in each of said sections, as to be adapted to receive the projection cooperating therewith when said cam is in either of a certain two of the stop positions established by the engagement of the springdog 66'' with notches in the sector 65''. The notch 274 extends through all of the sections of the cam 63'' and is situated at such a distance from the notch 74'' that all of said projections may be simultaneously held against operative actuation by portions of the cam face situated between said notches notwithstanding the angular displacement thereof. Said notch 274 is of such width that, when the cam 63'' is in the position which presents a portion of said notch adjacent to one of the side walls thereof to one of the projections, said cam may be moved in the direction to carry such side wall away from such projection a distance represented by three teeth of the sector 65'' without withdrawing said notch from the path of such projection, and that such a movement of said cam for a distance representing four of said notches will withdraw said notch from the path of such projection.

The portions of the notches in the respective sections of the cam are angularly displaced so that the portion of the notch 274 in the cam section 204 is spaced above the portion of said notch in the cam section 203 by substantially the angular distance from one tooth to another of the sector 65'', the portions of the notches in the cam section 202 are similarly spaced below the portions of said respective notches in the cam section 203, and the portion of the notch 274 in cam section 201 is correspondingly spaced below the portion of said notch in cam section 202.

From the foregoing it is apparent that when the cam 63'' is in the position shown in Fig. 5 it permits the operative actuation of all of the arms associated therewith; that when said cam is moved toward the stop 68'' from the position shown in Fig. 4, a distance represented by one tooth of the sector 65'', said cam will serve to hold the arm associated with the projection 261 against operative actuation, while permitting such actuation of the other arms; that when said cam is so moved a distance represented by two teeth of said sector, said cam will serve to hold the arms associated with the projections 261 and 61'' against operative actuation, while permitting such actuation of the arms associated with the projections 62'' and 262; that when said cam is so moved a distance represented by three teeth of said sector, thus bringing said sector into engagement with said stop 68'', said cam will serve to hold the arms associated with the projections 261, 61'' and 62'' against operative actuation, while permitting such actuation of the arm associated with the projection 262; that when said cam is moved toward the stop 67'', from the position shown in Fig. 5, a distance represented by one tooth of said sector, said cam will serve to hold the arm associated with the projection 262 against operative actuation, while permitting such actuation of the arms associated with the other prejections; that when said cam is so moved a distance represented by two teeth of said sector, said cam will serve to hold the arms associated with the projections 262 and 62'' against operative actuation, while permitting such actuation of the arms associated with the projections 61'' and 261; that when said cam is so moved a distance represented by three teeth of said sector, said cam will serve to hold the arms associated with the projections 262, 62'' and 61'' against operative actuation, while permitting such actuation of the arm associated with the projection 261; that when said cam is so moved a distance represented by four teeth of said sector, said cam will serve to hold the arms associated with all of the projections against operative actuation; that when said cam is so moved a distance represented by five teeth of said sector, said cam will permit operative actuation of the arm associated with the projection 62'', while serving to hold the other arms against such actuation; that when said cam is so moved a distance represented by six teeth of said sector, said cam will permit the operative actuation of the arms associated with the projections 62'' and 61'', while serving to hold the other two arms against such actuation; and that when said cam is so moved a distance represented by seven teeth of said sector, thus bringing said cam into engagement with said stop 67'', said cam will permit the operative actuation of the arm associated with the projection 61'', while serving to hold all of the other arms against such actuation.

The construction of the restoring block 70, which is illustrated in Fig. 3, is based upon the assumption that, under normal conditions, it is desired that all signals shall be transmitted over both the local alarm and the general alarm circuits, but it is evident that, by varying the slant and position of the faces 71 and 72, such block 70 may be arranged to cause the cam 63 to be moved to any desired position when the door 73 is closed.

It will be apparent, from the foregoing description, that the movement of the handle 69, to carry the cam 63 to its various abnormal positions, can only be accomplished while the door 73 is open, and that upon closing said door 73, after the handle 69

has been moved to any position other than that shown in Fig. 2, the face 71 or the face 72 of the said block 70 will act to restore the handle 69 and parts moving therewith to the position shown in Fig. 2.

The positions to which the handle 69 may be set, other than the position in which it is shown in Fig. 2, are indicated by the dotted circles in Fig. 3.

The operation of this invention is as follows:

When the system is at rest and in normal condition, there is a current flow through the local and the general alarm circuits and, if the current strength in said circuits is equal, said current flow will pass serially through said circuits as follows:—from one terminal of local current source H, through conductor 14, gong N, conductor 15, contacts 34 and 33 of signal-box C, conductor 16, gong M, conductor 17, contacts 34 and 33 of signal-box B, conductor 18, gong L, conductor 19, contacts 34 and 33 of signal-box A, and conductor 20, to joint 11, thence through conductor 29 and magnet 40, conductor 24, contacts 31 and 32 of signal-box A, through conductor 27, magnet 40, conductor 24 and contacts 31 and 32 of signal-box B, through conductor 25 and magnet 40, conductor 24 and contacts 31 and 32 of signal-box C, through conductor 23, general alarm current source G, conductor 22, general alarm mechanism R, conductor 21, joint 10 and conductor 13 to the other terminal of current source H. If the current flow through one of said circuits exceeds that through the other of said circuits such excess will pass through conductor 12 between joints 10 and 11.

If now the winding handle 42 of one of the signal-boxes is depressed until the sector 43 of said box is brought against the stop 45 and thereupon released, the spring 41 associated therewith will act in a well known manner to cause the rotation of the signal wheel 30 driven thereby, and the rotation of said wheel will alternately release and support the tracers 35 and 36. Assuming that the cam 63 of such box stands in the position shown in Fig. 2, so that its notch 74 is in the path of projections 61 and 62, the contacts 32 and 34 will alternately move away from and press against the contacts 31 and 33 respectively, and thereby alternately break and close the local and general alarm circuits, whereupon the local alarm mechanism L, M and N and the general alarm mechanism R will give the desired manifestations of the code signal for the transmission of which such wheel 30 is arranged.

During the transmission of such signal, the non-interference mechanism provided at the various signal-boxes will function in a manner which is well understood by those skilled in this art, and such functioning will not, therefore, be herein described in detail.

If it is desired to sound the mechanism in the local alarm circuit from any signal-box without sounding the general alarm mechanism, the handle 69 of such box should be moved to its extreme right hand position, thus carrying its associated cam 63 to the position of the cam 63 of signal-box C shown in Fig. 1, and the winding handle of such box should be then depressed until the sector 43 associated therewith is brought against its stop 45 whereupon said winding handle should be released. The projection 61 of the arm 59 of such box being now supported by the face 75 of the cam 63 associated therewith, its associated tracer 35 will hold its contact 32 against movement away from its contact 31, but a portion of the notch 74 will be presented to the projection 62, so that the tracer 36 will be allowed to drop and thereby permit the contact 34 to move away from the contact 33, so that said contact 34 will be moved in accordance with the outline of its associated signal wheel 30 and thereby cause the desired signal to be manifested by the local alarm mechanism L, M and N without causing any responsive action of the general alarm mechanism R.

If it is desired to transmit a signal from one of the boxes over the general alarm circuit without transmitting any signal over the local alarm circuit, the handle 69 of such box should be moved to the left a distance represented by one notch of its sector 65, so as to bring the cam 63 of such box to the position shown at station A in Fig. 1, such box should then be set in motion in the usual manner. The face 76 of the cam 63 of such box would thus be brought into the path of its associated projection 62, while a portion of its notch 74 would lie in the path of the projection 61. The arm 60 and tracer 36 of such box would thus be held against such movement as would permit its associated contact 34 to move away from its contact 33, while its arm 59 and tracer 35 would be permitted to oscillate in response to the outline of the wheel 30 associated therewith, and would thus cause the desired movement of its contact 32 with relation to its contact 31 so as to suitably open and close the general alarm circuit and thereby cause the desired responsive action of the general alarm mechanism R without causing responsive action of the local alarm mechanism L, M and N.

If it is desired to operate the mechanism of one of the signal-boxes without causing responsive action of either the local or the general alarm translating devices, the handle 69 of such box should be moved to its extreme left hand position, whereupon the face 76 of its cam will be brought into the

path of its associated projections 61 and 62 and thus prevent such movement of its arms 59 and 60 and its tracers 35 and 36 as would permit its contacts 32 and 34 to move away from its contacts 31 and 33.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a signaling system, the combination of a general alarm circuit including general alarm mechanism, a local alarm circuit including local alarm mechanism, a plurality of stations, circuit-controllers at each station in the general and local alarm circuits, respectively, signal formulating mechanism at each station for operating both circuit-controllers, and alarm-controllers at each station having means to variably control the operation of said circuit-controllers by the formulating mechanism associated therewith.

2. In a signaling system, the combination of a general alarm circuit including general alarm mechanism, and a local alarm circuit including local alarm mechanism, a plurality of stations, circuit-controllers at each station in the general and local alarm circuits, respectively, signal formulating-mechanism at each station for operating both circuit-controllers, and alarm-controllers at each station having means adapted to be set to permit the operation of the local alarm circuit-controllers and the general alarm circuit-controllers by the formulating mechanism, the setting of said alarm-controllers to another position permitting the operation of only the local alarm circuit-controllers by the formulating mechanism.

3. In a signaling system, the combination of a general alarm circuit including general alarm mechanism, a local alarm circuit including local alarm mechanism, a plurality of stations, circuit-controllers at each station in the general and local alarm circuits, respectively, signal formulating mechanism at each station for operating both circuit controllers, and alarm-controllers at each station having means adapted to be set to permit the operation of the general alarm circuit-controllers upon actuation of the signal formulating mechanism, and setting of said alarm-controllers to another position permitting the actuation of the local alarm circuit-controllers upon actuation of the signal formulating mechanism.

4. In a signaling system, the combination of a plurality of stations, a main circuit extending to said stations, signal mechanism included in said main circuit, a local circuit extending to said stations, signaling mechanism included in said local circuit, a set of contact members at each station connected with said main circuit for controlling the opening and closure thereof, a second set of contact members at each station connected with said local circuit for controlling the opening and closure thereof, signal formulating mechanism at each station connected with both sets of contact members thereat for actuating said contact members to control the opening and closure of said circuits, means at stations for mechanically rendering the main circuit contact members unresponsive to the signal formulating mechanism, and means at each station for mechanically rendering the local contact members at said station unresponsive to the signal formulating mechanism thereat, and suitable current supply mechanism for said circuits.

5. In a signaling system, the combination of a plurality of stations, a main circuit extending to said stations, main alarm mechanism included in said circuit, a local alarm circuit extending to said stations, local alarm mechanism included in said local circuit, a set of contact springs at each station, said contact springs at the various stations being normally in position to close the main circuit, a second set of contact springs at each station, said second named springs at the various stations being normally in position to close the local circuit, signal formulating mechanism at each station adapted to operate both sets of contact springs thereat and to control the opening and closure thereof and thus cause response of both the local and the general alarm mechanism, means at each station for mechanically rendering the main circuit contact springs unresponsive whereby upon operation of the signal formulating mechanism the local circuit will be opened and closed, each of said circuits including suitable current supply mechanism.

6. In a signaling system, the combination of a plurality of stations, a main circuit extending to said stations, main alarm mechanism included in said circuit, a local circuit extending to said stations, local alarm mechanism included in said local circuit, a set of contact springs at each station, said contact springs at the various stations being normally positioned to close the main circuit, a second set of contact springs at each station, said second set of contact springs at the various stations being normally positioned to close the local circuit, signal formulating mechanism at each station so connected with both sets of contact springs thereat as to be adapted to control the opening and closure thereof and thus cause response of the local and main receiving devices, and means at each station for mechanically preventing action of the local circuit contact springs to open the local circuit thereat whereby upon actuation of the signal formulating mechanism the local circuit contact springs will remain closed and only the main circuit controlled, said circuits including current supply mechanism.

7. In a signaling system, the combination of a plurality of stations, a main circuit serially running through said stations and including main signal receiving devices, a set of contact members at each station normally closing the said main circuit, a local circuit running serially through said stations and including local receiving devices, a second set of contact members at each station normally closing said local circuit, said signal receiving devices responding upon openings of their respective circuits, signal formulating mechanism at each station for both sets of contact members thereat adapted to open and close said circuits, means at each station adapted to be set in various positions to variably control the operative actuation of the associated contact members during movement of the associated signal formulating mechanism.

8. In a signaling system, the combination of a plurality of signal-boxes, a plurality of circuits running serially through said boxes and each including translating devices, each signal-box having signal initiating mechanism including a plurality of circuit-controllers, one for each circuit, and an alarm-controller at each box having means to variably control the operative actuation of said circuit-controllers.

9. In a signaling system, the combination of a plurality of signal-boxes, a plurality of electric circuits each running serially through said boxes, each signal-box having signal mechanism including a plurality of circuit-controllers, one for each circuit, a plurality of translating devices, one or more for each circuit, and an alarm-controller at each box having movable means to separately lock said circuit-controllers, thereby to selectively cause the response of the translating devices included in any one of said circuits according to the positioning of said alarm-controllers.

10. In a signaling system, the combination of a plurality of signal-boxes, a plurality of electric circuits each running serially through said boxes, each signal-box having signal mechanism including a plurality of circuit-controllers, one for each circuit, a plurality of translating devices, one or more for each circuit, and an alarm-controller having movable means for locking said circuit-controllers singly or in groups, thereby to render any, all, or none of said circuits responsive to said signal mechanism according to the positioning of said alarm-controller.

11. In a signaling system, the combination of a plurality of signal-boxes each having signal formulating mechanism, translating devices, a plurality of circuits for connecting said mechanism and said devices, and means at each box adapted to mechanically adjust the signal formulating mechanism thereat to cause response of all of the circuits upon the actuation of said mechanism, the means at any station being adapted to be set to adjust the signal formulating mechanism to cause response of only one of said circuits upon the actuation of the associated signal formulating mechanism.

12. In a signaling system, a plurality of circuits, a plurality of signal initiating stations each having signal formulating mechanism including a plurality of circuit-controllers, one for each circuit, a plurality of translating devices, one or more for each circuit, and selective holding mechanism at each station for the circuit-controllers thereat, the holding mechanism at the stations being normally set to cause the operation of all of the circuit-controllers at any one of said stations upon actuation of the signal formulating mechanism thereat, setting of the holding mechanism at any station to another position effecting the adjustment of the circuit-controllers to permit operative actuation of certain but not all of the circuit-controllers at the said station upon actuation of the signal formulating mechanism thereat, the setting of the holding mechanism at any station to another position effecting the adjustment of the circuit-controllers to cause response of certain but not all of the circuit-controllers at the said station upon actuation of the signal formulating mechanism thereat.

13. In a signaling system, a plurality of circuits, a plurality of signal initiating stations each having signal formulating mechanism including a plurality of circuit-controllers, one for each circuit, a plurality of translating devices, one or more for each circuit, and selective holding mechanism at each station for the circuit-controllers thereat adapted to be moved to various positions so as to mechanically prevent either a predetermined one or a predetermined group of said circuit-controllers from effectively responding to the actuation of their associated formulating mechanism.

14. In a signaling system, a plurality of circuits, a plurality of signal initiating stations each having signal formulating mechanism including a plurality of circuit-controllers, one for each circuit, a plurality of translating devices, one or more for each circuit, and selective holding mechanism at each station for the circuit-controllers thereat adapted to be moved to various positions so as to mechanically prevent either a predetermined one or a predetermined group or all of said circuit-controllers from effectively responding to the actuation of their associated formulating mechanism.

15. In a signaling system, a plurality of circuits, a plurality of signal initiating stations each having signal formulating mechanism including a plurality of circuit-controllers, one for each circuit, a plurality of

translating devices, one or more for each circuit, and selective holding mechanism at each station for the circuit-controllers thereat adapted to be moved to various positions so as to mechanically prevent either a predetermined one or a predetermined group of said circuit-controllers from effectively responding to the actuation of their associated formulating mechanism, the holding mechanism at the stations being normally set to permit the effective operation of all of the circuit-controllers upon the actuation of their associated formulating mechanism.

16. In a signaling system, a plurality of circuits, a plurality of signal initiating stations each having signal formulating mechanism including a plurality of circuit-controllers, one for each circuit, a plurality of translating devices, one or more for each circuit, and selective holding mechanism at each station for the circuit-controllers thereat adapted to be moved to various positions so as to mechanically prevent either a predetermined one or a predetermined group of said circuit-controllers from effectively responding to the actuation of their associated formulating mechanism, the holding mechanism at the stations being normally set to permit the effective operation of all of the circuit-controllers upon the actuation of their associated formulating mechanism, setting of the holding mechanism at any station to a second position affecting the locking of one of the circuit-controllers thereat without locking the other of the circuit-controllers thereat.

17. In a signaling system, a plurality of circuits, a plurality of signal initiating stations each having signal formulating mechanism including a plurality of circuit-controllers, one for each circuit, a plurality of translating devices, one or more for each circuit, and selective locking mechanism at each station for the circuit-controllers thereat adapted to be moved to various positions so as to mechanically prevent either a predetermined one or a predetermined group of said circuit-controllers from effectively responding to the actuation of their associating formulating mechanism, the locking mechanism at the stations being normally set to permit the effective operation of all of the circuit-controllers upon the actuation of their associated formulating mechanism, the setting of the locking mechanism at any station to a second position effecting the locking of one of the circuit-controllers thereat without locking the other circuit-controllers thereat, the setting of the holding mechanism to a third position effecting the locking of the circuit-controller which is unlocked when said locking mechanism is in said second named position and the unlocking of a circuit-controller which is locked when the holding mechanism is in said second position.

18. In a signaling system, a plurality of circuits, a plurality of signal initiating stations each having signal formulating mechanism including a plurality of circuit-controllers, one for each circuit, a plurality of translating devices, one or more for each circuit, and selective holding mechanism at each station for the circuit-controllers thereat adapted to be moved to various positions so as to mechanically prevent either a predetermined one or a predetermined group of said circuit-controllers from effectively responding to the actuation of their associated formulating mechanism, the holding mechanism at the stations being normally set to permit the effective operation of all of the circuit-controllers upon the actuation of their associated formulating mechanism, setting of the holding mechanism at any station to a second position effecting the locking of one of the circuit-controllers thereat without locking other of the circuit-controllers thereat, setting of the holding mechanism to a third position effecting the locking of a circuit-controller not locked when said holding mechanism is in said second position and unlocking of a circuit-controller locked when the holding mechanism is in said second position, and setting of said holding mechanism to a fourth position effecting the locking of all of the circuit-controllers associated therewith.

19. In a signaling system, a plurality of circuits, a plurality of signal initiating stations, each having signal formulating mechanism including a plurality of circuit-controllers, one for each circuit, a plurality of translating devices, one or more for each circuit, electro-magnetically controlled holding mechanism and manually operable selective holding mechanism at each station for the circuit-controllers thereat, said electro-magnetically controlled mechanism being responsive to one of said circuits and having interlocking association with the circuit-controller at said station for said circuit for preventing interference between signals from different initiating stations, said manually operable mechanism being adapted to be moved to various positions so as to prevent the operative actuation of the circuit-controller associated with the electro-magnetically controlled holding mechanism when said manually operable holding mechanism is in a certain position and to release said circuit-controller when said manually operable holding mechanism is in another position.

20. In a signaling system, the combination of a plurality of circuits, a plurality of signal initiating stations, a plurality of circuit-controllers at each station in said circuits,

respectively, signal formulating mechanism at each station adapted to operate all of said circuit-controllers, an alarm-controller at each station having means to variably control the responsive action of said circuit-controllers, means to lock and hold said alarm-controller in the different positions to which it may be set, and means to return the alarm-controller to and hold it in normal position.

21. In a signaling system, the combination of a plurality of circuits, a plurality of signal initiating boxes, a plurality of circuit-controllers at each box in said circuits, respectively, a plurality of translating devices, one or more for each circuit, an alarm-controller at each box having means to variably control the responsive action of the circuit-controllers thereat, means to lock and hold said alarm-controller in the different positions to which it may be set, a door for inclosing said alarm-controller, and means operable by the closing of said door to move to and hold the alarm-controller in a predetermined position.

22. In a signaling system, a plurality of signaling circuits, a plurality of translating devices, one or more included in each of said circuits, respectively, in combination with a plurality of signal initiating stations, each serially included in each of said circuits, a plurality of circuit-controllers at each station, one for each signal-circuit, code-wheel mechanism at each station, a plurality of independently movable members, one for each circuit-controller, said members being adapted to be suitably moved during the actuation of the code wheel mechanism, thereby effecting the desired openings and closures of the circuit controllers associated therewith, a movable controller adapted to engage said independently movable members and having raised and depressed faces to so coöperate with said members that when said controller is in one position a depressed face will be presented to all of its said members, and so that when said controller is in a second position a depressed face will be presented to one member and a raised face will be presented to another member.

23. In a plural circuit signaling system, a plurality of signal initiating stations, a plurality of circuit-controllers at each station, one for each circuit, code wheel mechanism at each station, a plurality of tracers at each station operable by said code wheel mechanism, one for each circuit-controller, a movable notched controller at each station so constructed and arranged with relation to said tracers that they may be singly or in groups rendered responsive or unresponsive to the actuation of the code wheel mechanism by the presentation of notched or raised portions of the notched controller thereto.

24. In a plural circuit signaling system, a signal box having a plurality of circuit-controllers, a signal wheel, a plurality of independently movable tracers for said signal wheel, one for each circuit-controller, a notched cam mounted adjacent to said controllers, projections moving with said tracers and extending toward said cam whereby any tracer may be supported to hold its associated circuit-controller closed independently of the actuation of the signal wheel.

25. In a signaling system, the combination of a plurality of signaling circuits, a plurality of translating devices included in said circuits, respectively, a plurality of signal initiating stations, circuit-controllers at each station in said circuits, respectively, signal formulating mechanism at each station adapted to operate the circuit-controllers thereat, and an alarm-controller at each station having means to variably control the responsive action of said translating devices without thereby altering current paths for the circuits of said systems.

26. In a signaling system, the combination of a plurality of signaling circuits, a plurality of translating devices included in said circuits, respectively, a plurality of signal initiating stations, circuit-controllers at each station in said circuits, respectively, signal formulating mechanism at each station adapted to operate the circuit-controllers thereat, and an alarm-controller at each station having means to variably control the responsive action of said translating devices without establishing any additional current paths for said circuits.

27. In a signaling system, the combination of a plurality of signaling circuits, a plurality of translating devices included in said circuits, respectively, a plurality of signal initiating stations, circuit-controllers at each station in said circuits, respectively, signal formulating mechanism at each station adapted to operate the circuit-controllers thereat, and an alarm-controller at each station having means to variably control the responsive action of said translating devices without the employment of additional circuit-controllers or alternate current paths.

28. In a signaling system, the combination of a plurality of signaling circuits, a plurality of translating devices included in said circuits, respectively, a plurality of signal initiating stations, circuit-controllers at each station in said circuits, respectively, signal formulating mechanism at each station adapted to operate the circuit-controllers thereat, and an alarm-controller at each station having means to variably control the responsive action of said translating devices

without the employment of holding circuits or abnormal current paths.

29. In a signaling system, a signal circuit, a plurality of signal initiating stations, each having signal formulating mechanism including a circuit-controller for said circuit, a translating device for said circuit, electro-magnetically controlled holding mechanism and manually operable holding mechanism at each station for the circuit-controller thereat, said electro-magnetically controlled mechanism at each station being responsive to said circuit and having interlocking association with the circuit-controller thereat for preventing interference between signals from different initiating stations, said manually operable mechanism at each station being adapted to prevent the effective operation of the circuit-controller associated therewith when moved to a certain position and to release its associated circuit-controller when moved to another position.

In witness whereof, I hereunto subscribe my name, this 15th day of December, A. D. 1916.

C. E. BEACH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents Washington, D. C."