Aug. 1, 1939. F. E. WELD ET AL 2,167,964

WARNING SIGNAL AND MECHANISM THEREFOR

Filed Oct. 18, 1935 3 Sheets-Sheet 1

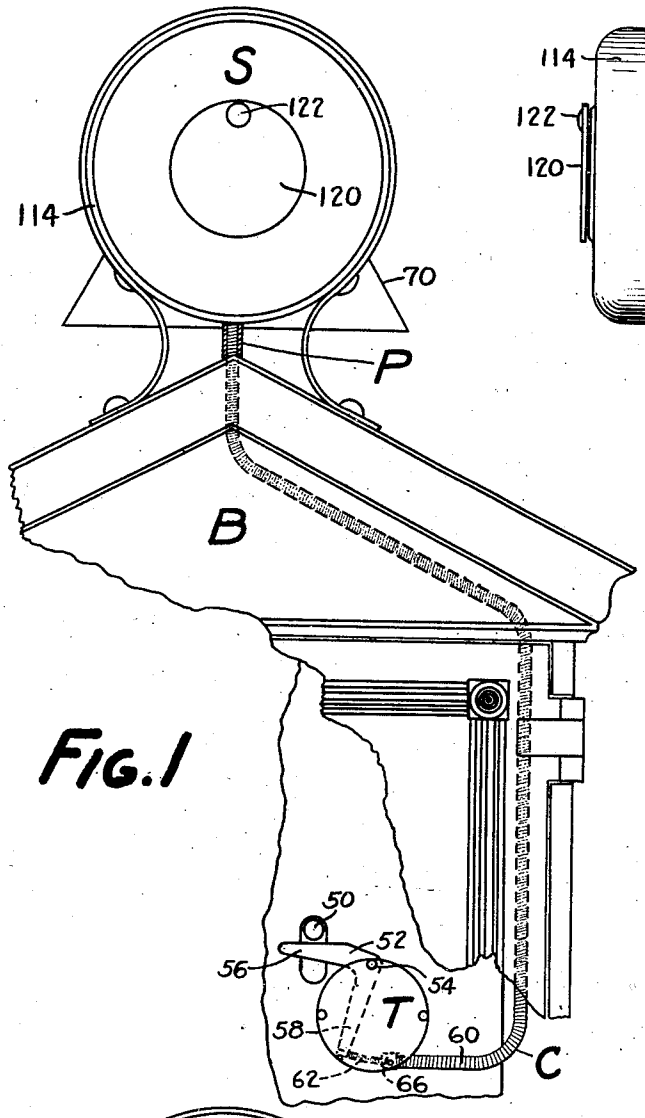

FIG. 1

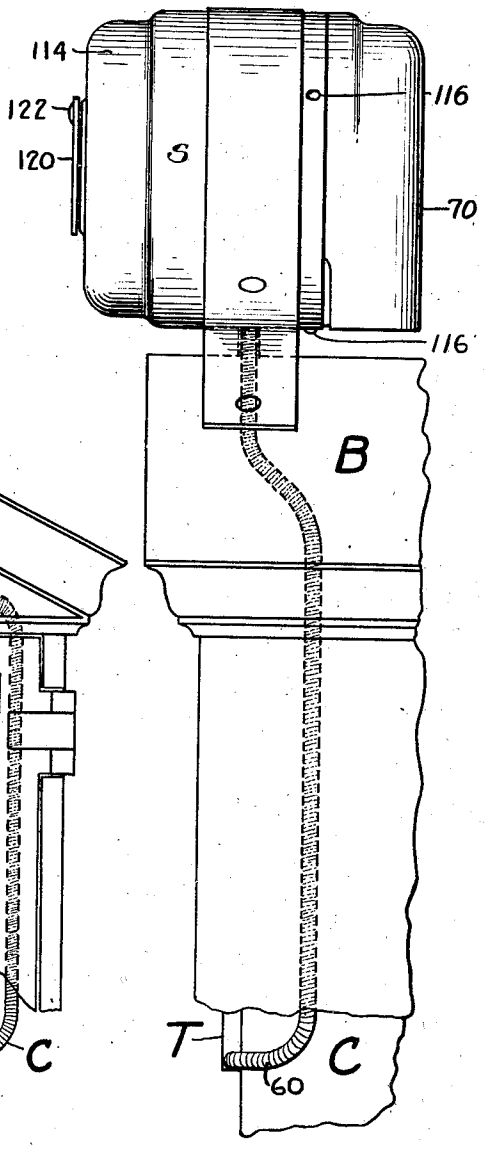

FIG. 2

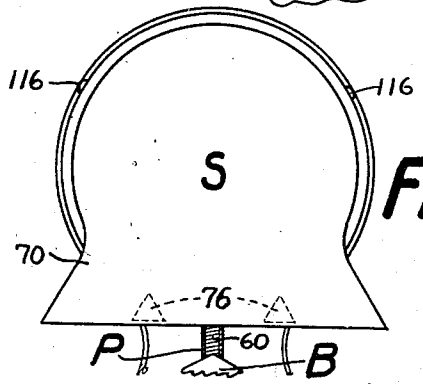

FIG. 3

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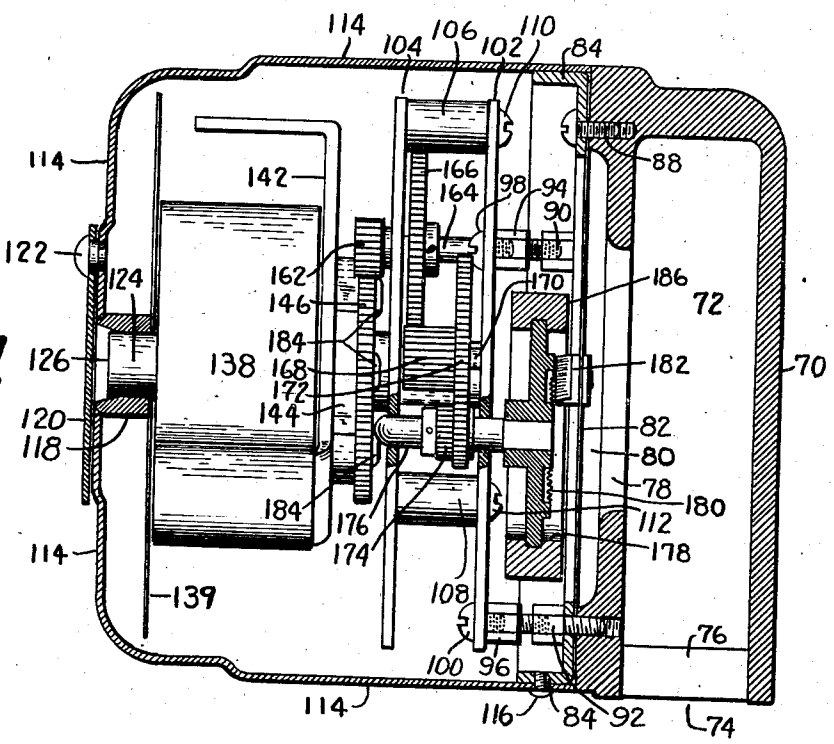
FIG. 4



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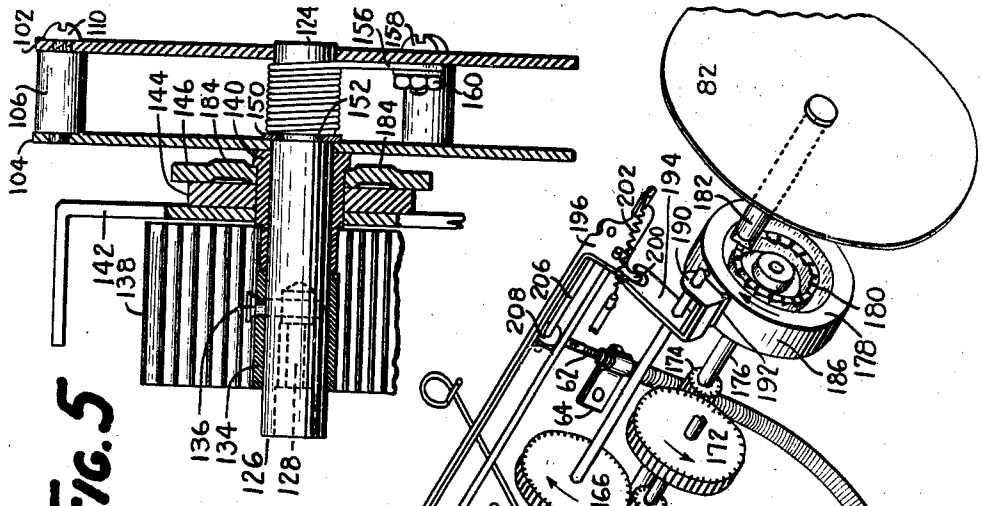

FIG. 5

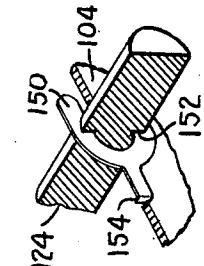

FIG. 7

FIG. 6

FIG. 8

FIG. 9

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Patented Aug. 1, 1939

2,167,964

UNITED STATES PATENT OFFICE

2,167,964

WARNING SIGNAL AND MECHANISM THEREFOR

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Application October 18, 1935, Serial No. 45,608

5 Claims. (Cl. 177—373)

This invention relates to warning signals and mechanism therefor and, more particularly though not exclusively, to pre-powered signaling mechanism and starting means therefor, operation of which will be initiated upon manual actuation or displacement of some part or object, for causing a warning signal such as will attract the attention of those in the immediate vicinity.

Furthermore, mechanism constructed in accordance with this invention may be advantageously employed for giving warning of unauthorized tampering with or appropriation of property; as, for example, for purposes of discouraging the steeling of automobiles, boats, etc., as well as for deterring intrusion into buildings or unauthorized opening of cash drawers, safes and the like.

More specifically, this invention relates to mechanism for discouraging or deterring unwarranted manipulation of fire alarm signal stations or boxes; to the end that life and property may be safeguarded against the hazards which are created by so-called "false fire alarms."

Warning signals and mechanism heretofore available, for services such as those just referred to, either have failed to produce a signal of duration sufficient for practical purposes or have embodied features intricate and complicated in character and have been found to be of insufficient reliability as well as undesirable in respects of design and bulkiness. Furthermore, such signals and mechanism have been found unsuited for convenient, expeditious and economical installation, application to and adjustment of, in connection with existing objects and equipment not specially designed therefor. Such prior signals and mechanism also have, in many instances, been found to be liable to interfere with the normal utilization and actuation of the safeguarded equipment, and have been found to deter, detain and/or discourage authorized actuation, inspection or manipulation of such equipment.

It is, therefore, an important object to provide a unitary or self-contained warning signal structure of such character that it may be readily and inexpensively applied to or associated with existing objects or equipment not specially designed for use therewith.

Another object of this invention is to provide a warning signal easily and readily distinguishable from frequently encountered sounds and signals utilized for dissimilar purposes.

Another object is to provide such a warning signal which, following initiation of activity thereof, will continue persistently and distinctly to give the intended signal throughout a predetermined and relatively long time.

Another object is to provide such a warning signal mechanism of such reliability as will deter unauthorized manipulation of protected equipment while inviting and encouraging authorized manipulation thereof.

Another object is to provide a visually recognizable warning signal structure whereby to deter unauthorized manipulation of protected equipment.

Another object is to provide warning signal and mechanism of such character as to resist tampering and/or interference endangering the reliableness and/or effectiveness thereof.

Another object of this invention is to provide a warning signal and mechanism therefor which may be applied in combination with the mechanism of a fire alarm station or box in a manner as will preclude activity of the warning signal mechanism prior to activity of the fire alarm box mechanism.

A further object of this invention is to provide a warning signal and its mechanism for the accomplishment of all, of any group, or of any one of the foregoing objects, with greater effectiveness and reliability and with a smaller number of parts severally characterized by strength, durability, facility of assembly and amenable to a lower cost of manufacture than prior warning signals.

Other and more specific objects and advantages will appear in the following description of an illustrative embodiment of this invention, or will be apparent to those skilled in this art.

In order to facilitate comprehension of this invention, an embodiment thereof is shown in association with a conventional fire alarm signal station as a false alarm deterrent, whereby the foregoing objects and others ancillary thereto are accomplished as follows:

A conspicuous structure is mounted upon the fire alarm box and is secured thereto in such manner as to prevent its removal other than by obtaining access to the interior of the box or by severing rugged metallic parts.

This structure comprises a weatherproof casing which contains a spring motor, acting through a train of gears, for effecting a comparatively rapid rotation of a flywheel which carries a plurality of toothed projections on one face thereof, and which is so supported as to be movable axially.

A diaphragm is fixed adjacent said flywheel and carries a projecting member in such rela-

tion thereto that said teeth may be brought into engagement with said member incidental to axial movement of said flywheel during rotation thereof, to thereby produce a signal in the well known manner.

A comparatively slow moving gear in the foregoing train has a number of projections from one of its faces. Such projections engage the rounded end of a shaft upon which said flywheel is secured, to the end that, as each projection on said gear moves into engagement with said flywheel shaft, said shaft and the flywheel thereon will be so moved as to bring said teeth into engagement with the projection carried by said diaphragm.

Upon disengagement of the gear projection from the end of the flywheel shaft, the inherent tension of the diaphragm causes the flywheel and shaft to move therefrom until the flywheel teeth are disengaged from said diaphragm projection.

A driving spring for said motor has, associated with an end thereof, manual winding means and retaining means; the torque of the other end of said spring being applied for driving said gears.

A two-position brake is associated with said flywheel for normally holding said train at rest.

A flexible cable connects said brake with the starting lever of the fire alarm box to be safeguarded; said cable being so installed as to minimize opportunity for tampering with or damaging any portion thereof outside of the casing of the warning signal and that of the fire alarm box. This cable is so applied that actuation of said starting lever effective for causing an alarm to be sent will transmit movement through said cable such as will cause said brake to move to releasing position. Said spring motor will thereupon cause said flywheel to be rapidly rotated and said gear will cause intermittent engagement between said flywheel and diaphragm projection to produce a warning signal comprising a series of distinctive raucous blasts.

Brake governing mechanism is provided comprising a notched wheel driven concurrently with said gear and associated with said brake in such manner as will prevent the movement of said brake to its holding position when said flywheel is in diaphragm projection engaging position; to the end that the brake can be effective only when said projections are positioned to permit disengagement of said teeth from said diaphragm projection. This brake governing mechanism assures that, whenever the brake is released, the spring motor and the train may move to a substantial extent, and thereby gain considerable momentum, before application of the load incidental to the first flywheel-diaphragm engagement.

Ordinarily the aforementioned brake device and cable arrangement is such that the brake is moved to releasing position and allowed to there remain until the entire useful energy in the spring motor is expended; however, if desirable the arrangement may be such that the brake remains in released position only during a period substantially co-extensive with the time during which there is displacement or manipulation of the safeguarded equipment, thereby conserving the motor spring energy so as to provide for effective signaling incidental to number of subsequent safeguarded equipment manipulations.

For the purpose of facilitating comprehension of this invention and what are considered to be its novel characteristics, an embodiment thereof is represented in the annexed drawings and hereinafter described. Such embodiment, though practical, is by no means the only one which the invention may assume; wherefore the invention is not confined to any particular degree of conformity with the more or less diagrammatic representation of the drawings but may be changed and modified in various particulars so long as such changes and modifications make no material departures from the invention as more particularly set forth in the annexed claims.

In the accompanying drawings, like parts are designated by the same reference characters throughout the several views in which

Figure 1 is a front view of a warning signal embodying this invention as applied to a fire alarm signal station;

Fig. 2 is a side elevation of the signal of Fig 1;

Fig. 3 is a rear elevation of the signal of Fig. 1;

Fig. 4 is an enlarged side elevation of the signal of Figs. 1, 2 and 3; certain parts being omitted in the interests of clearness and other parts being broken away and shown in section;

Fig. 5 is a view, partly in section, more clearly indicating details of construction of certain of the parts indicated in Fig. 4;

Fig. 6 is a distorted isometric view of the mechanism of the signal of Figs. 1, 2 and 3, including the parts shown in Figs. 4 and 5, in which axial displacements have been increased in the interests of clarity;

Figs. 7 and 8 show details to be referred to; and

Fig. 9 shows a modification to be referred to.

A conventional fire alarm signal station or box B is shown in Figs. 1, 2 and 3. This box has a handle 50 which, when pulled downwardly, will initiate activity of signaling mechanism associated therewith for the purpose of transmitting signals to a fire brigade or department to summon aid therefrom.

The casing of a warning signal S embodying this invention is shown mounted on the top of the fire alarm box B.

A bell crank 52 is pivoted at 54 and has one leg 56 thereof extending in a substantially horizontal direction in the path of downward movement of the handle 50, so as to be rotated in a counterclockwise direction about pivot 54 whenever said handle is moved to a position for causing signal transmission.

A depending leg 58 of said bell crank lies wholly within a trip mechanism casing T, and moves with the leg 56 for causing activity of the warning signal as hereinafter more fully explained.

A control cable C extends from the trip mechanism casing T through the box B to the warning signal S. The portion of the cable extending between the box B and the warning signal S is enclosed in a protective tubing or pipe P which is firmly secured in the top of the box B (as by a threaded or a "press fit" connection) and extends through the casing of the warning signal S.

The cable C comprises an outer casing or sheath 60 and an inner plunger 62 freely slidable therethrough. One end of said casing is firmly secured at a fastening 66 to the trip mechanism casing T, and the other end of said casing is firmly secured, as at a fastening 64 (Fig. 6), within the warning signal S.

One end of the plunger 62 is associated with the leg 58 of the bell crank 52 so that said plunger will be moved through said casing responsive to rotation of said bell crank. Said association is such as to facilitate adjustment of the relationship between said bell crank and said plunger; a threaded connection between the free end of said plunger and said leg having been found to be a desirable means of association. The other

end of the plunger 62 is associated with the signal mechanism S, as hereinafter more fully explained.

For a detailed description of the warning signal S, reference is had to Fig. 4 in which a sound chamber or end member 70 is shown as comprising a reverberatory chamber 72 and an orifice 74, the lower end of which orifice communicates with the outside atmosphere. A number of struts or ribs 76, 76 (see also Fig. 3) are situated in this orifice for the purpose of structural reinforcement and for the further purpose of obstructing the introduction through said orifice 74 of any object or implement capable of disabling the sound producing mechanism which will be presently described. One of the walls of the chamber 72 has an opening 78 therethrough and the outer surface of said wall has a recess 80 formed therein.

A diaphragm 82 is clamped to the member 70 by means of a clamping ring 84, in such position that said diaphragm covers the opening 78 and the recess 80. The ring 84 is secured to the member 70 by screws such as 88, 90 and 92.

It will be noted that certain of the screws, such as 90, 92 have threaded openings in the heads thereof (indicated by dotted lines) for receiving mechanism supporting screws such as 94, 96 which, in turn, have threaded openings in the heads thereof for receiving mechanism attaching screws such as 98, 100.

A frame plate 102 is clamped to mechanism supporting screws 94, 96, by mechanism attaching screws 98, 100 in such manner that the spacing of said plate from the diaphragm 82 may be readily adjusted by rotating the supporting screws in one direction or the other while the attaching screws are temporarily loosened.

A second frame plate 104 is spaced from the plate 102 by posts or pillars such as 106, 108 which are affixed thereto and are secured to the plate 102 by screws such as 110, 112.

A housing or casing 114 is secured to the ring 84, as by screws 116 (see also Figs. 2 and 3) and said casing carries in an opening therethrough a bearing 118 for a shaft which will be presently described.

A cover 120 is secured to the casing 114 by means of a pivot stud 122, so that said cover may normally close the opening in which the bearing 118 is secured but may be moved to a position exposing said opening.

It will be observed that the ring 84 does not fully cover the adjacent face of the member 70, and that the edge of the casing 114 which surrounds said ring forms a snug joint with said adjacent chamber face.

A main shaft 124 has an end 126 thereof journaled in said bearing 118 and the other end thereof journaled in frame plates 102 and 104, as best shown in Fig. 5.

The end 126 of the main shaft 124 has a polygonal opening 128 formed therein, as best shown in Figs. 5 and 6, for receiving a correspondingly formed end 130 of a winding key 132.

A sleeve 134 is fixed upon the shaft 124 by means of a stud 136; the head of which stud serves for attachment of the inner end of a main spring 138. Said sleeve extends along said shaft 124 from the edge of the spring 138 farthest from the frame plate 104 towards said frame plate to a point somewhat beyond the stud 136; however, such sleeve does not extend to the opposite edge of said spring.

A disc 139 is loosely supported by the shaft 124 between the bearing 118 and the sleeve 134 for preventing distortion of the convolutions of said spring 138 during winding and unwinding.

A bushing 140 extends from the sleeve 134 to said plate 104; a portion thereof situated within the spring 138 being of somewhat smaller diameter than the sleeve 134, so as to be at all times free from said spring.

Said bushing 140 is journaled upon said shaft 124 for rotation independently thereof, and said bushing has fixed thereon a spring guard member 142, a notched disc 144, and a gear 146; said spring guard member, disc and gear being further secured against relative rotation by means of a dowel pin 148 which is indicated in Fig. 6 as consisting of a rod.

The bushing 140, in cooperation with the sleeve 134, serves to limit axial movement of the shaft 124 such as would carry the spring 138 toward the frame plate 104. Axial movement of said shaft in the other direction is limited by a bifurcated member 150 (best shown in Fig. 7) which is situated in a groove 152 and which has a turned-over end thereof 154 projecting into an opening provided therefor in the plate 104. Such member 150 permits free rotation of said shaft 124, while suitably limiting the axial movement thereof such as would carry the spring 138 away from the frame plate 104.

A wire spring 156 is coiled around a portion of the shaft 124 situated between the plates 102 and 104; an end of said spring being secured to the plate 102 by means of the screw 158 and nut 160. The application of this coiled wire is such as to provide a friction clutch which resists rotation of said shaft 124 in a direction which would permit unwinding of the spring 138 while permitting such rotation in a direction tending to wind the spring 138.

The outer end of the spring 138 is connected to the member 142 (as best indicated in Figs. 4 and 6) so as to act through said member 142 and gear 146 to drive a train of gears. Such gear train consists of the gear 146 meshing with a pinion 162 on a shaft 164, a gear 166 on said shaft 164 meshing with a pinion 168 on a shaft 170, and a gear 172 on said shaft 170 meshing with a pinion 174 secured to a shaft 176.

The shafts 164, 170 and 176 are journaled in the frame plates 102 and 104; said shaft 176, and the parts carried thereby, being so formed and arranged as to permit both rotational and axial movement of said shaft, for the purpose which will be hereinafter more fully explained.

A flywheel 178 is fixed upon the shaft 176 and carries a circular series of projections 180. A tooth or projection 182 is fixed upon the diaphragm 82 and substantially concentric therewith; the relationship between said tooth 182 and the flywheel projections 180 being such that said tooth will be situated in the path of the rotation of said projections when the shaft 176 is axially moved toward said diaphragm.

A series of projections or basses 184, 184, 184, 184 are carried by the gear 146 in such relationship to the shaft 176 that, during rotation of said gear, said bosses will be carried past that end of said shaft 176 situated farthest from said diaphragm.

During assembly, the adjusting screws (such as 94, 96) are so set and clamped by the attaching screws 98, 100 as to space the gear 146 from the tooth 182 a distance such that, when the parts are assembled as hereinbefore described and said bosses are carried past the end of said shaft 176 in the course of the rotation of said gear 146,

each boss will engage and cause sufficient axial movement of said shaft 176 to effect suitable engagement between the projections 180 and the tooth 182 whereby to cause actuation of the diaphragm 82 and the generation of sound waves thereby; said spacing also being such as to permit rotation of the flywheel 178 without bringing any of the projections 180 into engagement with the tooth 182 when none of the bosses 184, 184, 184, 184 are in the path of the end of the shaft 176.

For reasons well understood by those skilled in this art, the tooth 182 and the projections 180 should be of wear-resisting material. In order that the flywheel 178 may readily be so produced as to provide wear-resisting surfaces for the projections 180 and, at the same time, have adequate mass in compact form, it has been found desirable to construct the central portion or web of said wheel, as well as the projections 180, of hardened steel, and to apply thereto a rim 186 (best shown in Fig. 4) of comparatively heavy material, such as lead, which may be readily machined for true balancing of the flywheel.

A brake member 190 is loosely pivoted upon the shaft 164 and has affixed thereto, at one side of said shaft, a brake shoe 192 for engaging the periphery of the flywheel 178 and, at the opposite side of said shaft, has a projecting arm 194.

A brake toggle piece 196 is pivotally mounted on a shaft 198 (see Figs. 6 and 8) and is operatively connected with the free end of the arm 194 of the brake member 190 by a ball-tenon and socket connection 200.

An over-center spring 202 is so applied to the toggle piece 196 as to tend to retain same in a position which causes the brake shoe 192 to be applied to the periphery of the flywheel 178 and also to retain same in another position causing said shoe to be withdrawn from said periphery.

A tracer 204 cooperates with the periphery of the notched disc 144 and is so associated with said toggle 196 as to permit movement thereof such as will carry the shoe 192 into engagement with the periphery of the flywheel 178 only when a notch in said disc 144 is presented to said tracer 204.

A pin 206 carried by the toggle 196 engages a terminal member 208 which is secured to the plunger 62 of the control cable C adjacent the fastening 64.

Operation

The operation of the warning signal thus far described is as follows:

Assuming that the spring 138 has been wound, and that the brake shoe 192 is holding the flywheel 178, manipulation of the handle 50 for the purpose of causing the transmission of an alarm will cause the bell crank 52 to swing around its pivot 54 and thereby so move the core or plunger 62 of the cable C as to swing the toggle 196 around the shaft 198 to a position which will cause the brake member 190 to withdraw the shoe 192 from engagement with the periphery of the flywheel 178. The spring 202 will be then so applied as to tend to retain the toggle member 196 in its revised position.

When the mechanism has thus been released, the gear train will run, rapidly accelerating the speed of the flywheel 178, until one of the projections 184 is carried by the gear 146 into engagement with the end of the shaft 176. Such engagement will move said shaft axially and cause the projections 180 to engage the tooth 182 and vibrate the diaphragm 82, whereupon sound waves will be generated.

The resultant sound as emitted from the orifice 74 will be of an unusual, distinctive and attention-attracting character effected by the moving of the projections 180 into engaging relation with the tooth 182, the slight deceleration of the flywheel 178 due to such engagement, and the ensuring withdrawal of said projections from engagement with said tooth incidental to withdrawal of projection 184 from the rounded end of the shaft 176.

From the foregoing it is evident that the mechanism will continue to operate as indicated, until the power of the spring 138 is substantially exhausted, thereby producing a series of blasts each of which will have strikingly distinctive characteristics for the reasons just explained.

When it is desired to restore the parts for further operation, the bell crank 52 should be moved to its normal position, thus tending to swing the toggle 196 to a position which will cause the shoe 192 to be brought into arresting engagement with the periphery of the flywheel 178.

If, at such time, one of the notches formed in the disc 144 is presented to the tracer 204, said shoe may be brought into effective restraining relationship with said flywheel 178. Otherwise, such relationship cannot be attained until the spring 138 has been sufficiently rewound to rotate the parts, so that none of the projections 184 will engage the shaft 176, whereupon one of the notches formed in the disc 144 will be presented to the tracer 204 and the toggle 196 will be permitted to move to a position where the spring 202 will cause it to act through the member 190 to maintain the shoe 192 in restraining relationship to the flywheel 178.

For the purpose of rewinding the spring 138, the cover 120 should be swung around its pivot stud 122 thereby uncovering the end 126 of the main shaft 124, whereupon the polygonal end 130 of the winding key 132 may be inserted in the polygonal opening 128 in the end of said main shaft and said key may then be rotated until the spring is fully wound.

Modification of Fig. 9

If it is desired that the warning signal shall sound only so long as the safeguarded movable part is displaced, provision should be made for automatically reapplying the brake shoe 192 to the flywheel 178 when such movable member has been returned to its normal position. For this purpose, a spring may be so applied as to constantly urge movement of the brake member 190 toward effective position. This may be accomplished as indicated in Fig. 9 where the spring 220 is so applied to the bell crank leg 56' as to tend to restore said bell crank to normal position whenever the handle 50 has returned to its normal position after having been moved to a position which has caused release of the warning signal.

The operation of the signal when constructed in accordance with the modification of Fig. 9 is the same as that hereinbefore described except that, whenever the handle 50 is restored to its normal position, the spring 220 will urge movement of the brake member 190, acting through the bell crank 52, the cable plunger 62, the pin 206 and the toggle 196 to cause the shoe 192 to be moved toward the flywheel 178; to the end that, when a notch in the disc 144 is next

presented to the tracer 204, the operation of the warning signal will be arrested.

It is believed that the accompanying drawings, taken with the foregoing description, will enable those skilled in this art to fully understand this invention and to avail themselves of the many alternative arrangements of parts which may be made for meeting the diverse service problems for the solution of which this invention is suited.

The noise producing mechanism itself apart from the combination herein claimed, is claimed in a divisional application, Serial No. 278,460, filed June 10, 1939.

We claim:

1. In combination with a conventional alarm box including manually operable means accessible to the public for transmitting a signal, an enclosed noise-producing mechanism mounted externally of the box and in proximity thereto, said noise-producing mechanism embracing a metal diaphragm and means for vibrating said diaphragm to produce a noise of substantial intensity, connections between the manually operable means and the noise-producing mechanism to operate the latter whenever the box is operated to transmit a signal and means for completely enclosing said connections to render them inaccessible and to prevent disabling of the noise-producing mechanism.

2. In combination with a conventional alarm box including manually operable means accessible to the public for transmitting a signal, an enclosed noise-producing mechanism attached to the box externally thereof, said noise-producing mechanism embracing a metal diaphragm and means for intermittently vibrating said diaphragm to produce a series of noises of substantial intensity, a flexible cable connecting the manually operable means and the noise-producing mechanism to operate the latter whenever the box is operated to transmit a signal, and means for enclosing the cable throughout its length to render it inaccessible and to prevent disabling of the noise-producing mechanism.

3. In combination with a conventional alarm box including manually operable means accessible to the public for transmitting a signal, an enclosed noise-producing mechanism attached to the box externally thereof, said noise-producing mechanism embracing a metal diaphragm and means for vibrating said diaphragm to produce a noise of substantial intensity, a flexible cable connecting the manually operable means and the noise-producing mechanism to operate the latter whenever the box is operated to transmit a signal, said cable being inaccessibly enclosed at both ends by the box and by the noise-producing mechanism, and means enclosing the cable between the box and the noise-producing mechanism to prevent tampering therewith.

4. In combination with a conventional alarm box including manually operable means accessible to the public for transmitting a signal, an enclosed noise-producing mechanism attached to the box externally thereof, said noise-producing mechanism embracing a metal diaphragm and normally wound spring means for vibrating said diaphragm to produce a noise of substantial intensity, a detent normally preventing operation of the noise-producing mechanism, connections between the manually operable means and the detent to release the latter whenever the box is operated to transmit a signal, and means for completely enclosing said connections to render them inaccessible and to prevent disabling of the noise-producing mechanism.

5. In combination with a conventional alarm box including manually operable means accessible to the public for transmitting a signal, an enclosed noise-producing mechanism attached to the box externally thereof, said noise-producing mechanism embracing a metal diaphragm and normally wound spring means for intermittently vibrating said diaphragm to produce a series of noises of substantial intensity, a detent normally preventing operation of the noise-producing mechanism, a flexible cable between the manually operable means and the detent to release the latter whenever the box is operated to transmit a signal, and means for completely enclosing the cable to render it inaccessible and to prevent disabling of the noise-producing mechanism.

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