

May 24, 1932.

H. KAGEYAMA

1,859,515

SIGNAL DEVICE FOR AUTOMOBILES

Filed Dec. 22, 1926

2 Sheets-Sheet 1

Fig. 1

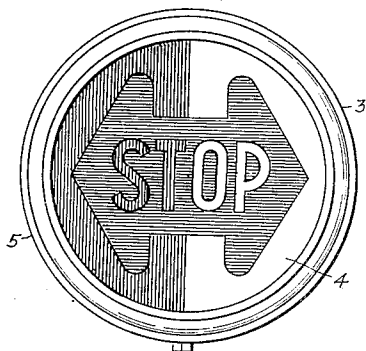


Fig. 2

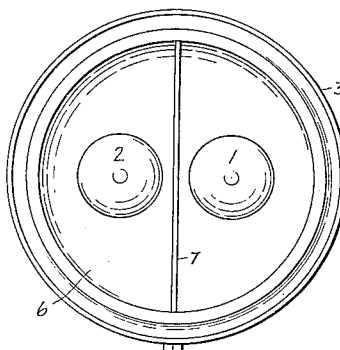


Fig. 4

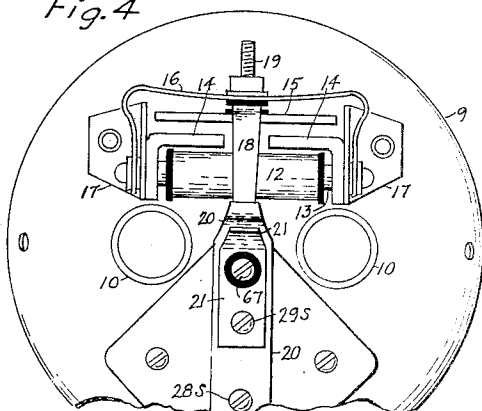


Fig. 3

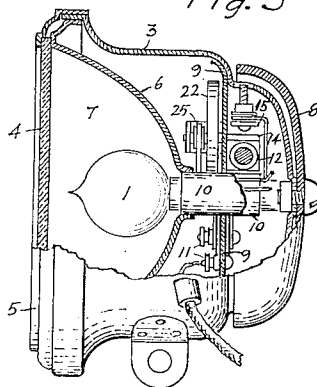


Fig. 5

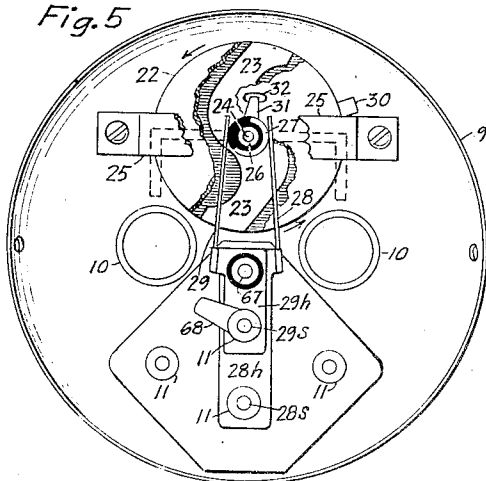
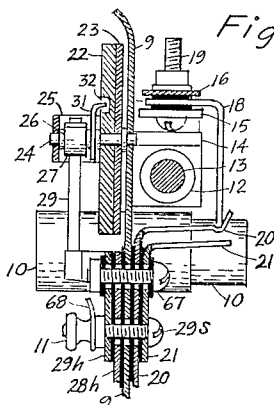


Fig. 6



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2 Sheets-Sheet 2

Fig. 7

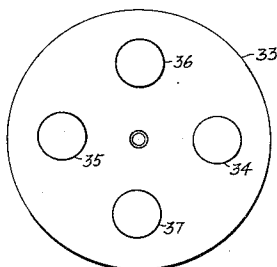


Fig. 8

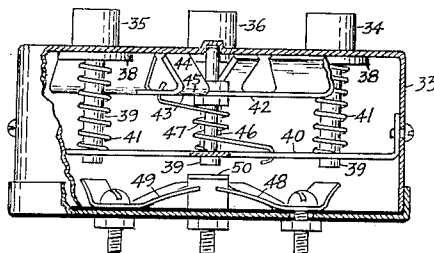


Fig. 11

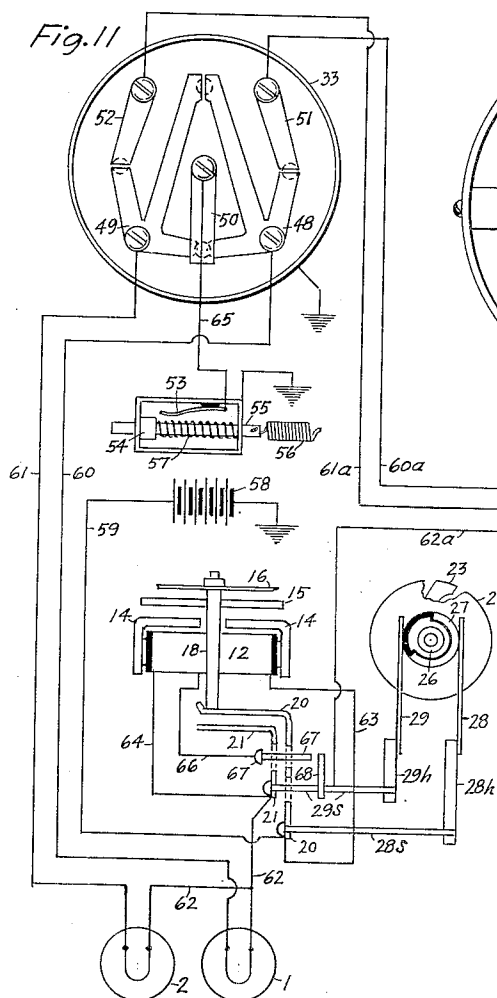


Fig. 9

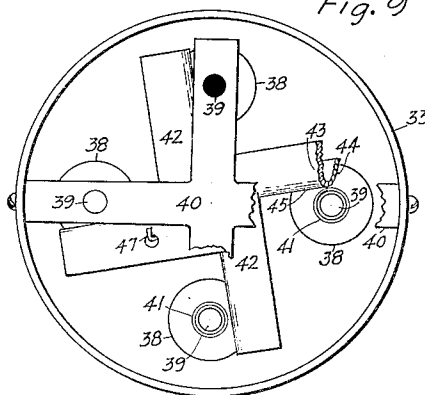
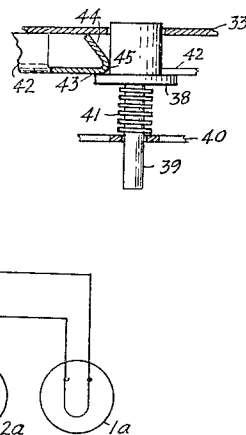


Fig. 10



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SIGNAL DEVICE FOR AUTOMOBILES

Application filed December 22, 1926. Serial No. 156,399.

This invention relates to a signal device for automobiles for indicating the direction in which the automobile is about to turn, or indicating that the automobile is about to stop or slow up, and while primarily intended for this purpose it may be adopted in any situation where information may be similarly given.

In a previous application of mine, filed April 3rd, 1923, Serial No. 629,652, I have shown a signal device of this character with an electric bell giving an audible alarm in cooperation with a visual signal, but ringing of the bell in the device was continuous.

The present invention has for its main object to provide a device that makes the ringing of the bell intermittent after giving an initial alarm by a short, continuous ringing, to avoid an unnecessary sounding of the bell.

Another object of my invention is to make the light of electric lamps, which produces the visual signal alternately bright and dim in synchronism with the intermittent ringing of the bell, to secure an animated effect for the visual signal.

Still another object is to secure the best arrangement of mechanism to accomplish the above objects, adapted for installation within a compact casing.

Still other objects and advantages of my invention will appear from the following description.

Referring to the drawings:

Figure 1 is a front view of the signal, giving one of the signal indications.

Figure 2 is another front view of the signal when the front of the device is removed.

Figure 3 is a side elevation of the same device showing a part of the casing broken off to give an inner view of the device.

Figure 4 is an enlarged view of the rear side of an inner plate used for mounting the lamp sockets and other mechanisms, the drawing showing the construction of the bell magnet in detail.

Figure 5 is a front view of the same inner plate, showing in detail a disk oscillator which makes the ringing of the bell intermittent.

Figure 6 is a view of a vertical section of what is shown in both Figures 4 and 5.

Figure 7 is a top or front view of a manually operated switch.

Figure 8 is a side view of the manual switch, showing the wall of the casing and other parts broken off to reveal the inside mechanism.

Figure 9 is a bottom view of what is shown in Figure 8, when the bottom cover is removed, various parts also being broken off.

Figure 10 is a view of a section taken at one of the switch buttons, the button being shown in a depressed position.

Figure 11 is a combination of a top view of the bottom cover of the manual switch on which contact members of the switch are arranged and of a circuit diagram.

The invention embodies a signaling device adapted to be placed on one or more points in any convenient position on an automobile or any other vehicle, and which is controlled by switch means from the driver's seat.

Figures 1 to 3 inclusive illustrate an indicating device of my signal 1 in which a pair of signal lamps, designated by numerals 1 and 2, are installed inside of a casing, 3, having a transparent front, 4, through which the light of the signal lamps is to shine. Said transparent front is made of a colored glass upon the rear face of which indicating signs are designed. The indicating signs, in the present instance, are a combination of two arrows and a word Stop, as shown in Figure 1. The arrowed area is printed dark and made opaque to the inside lights, except the word Stop, which is left transparent, the opaque portion being shown shaded by horizontal lines in Figure 1.

The front glass is mounted on a front frame, 5, which is made removable whenever an access is desired to the signal lamps within and when so removed the device appears as shown in Figure 2, showing a concave reflector, 6, which carries a partition, 7, dividing the space into two compartments, in each of which a respective signal lamp is located, so that each signal lamp illuminates the respective half of the transparent front.

With this arrangement, if it be desired to indicate the turning to the right or to the left, the respective half of the front is illuminated. Figure 1 shows the device when its right half is illuminated, which indicates the turning to the right, and if the other half be illuminated, the indication will be similar, but with an arrow pointing to the opposite direction, indicating the turning to the left. In case the operator desires to indicate a stop, he has to operate both lamps simultaneously, which will illuminate the whole front, completing the word Stop.

To attract the attention of those around the vehicle which is about to turn or stop, and cause them to look at the indicator, a bell 8, is mounted on the rear of the casing. The electrical apparatus that operates the bell, as will be seen, is connected with the signal lamps in series circuit, so that the bell cannot ring without the light and the ringing of the bell can be an indication to the operator that the lamps were lighted. As a continuous ringing of a few seconds is sufficient for the purpose of giving an alarm, the ringing of the bell thereafter is made intermittent, this action automatically causing the light to flicker, giving thereby an animated effect to the visual indicator, as will be fully described hereafter.

To facilitate electrical connections between various electrical apparatus, a plate, 9, is mounted inside of the casing and upon this plate are assembled all electrical apparatus including sockets, 10, for the signal lamps and binding posts, 11, for the transmission wires, respectively, occupying the middle and the lower parts of the plate, while the upper part is taken up by the bell operating mechanism, as can be seen in Figures 3 to 6. Bell, 8, is mounted on the casing, to cover the rear end of the same, which extends into the concave hollow of the bell, making room for the electrical apparatus mounted on the rear of the plate. The reflector, 6, is removable from the casing when the lamps are removed from their sockets, giving an access to the plate, 9, for connecting the transmission wires to the binding posts. The plate, 9, also can be removed from the casing, if need occurs, for the repair of the electrical apparatus and, in fact, in making the device, all electrical apparatus is assembled on the plate outside of the casing, the plate being screwed into the place in the casing afterward.

The construction of a magnet device for operating the bell is shown in Figure 4, which represents the rear view of the plate, 9, the bottom portion of which is shown broken off, while a vertical sectional view of the device can be had in Figure 6. The device comprises a magnet coil, 12, wound on a single core, 13, and a pair of pole pieces, 14, for attracting an armature, 15, which is carried by

a spring, 16. The spring, 16, is turned at both sides, as shown, to bring its two ends toward the ends of the magnet core, and being screwed thereto, said two ends of the spring, 16, and the pole pieces, 14, together with brackets, 17, are put together, and by means of the latter, the device is mounted on the plate, 9. A push member, 18, which is to operate a switch for de-energizing the coil, 12, is put together with the armature, 15, and the spring, 16, by means of a screw, 19, which acts as a hammer for striking the bell, 8, the push member being insulated from the other members of the assemblage. A pair of contact springs, 20 and 21, mounted on the plate, 9, just below the bell magnet, form the switch for de-energizing the coil, 12. The contact springs are insulated from the plate and from one another at the place of mounting and they are normally separated a short distance from one another at the point of contact. The armature, 15, is normally held by the spring, 16, at a position such as shown in Figure 4, the push member, 18, then just touching the contact spring, 20. When the armature, 15, is attracted by the pole pieces, 14, upon an energization of the coil, 12, the push member, 18, presses the contact spring, 20, bringing the same into contact with the contact spring, 21, at the same time farther bending both contact springs. This has an effect, as hereafter will be made clearer by a description of circuit connections, of short circuiting the coil, 12, deenergizing the same. As soon as the magnetic action of the coil ceases, the spring, 16, assisted by the contact springs, throws back the armature, 15, toward the bell causing the hammer to strike the same. As soon as the armature is thrown back carrying therewith the push member, 18, the contact spring, 20, is separated from the contact spring, 21, and the re-energization of the coil, 12, begins for repeating the foregoing action, causing the vibration of the armature and the hammer.

This arrangement of the bell magnet makes the device very compact, enabling the same to be placed within the narrow confines of the concave hollow provided by the shape of the bell. The armature and the hammer as can be seen are supported symmetrically at both sides, and are therefore capable of making a straight back and forth motion adapted for striking the bell at a right angle to its wall.

A device for making the ringing of the bell intermittent is illustrated in Figure 5, which is a front view of the plate, 9, and its vertical sectional view can be had in Figure 6. It consists of an oscillating disk, 22, carrying an armature 23, which is placed imbedded in the disk at its side nearest to the face of the plate, 9. The disk, the face of which is shown broken off in Fig. 5, to reveal the form of the armature within, is simply a weight

providing an inertia and is made of a heavy metal such as lead, and it is mounted upon a shaft 24, which is journaled in the plate, 9, at one side in a frame, 25, at the other. A sleeve, 26, mounted in the shaft 24, carries on its cylindrical face, a contact arc, 27, which covers an arc substantially equal to two-thirds of the entire circumference, the remaining surface being covered by an insulating material, while the contact arc is insulated from the sleeve itself. Two contact fingers, 28 and 29, are bearing upon the cylindrical surface of the sleeve and adapted to come into electrical communication with one another when the contact arc, 27, bridges over between them. The contact fingers, 28 and 29, are respectively supported by their holders, 28—h and 29—h, which are mounted on the plate, 9. The holders 28—h and 29—h are insulated from one another and from the plate, 9, but connected respectively with the contact springs 20 and 21, on the other side of the plate, 9, by means of screws, 28—s and 29—s, which are forming the above mentioned binding posts, 11. These screws, while making the above connections, are not in contact with other members through which they pass, as the holes of the other members are made much larger than the body of the screws. The purpose of these connections will be made clear in the description of circuit connections later on.

The disk 22, is slightly biased at one position by making the bottom of the disk heavier than the top, so as to maintain the armature, 23, normally in a position such as shown in Fig. 5, or to restore the disk to this position when it is turned. A stop, 30, carried by the disk assists in fixing more precisely this normal position of the disk when its movement is arrested by the frame, 25, and it is so arranged that this occurs when the bias or restoring weight reaches about its lowest point.

The armature, 23, is under influence of the magnet coil 12, at the other side of the plate, 9, or more directly of the pole pieces, 14, outlines of which are shown in dotted lines in Fig. 5, and when the bell magnet is caused to start its action, the armature, 23, is attracted by the field produced by the pole pieces, 14, and is turned, due to its shape or contour particularly at the middle part, counter clockwise, as shown by arrows in Fig. 5, carrying with it the disk, 22, until they make ninety degrees or more angular movement, and the armature lines up with the direction of the field poles.

One of the contact fingers rests always upon the contact arc, 27, which forms a portion of the cylindrical surface of the sleeve, 26, but the other contact finger rests normally upon that portion which is covered by the insulating material, so that no electrical connection exists between the two contact fingers. When, however, the disk makes, as mentioned

before, ninety degrees or more angular movement, carrying with it the sleeve, 26, and the armature reaches substantially the limit of turning the field can exert, it is arranged that the contact arc, 27, reaches the other contact finger, so that the contact arc bridges between the two contact fingers. This has an effect, as will be made clearer by the description of circuit connections, of short circuiting the magnet coil, 12, which is thereby de-energized. In this way the bell is stopped, but the disk, 22, by its own inertia, will continue the turning and usually in case of first turning it may be thrown as far as the stop, 30, is arrested by the frame, 25, at the left side, while the arcuate length of the contact arc, 27, as defined before, is sufficient to maintain the contact fingers bridged and the bell silenced during all this stage of movement of the disk. The bell is started again, however, when the disk makes its return trip, due to its bias weight, carrying with it the sleeve, 26, and then one of the contact fingers comes to rest again upon the insulating material. The disk then may force its way back a short distance by its inertia, but being overcome by the action of the bell magnet, is again thrown forth to repeat the oscillation, which causes the intermittent ringing of the bell.

This oscillating motion, unless otherwise provided, may not be permanent, as, it can be seen, the power that causes the motion throwing the oscillator forward is only the same power that arrests its motion in the return trip, and there is little extra power that can make up the loss caused by the frictional resistance that may exist in the journal and in the contact between the contact fingers and the sleeve. In fact there may be working the effect of self-induction of the coil which causes the action of magnetization and demagnetization of the field to lag behind the movement of the armature, upon which, as is well known to those versed in the electrical art, the vibration of the armature, 15, of the bell magnet owes its continuance. But this effect is shown to be too slight in case of the slow moving oscillator to maintain its motion, so that the oscillator soon narrows its amplitude of oscillation, until the motion is reduced to that of an irregular vibration of very small amplitude causing rather continuous but much reduced and uncertain sounding of the bell.

For this reason the sleeve, 26, is not made rigid with the shaft, 24, but mounted loose thereon and an arm, 31, connected with the sleeve, extends to have its bent end fall into a slot, 32, provided in the disk, 22. The length of the slot is made larger than the width of said end of the arm, 31, so that the arm can make free movement within the slot to allow the sleeve, 26, to make some angular displacement relative to the disk, 22. When the oscillator makes the forward movement,

one end of the slot catches the arm and the sleeve is carried forward, the ensuing action being the same as described before. But when the disk starts its return trip, it does not carry the sleeve immediately, but makes free movement relative to the latter, which is held by the contact fingers, until the other end of the slot catches the arm and then the sleeve is carried back to a point in which the contact arc, 27, leaves one of the contact fingers, starting the bell as in case of the previous description. It can be seen, however, that at this point, the disk and the armature are not at the same point in which one of the contact fingers left the insulating surface and came into contact with the contact arc, 27, in the forward movement of the disk and its armature, but they are at a point a distance removed to the back, the distance being the amount of the free movement of the disk relative to the sleeve, made at the beginning of the return trip. This means that the disk has to cover the same distance in another forward rotation before it can stop the action of the bell and its magnet, this being done by the free movement of the disk relative to the sleeve, which is again held by the contact fingers as in case of the return movement, and then the same end of the slot as in the previous forward movement comes to engage the arm, 31, which will operate the sleeve for silencing the bell.

In this way above mentioned distance allowed for free movement of the disk, has an effect of at least fixing a minimum amplitude for the oscillation of the disk. But in actual operation this distance enables the disk to acquire a power anew in form of velocity in each forward rotation, so that the disk is thrown not only forward, but also backward far beyond the limit of said minimum amplitude, and oscillation is maintained permanently; the loss which may be occasioned by the before mentioned frictional resistance being supplied by said acquired power.

When the bias weight of the oscillator rotates upon the shaft, its influence on the turning of the disk varies according to the angular position of the bias weight, first it being zero at a point directly below the shaft, gradually increasing with the angular displacement until it reaches a maximum at 90 degrees, and in short the turning torque being as well known, proportional to the trigonometrical sine of the angle. The shape of the armature, 23, as can be seen in Fig. 5, is designed with this fact in view. The curved contour at the middle part of the armature, speaking of that side to which the attraction occurs, is making a fast turn away from the attracting field, to merge with the more straight contour given to the ends of the armature. This is intended to prevent too fast increase of the attraction in the first stage of the rotation and keep the turning force of

the magnet well proportioned to the retarding torque of the bias weight, so that the movement of the disk may be retarded or may be made without much acceleration to provide time enough for initial ringing of the bell, whereas at the latter stage of the rotation, which is allotted for the oscillating movement of the disk and where both ends of the armature come into attraction with the field, the straight contour of the armature, which is adapted to offer to the field all at once longer lines of attraction, coupled with the increased leverage which the ends of the armature possess, is capable of exerting a strong attraction to the field for accelerating and throwing the disk to give the oscillating movement.

When the shape of the armature of the oscillator is carefully proportioned in such a manner that the rotating force of the magnet is just enough to overcome the retarding torque of the bias weight at various angular positions, but not sufficient to cause the rotation of the disk by itself against an additional resistance existing in form of the friction mentioned in the foregoing description, the vibration of the bell operating mechanism at the other side of the plate has an effect of nullifying this frictional resistance and will start the disk in rotation, in which the progress is made step by step, with each vibration giving the disk a slow but steady creeping movement, giving all this while a continuous ringing of bell, and in fact it is possible to give an initial ringing of a considerable duration. It is considered, however, that for the present purpose two or three seconds initial ringing is sufficient to give the desired warning. As to the period of the intermittent ringing, it can be made in various speeds of alternation and various proportions of time of ringing and cessation of the bell in each cycle of alternation, by proportioning the bias weight, the weight of the disk for inertia and the power of electromagnet. But it is considered that about one complete oscillation of the disk in each second, gives in the present case a proper speed of ringing that gives a pleasing impression to the observers, in which case the duration of ringing in each cycle of intermittence would be one-half second or maybe less, including therein still several strokes of the bell by its vibrating hammer. In this way an observer of this signal will hear one prolonged ringing before he notices that the bell is ringing only intermittently.

The purpose of making the ringing of the bell intermittent is to reduce the amount of sound after the bell has given the initial ringing, thereby avoiding an annoyance which a long continual ringing may cause. It can be mentioned in this regard that when the armature, 23, of the disk oscillator makes enough turn to line up with the direction of the field, as is the case in the oscillating stage,

a large amount of magnetic lines of force is turned toward this armature from the field, depriving thereby the armature, 15, of the bell operating vibrator, of some of its lines of force so that the action of the vibrator is much reduced. Thus the amount of sounding of the bell is reduced in two ways during the oscillating movement of the disk, first, by the intermittence of ringing; second, in the tone itself.

When a sufficient electrical resistance is provided in the magnet coil, 12, which is in series circuit with the lamps as said before, it has an effect of dimming the light of the lamps during the action of the magnet or the ringing of the bell. When, however, the magnet coil is short-circuited by the contact fingers, 28 and 29, during cessation of the bell, the electric current is directly passed to the lamps and the light brightens up. This alternation of brightening and dimming goes on in synchronism with the ringing of the bell, giving an animated aspect to the inert visual indicator, thereby increasing its efficiency.

The switch for controlling this signal is of two forms, one manually operated, the other operated through the brake mechanism, the latter, however, being the same as the switches of ordinary stop lights now widely used, is not illustrated here except diagrammatically in the circuit connections.

Figures 7 to 11, inclusive, illustrate the manually operated switch. Referring to Fig. 7, which represents the front of the casing, the device consists of a casing, 33, carrying four push buttons, of which three buttons represented by numerals, 34, 35 and 36, are employed for giving the signals, while another button, 37, is for restoring or canceling the given signal. The right hand button, 34, if depressed, will connect into circuit the signal lamp, which is at the right side, and give an indication of turning to the right, and the left hand button, 35, will give in the same way an indication of the left turn, while the top button, 36, will connect both lamps into circuit for indicating a stop, and when any of these buttons is depressed it is kept depressed to maintain the signal indicated, until the button, 37, is depressed, which will restore the depressed signal button to the original up position.

The mechanism for operating the push buttons is shown in Figures 8 to 10 inclusive, in which each button carries a cam plate, 38, made in the disk form and a push shaft, 39, which passes through a hole in a frame, 40, to guide the movement of the button. Each button is also provided around the shaft with a coiled spring, 41, which acts between the frame, 40, and the cam plate, 38, to spring the button upward, the latter then being held at its normal position by said cam plate. A spider, 42, extends four arms to engage with

the cam plates. Each spider arm has a flat bottom face, 43, and a slant face, 44, the latter being bent from the former, giving a round corner, 45, and it is over these faces the cam plate works. The spider, as can be seen in Fig. 8, is mounted on a shaft, 46, and at one end of the shaft is journaled on the front plate of the casing, while at the other end of the shaft it is pressed lightly by the frame, 40, so that the spider rests against the front plate of the casing by the extremities of the slant faces of the four arms. The spider is provided around its shaft with a coiled spring, 47, one end of which is carried by the spider itself, while the other end is borne by the frame, 40, so that the spring, 47, acts to turn the spider on its shaft, forcing the arms toward the buttons.

The operation of the push buttons is as follows: As will be seen, one of these buttons usually is at the depressed position in the actual operation, but if all buttons are at the up positions, then the spider is stopped from further turning by the cam plates, against which the ends of the slant faces of the spider arms may bear, as may be seen in Fig. 8. Beginning at this, any button may be pressed down, and if that be the right hand button, its cam plate will work down along the slant face, 44, of the spider arm with which it is engaged, forcing back as it descends, the spider arm thereby the spider itself, against the force of the spring which is not really very large, until the round corner, 45, is passed, when the spring, 47, forces the spider arm between the cam plate and the front plate of the casing, the spider arm then being stopped by the button, which is in turn prevented from returning by the flat bottom face, 43, upon which the cam plate rests as shown in Fig. 10, and this will give the right turn signal indication which is maintained given as long as the button is depressed. If now the restoring button, 37, is pressed, its working on the spider arm will be exactly the same. But it can be seen that in this case the button, 37, while working its way down to the depressed position, has moved the spider arm for the already depressed right hand button to get out of seat, so that the latter button under the pressure of its spring, 41, will spring up to the original position, while the button, 37, is kept in the depressed position until another signal is given. If, now, any other button is depressed to give another signal, the button, 37, will spring up, which is thereby ready to be depressed for restoring the second depressed button. In this way, the restoring button, 37, is in an up position while a signal is being given, but normally it is in a depressed position.

All buttons are of the same construction and their mutual relationship is the same so that any button if depressed will bring up any other already depressed button and there-

fore in case two or more signals are given in succession, it is not necessary to touch the restoring button, 37, each time, but the desired signal buttons can be pressed in succession, as the pressing of any signal button for giving another signal will automatically cancel the preceding signal.

The arrangement of the various switch contacts is shown in the upper part of Figure 11, which is a view of the inner side of the rear cover of the switch casing. In the drawing contact, 48, extends in three branches and so does the contact, 49. Each contact is connected with the respective signal lamp as can be seen in the accompanying circuit diagram. The work of the signal buttons, 34, 35 and 36, is simply to ground these contacts to the casing which is grounded, this being done by putting the tips of the push shafts of the buttons in contact with these contacts when the buttons are depressed. Outlines of said tips are indicated by circles in dotted line. The button, 34, when depressed, connects the right hand branch of contact, 48, to ground, the button, 35, connects the left hand branch of contact, 49, to ground, while the button, 36, connects the middle branches of both contacts to ground. The lower branches of the contacts, 48 and 49, extends to make connection with a contact, 50. This is an arrangement for controlling the circuit of the brake operated switch and operated by the restoring switch, 37, work of which, however, is not to ground these contacts, but it is to connect the contact, 50, with the branches of contacts, 48 and 49, while the button is depressed. For this reason the tip of the push shaft of the button, 37, is covered by an insulating material and an outline of the tip is shown, also, by a circle in dotted line. When the button, 37, is in its up position, the contact, 50, is separated from both branches of the contacts, 48 and 49, which are separated from one another, and use of this arrangement will become evident in the later description of the operation of the signal. Contacts, 51 and 52, which may be also connected to ground by the buttons, 34 and 35, respectively, are for lamps of another signal used when the device is operated in pair, but this matter will be taken up in a later description.

The brake operated switch is of a simple form and is shown as a part of the circuit diagram in Fig. 11 just below the manual switch contacts above explained. It consists of a contact, 53, and a contact disk, 54, the latter being mounted on a shaft, 55, which makes sliding motion in the switch casing, and is connected to the brake operating mechanism by a spring, 56. When the brake is operated, the shaft, 55, is pulled against the spring, 57, and the disk, 54, is brought into contact with the contact, 53, giving a necessary electrical connection. When the brake is

released, the spring, 57, pushes the disk and shaft back to the original position.

In Figure 11, a circuit diagram is shown connected with the contacts of the manual switch. In the diagram, the structures already mentioned are represented by the same numerals while the battery is designated by numeral, 58.

The circuit connections are as follows: The battery, 58, is grounded at one side to the body of the automobile. A wire, 59, leads from the other side of the battery to the contact spring, 20, of the signal. A wire, 60, leads from the contact, 48, to the lamp, 1. A wire, 61, leads from the contact, 49, to the lamp 2. A wire, 62, leads from both lamps to the contact spring, 21. A wire, 63, leads from the contact spring, 20, to one end of the coil, 12, while a wire, 64, leads from the contact spring, 21, to the other end of the coil, 12. A wire, 65, leads from the contact, 50, of the manual switch to the contact, 53, of the brake operated switch. The casings of both manual and brake operated switches are grounded. In the diagram, the portions of the contact springs, 20 and 21, which are shown in dotted line, represent the enlarged holes through which screws pass, as previously mentioned, so that the screws are not in contact with the contact fingers at these points, while the dotted lines indicate the continuity between several parts of the contact fingers joined by these dotted lines.

The operation is as follows: If it be desired to signal the right turn, the operator will press down the button, 34, which will connect to ground the contact, 48, by its right hand branch. The circuit then established from the battery, 58, through, in order, wire 59, wire 63, coil 12, wire 64, wire 62, lamp 1, wire 60, contact 48, to ground. As soon as the coil, 12, is energized, the pole pieces, 14, attract the armature, 15, and the push member, 18, presses the contact spring, 20, which comes in contact with the contact spring, 21. The current then takes a new route from wire, 59, to contact spring, 20, contact spring, 21, and then to wire, 62. This will short circuit the coil, 12, de-energizing the same. When this happens, the armature, 15, is thrown back by the spring, 16, assisted by the contact springs, and the contact spring, 20, is separated from the contact spring, 21, which will cause the resumption of current through the coil, 12, for attracting the armature again, and thus the armature is vibrated and the bell is operated. During the operation of the bell, the current is passed to the lamp 1, part time through the coil, 12, part time through the short circuiting route and the lamp is illuminated. The lamp, however, is not bright, but dim, due to the resistance of the coil, 12, which limits the current of the lamp part time.

As soon as the action of the bell is started,

the armature, 23, of the oscillating disk, 22, is attracted by the bell magnet or more exactly by the pole pieces, 14, and the disk is rotated in counterclockwise direction, but not at a fast rate at the beginning, giving the bell time for an initial ringing. But when the disk is sufficiently rotated, carrying with it the sleeve, 26, the contact arc, 27, which is in contact with the contact finger, 28, reaches the contact finger, 29, to bridge between both contact fingers. The current then takes the route of, from wire 59 to contact finger 20, screw 28—s, holder 28—h, contact finger 28, contact arc 27, contact finger 29, holder 29—h, screw 29—s, contact spring 21, and thence to wire 62, so that the coil 12 of the bell magnet is short circuited, and the bell is silenced and at the same time the lamp 1 is brightened, giving the signal a clear indication shown in Fig. 1. At this point the disk 22 does not immediately return, but turns forward still farther, by its inertia, moving the sleeve 26, and causing the contact finger, 29, to ride well on the contact arc, 27. On the return trip, the disk does not carry the sleeve immediately, but makes a free return as formerly explained, leaving the contact finger riding on the contact arc, 27. Upon returning a predetermined distance, however, the disk catches the sleeve and causes the contact arc, 27, to leave the contact finger, 29, whereupon the current through the short circuiting route of the contact fingers is stopped, and the bell is once more started and the lamp is dimmed and when the inertia of the disk is overcome by the action of the bell magnet, the disk is once more thrown forward, repeating the action again and again until the operator touches the button, 37, and the button, 34, is brought up.

If the button, 35, is depressed, thereby connecting the contact, 49, to the ground by its left branch, the circuit will be the same except that the current takes the route of the wire, 61, instead of the wire, 60, and the lamp 2 is illuminated instead of the lamp 1, giving the signal an indication of the left turn, the operation of the bell and the oscillator being exactly the same.

If the button, 36, is depressed for giving a stop indication, it will connect the middle branches of both contacts, 48 and 49, to ground, inviting the current to go through both wires, 60 and 61, operating both lamps, 1 and 2, simultaneously, the circuit otherwise being the same as in the preceding cases.

While the button, 37, is in the depressed position, as is the case normally, if the brake is applied, it will cause the contact disk, 54, of the brake operated switch to come into connection with the contact, 53, the circuit will be then the same as in the last case, except that the current, instead of going to the ground directly at the contacts, 48 and

49, will pass from the lower branches of these contacts to the contact, 50, then wire 65, contact 53, contact disk 54, and then to ground, operating both lamps simultaneously. The brake operated switch is intended to give the stop indication only.

The arrangement of the contact, 50, though intended primarily for providing a means to cut out the brake operated switch, has simplified the latter. Note that the brake operated switch gives a single contact for operating two lamps, requiring in turn only a single lead, 65. Note that when the button, 37, is in the up position, which is the case when the right or the left indication is given, the contact, 50, is out of connection with the contacts, 48 and 49, and the brake operated switch is out of electrical connection, so that the signal which is being given, will not be interfered with by the application of the brake. Note also that if the button, 37, is brought up when no signal is given, the brake operated switch is at all times cut out, which is desired when the signal is not needed. Now the button, 37, can easily be brought up by any of the other buttons, by pressing only half way, then releasing. Referring once more to Figure 10, the round corner, 45, of the spider arm is such that when any button is partially depressed and has moved the spider enough for an already depressor button to get out of the seat of the flat bottom face, 43, the cam plate, 38, of the latter button can work up this round corner by itself from below, forcing its way to the up position, so that both depressing and depressed buttons can be brought up at the same time. Of course this must be done slowly, but there is no occasion demanding a quick action when this has to be done, as this is done only in a repair shop, in a garage, or maybe when the car is parked on an inclined street and the brake is left applied, while the switch is connected to the emergency or parking brake, instead of the service brake, or maybe to both, as that may be preferred by an operator of a car, as then the signal will remind him that he is running the car with the emergency brake partially applied, if he is ever doing that, which has been the cause of the brake fire.

If any of the lamps is burnt out or otherwise not working, non-response of the bell at the first corner or turn at which the lamp has to be operated, will be a reminder to the operator of this fact. If the operator forgets to cancel the signal after it is given, the continued ringing of the bell will also remind him of his negligence.

The foregoing description especially relates to what may be termed a rear signal, which is to be mounted on the rear end of the automobile to indicate signals to closely following vehicles. While this signal forms a complete unit by itself, it may be used in

connection with another signal, which may be placed at the front of the car, to signal to the oncoming vehicles and to pedestrians.

In the pending application cited at the beginning of this specification, I have shown an arrangement of operating the front and the rear signals in pair, in which the right hand lamps of both signals are simultaneously operated to indicate the right turn; the left hand lamps of both signals are similarly operated to indicate the left turn, and both lamps of the rear signal are lighted at the same time to indicate a stop, while no stop indication is given by the front signal, and said front signal carries no bell, but the bell carried by the rear signal serves for both. It is intended in the present case to adopt same arrangement when matter relates to the operation of the signals in pair.

To facilitate the connection of the front signal when the device is desired to be operated in pair, the manual switch carries the contacts, 51 and 52, connected with binding posts, which extend to the rear of the casing, as that is the case with the other contacts of the switch, and the signal itself carries a binding post in form of the screw, 29—s, and to these the wires of the front signal may be connected.

Figure 11 shows such connection in which numerals 1—a and 2—a represent the front signal lamps, and wires 60—a and 61—a respectively lead from the lamps, 1—a and 2—a, to the contacts, 51 and 52, and a wire, 62—a, leads from the other sides of the lamps to the binding post of the screw 29—s. When the button, 34, is depressed, to give the right turn indication to the rear signal, it will connect, also, as said before, the contact, 51, to ground, operating the lamp 1—a of the front signal. Similarly, the button, 35, which connects the contact, 52, to ground, will operate the lamp 2—a of the front signal, simultaneously with the corresponding one of the rear signal. As the contacts, 51 and 52, are not connected to ground in case of indicating a stop, the front signal does not participate in this operation.

The circuit of the lamps of the front signal divides from the contact spring, 21, or screw 29—s, at the end of the wire, 64, and can be easily traced. The identity in numbering the parts of the front and the rear signals distinguished by a letter "a" in case of the front signal, will suggest the symmetrical arrangement of circuits between two signals, having in common the bell magnet of the rear signal including the oscillator, so that the bell magnet is operated by the currents of the lamps of both signals, when front signal participates in the operation and the oscillator short circuits the bell magnet for the lamps of both signals causing their flickering.

There is a provision made in the rear signal to be used when the front signal is connected.

It consists of a wire, 66, tapping the coil, 12, half way between the ends of the coil, and leading to a screw, 67, which passes through the contact springs, 20 and 21, to extend to the front of the plate, upon which said contact springs are mounted. The screw 67 going through enlarged holes of these contact springs are in contact with neither as can be seen in Fig. 6. A contact piece 68 which can be seen in Fig. 5 also is carried by the screw 29—S and when the wire 62—a of the front signal is connected to this screw the contact piece 68 is to be brought in contact with the end of the screw, 67. This has an effect of short circuiting the part of the coil, 12, which lies between the wire 64, and the wire, 66, the current then taking the route of wire, 66, screw, 67, contact piece, 68, and screw, 29—S, to reach to the contact spring, 21, from the coil, 12, instead of by the way of the wire, 64, so that the power of the bell magnet is reduced. The tapping may not be necessarily an exact middle point between the ends of the coil, 12, but can be, for instance, one third point if the winding of the coil is made in three layers, thus short circuiting one complete layer which corresponds to the part between wires, 64 and 66.

It can be said that when two lamps are simultaneously operated as in case of giving a stop indication in the former descriptions, the bell rings louder than when in case of the single lamp due to the increased current and gives a shorter initial ringing for the same reason. The device is, therefore, adjusted as to the best timing, giving more consideration to the case of the single lamp and the operation in case of two lamps is improved by causing a saturation of the pole pieces particularly under increased current. But now when two signals are operated in the manner above described with two lamps participating in each operation giving the same amount of current throughout various operations, there is no more need of compromising between two different currents and the device can be brought down to the best adjustment or nearly so. This explains the reason why the above mentioned provision is made to reduce the amount of winding of the coil, 12. Another reason is that when the signal is operated singly, burning out of one lamp results in a complete silence of the bell which can be a sure reminder to the operator, but when two lamps enter into each operation, burning out of only one lamp does not silence the bell, but the other can give a good ringing as that was the case when signal operated singly. There is a difference in tone of the bell between one and two lamps but this is not enough to be distinguished by an unsuspecting ear. But when the amount of winding is reduced so that the bell rings just normally with two lamps in circuit, then dropping one lamp out of the operation, causes the bell to

ring far below normal or rather feeble and makes the distinction clearer. Besides, when the power of the bell magnet with two lamps in circuit is reduced closer to that with one lamp in circuit when the signal was operated singly, the oscillating disk then is not operated by the bell magnet under a very large margin over the counter force of the bias weight as can be seen from what is explained before, and then a further reduction of power caused by the failure of one lamp will make too large a difference for the disk to make a rotation so that the bell rings continuously without shifting to the phase of the intermittent ringing. This altered performance of the bell will not fail to arouse the suspicion of the operator who will soon discover what happened to the lamp.

While I have described the preferred form of carrying out my invention, it should be understood that I do not limit myself to the specific construction shown.

What I claim is:

1. A signaling device comprising a casing having a transparent front, electric lamps inside of the casing for illuminating said front, an audible signal carried by the casing to be operated jointly with the lamps, a plate inside of the casing, an electromagnet and a vibrator both included in said audible signal for operating the same to produce a continuous sound, said electromagnet being mounted on one side of the plate and being connected in series circuit with said lamps and a means mounted on the other side of the plate for short circuiting said electromagnet periodically to make the sounding of the audible signal intermittent, said means being operated by said electromagnet.

2. A signaling device comprising a casing having a transparent front, electric lamps inside of the casing for illuminating said front, a bell mounted on the rear of the casing to be operated in conjunction with said lamps, a plate carrying sockets for the lamps located between the lamps and the bell, a vibrating hammer mounted on the rear side of the plate for striking the bell to produce a continuous sound, an electromagnet for operating said vibrating hammer also mounted on the rear side of the plate and connected in series circuit with said lamps and an oscillator capable of turning back and forth mounted on the front of the plate and operated by said electromagnet for short circuiting the same periodically to make the ringing of the bell intermittent.

3. A signaling device comprising an indicating means, an electric lamp for illuminating said indicating means, an audible signal means, a vibrator included in said audible signal means for producing a continuous sound, an electromagnet forming an element in said audible signal means, for operating said vibrator, said electromagnet being con-

nected in series circuit with said lamp so that the audible signal may indicate to the operator whether said lamp is operated or not, and an automatic means for short circuiting said electromagnet periodically in order to stop the operation of the audible signal at intervals and thereby to make the sounding of the same intermittent, said automatic means being operated also by said electromagnet.

4. A signaling device comprising an indicating means, an electric lamp for illuminating said indicating means, an electric audible signal, said audible signal having a vibrator and an electromagnet included therein, said vibrator being operated by said electromagnet to produce a continuous sound, an electrical circuit established in series through said lamp then through said audible signal so that the latter may act as a pilot to indicate the operation of the lamp, a branch circuit leading from the lamp but shunting the audible signal to provide another route of passage for the current of the lamp, a switch in said branch circuit, said switch being primarily open, and an electrically operated movable means for closing said switch after it has made a predetermined movement during which an initial sounding is given by said audible signal.

5. A signaling device comprising an indicating means, an electric lamp for illuminating said indicating means, an audible signal, a vibrator included in said audible signal for producing a continuous sound, an electromagnet in said audible signal for operating said vibrator, an electrical circuit established through said electromagnet and through said lamp in series, so that the audible signal may be a pilot to indicate the operation of the lamp, a branch circuit shunting said electromagnet but leading to said lamp to supply current to the latter through another route, a switch in said branch circuit, said switch being primarily open and a movable means operated by said electromagnet for closing said switch after it has made a predetermined amount of movement during which an initial sounding has been given by said audible signal.

6. A signaling device comprising an indicating means, an electric lamp for illuminating said indicating means to give a visual signal, an electric audible signal operated simultaneously with the visual signal for sounding an alarm, said audible signal having a vibrator and an electromagnet included therein, said vibrator being operated by said electromagnet to produce a continuous sound, said audible signal being connected in series circuit with said lamp, to indicate to the operator whether said lamp is operated or not and an electrically operated movable means for automatically short circuiting said audible signal periodically in

order to stop the operation of the audible signal at intervals and thereby to make the sounding of the same intermittent.

7. A signaling device comprising an indicating means, an electric lamp for illuminating said indicating means, an electric bell for cooperating the visual signal by giving an audible alarm, a gong in said electric bell, a vibrating hammer also in the bell for striking the gong to produce a continuous sound, an electromagnet included in the bell for operating said hammer, and an automatic switch means to control the circuit of said electromagnet so as to stop the operation of the bell periodically for making the ringing of the bell intermittent, said automatic switch means being operated by said electromagnet.

8. A signaling device comprising an indicating means, an electric lamp for illuminating said indicating means, an electrically operated bell, a vibrating hammer for striking the bell to produce a continuous sound, an electromagnet for operating said hammer, said electromagnet being connected in series circuit with said lamp to indicate to the operator whether said lamp is operated or not and an oscillator operated by said electromagnet for short circuiting said electromagnet at intervals of time to cause an intermittent ringing of the bell.

9. A signaling device comprising an indicating means, an electric lamp for illuminating said indicating means, an electrically operated bell, a vibrating hammer for striking the bell to produce a continuous sound, an electromagnet for operating said hammer, said electromagnet being connected in series circuit with said lamp and an oscillator operated by said electromagnet for short-circuiting said electromagnet periodically after making a predetermined angular displacement, thereby causing the bell to give first an initial and then an intermittent ringing, said initial ringing being longer in duration than each intermittent ringing.

10. A signaling device comprising a visual signal, an audible signal for cooperating with the visual signal by sounding an alarm to attract the attention of the observers to whom said visual signal is intended, a vibrator in said audible signal to produce a continuous sound, an electromagnet also in said audible signal for operating said vibrator and means for controlling the circuit of said electromagnet so as to stop the operation of said vibrator periodically, thereby making the sounding of said audible signal intermittent, said means being operated by said electromagnet.

11. A signaling device comprising a casing having a transparent front, electric lamps inside of the casing for illuminating said front, a bell carried by the casing to be operated simultaneously with the lamps, a plate in-

side of the casing carrying sockets for said lamps, a vibrating hammer for striking said bell to produce a continuous sound, an electromagnet for operating said vibrating hammer, both the electromagnet and the vibrating hammer being mounted on one side of the plate and a means mounted on the other side of the plate for making the ringing of the bell intermittent, said means being operated by said electromagnet.

12. A signaling device comprising a casing having a transparent front, electric lamps inside of the casing for illuminating said front, a bell mounted on the rear of the casing to be operated simultaneously with the lamps, a plate carrying sockets for said lamps located between the lamps and the bell, a vibrating hammer for striking said bell to produce a continuous sound, an electromagnet for operating the said vibrating hammer, both the electromagnet and the vibrating hammer being mounted on the rear side of the plate and a rotatable means mounted on the front of the plate and operated by said electromagnet for making the ringing of the bell intermittent.

13. A signaling device comprising a casing having a transparent front, electric lamps inside of the casing for illuminating said front, a bell to be operated simultaneously with said lamps mounted to cover the rear of the casing, a plate carrying sockets for said lamps located between the lamps and the bell in the hollow of which the rear portions of said sockets are disposed and an electrical apparatus for operating the bell mounted on the rear of the plate and disposed also in the hollow of the bell.

14. A signaling device comprising a casing having a transparent front, a pair of electric lamps inside of the casing placed one at the right and one at the left for illuminating said front, a bell to be operated simultaneously with said lamps mounted on the rear of the casing, a plate vertically disposed between the bell and the lamps for carrying lamp sockets, an electromagnet with a vibrator for operating the bell, mounted on the rear of the plate and disposed above the lamp sockets occupying the space in the hollow of the bell, said vibrator being disposed above the magnet and resiliently supported at both sides and thereby adapted to make a straight up and down movement to strike the bell at right angle to its wall, contact members also mounted on the rear of the plate and located below the magnet and between the spaced lamp sockets for controlling the circuit of the magnet and a push member extending from said vibrator for operating said contact members.

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