W. SPARKS
SIGNAL.
APPLICATION FILED MAY 11, 1915.

1,240,156. Patented Sept. 11, 1917.

3 SHEETS—SHEET 1.

FIG. 1.

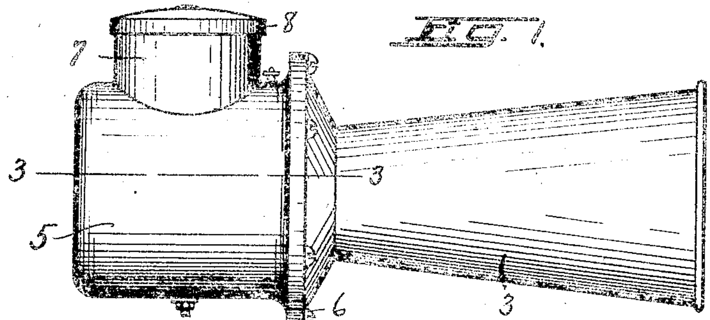


FIG. 2.

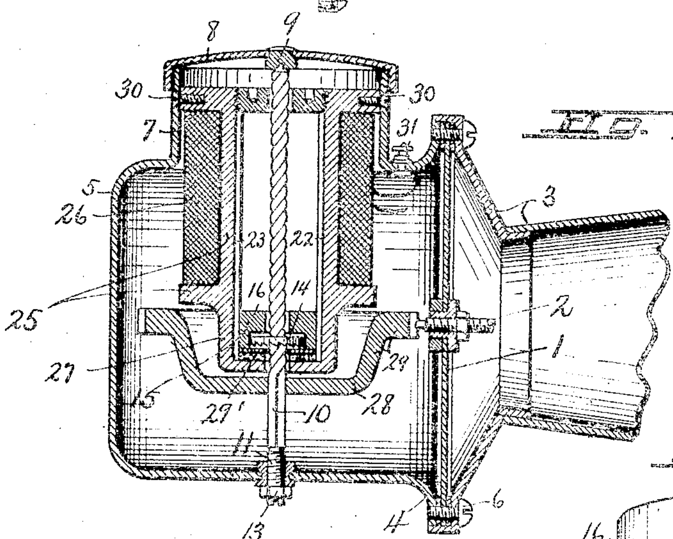


FIG. 3.

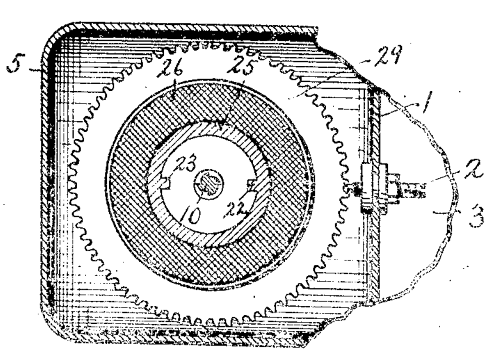


FIG. 4.

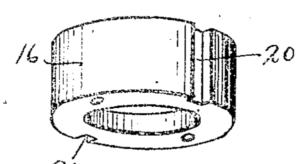


FIG. 5.

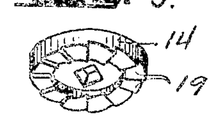
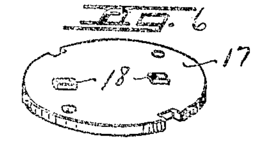


FIG. 6



WITNESSES:
[illegible]
Viola Howland

William Sparks INVENTOR
BY Howard P. Denison
ATTORNEY.

W. SPARKS.

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3 SHEETS—SHEET 2.

FIG. 7.

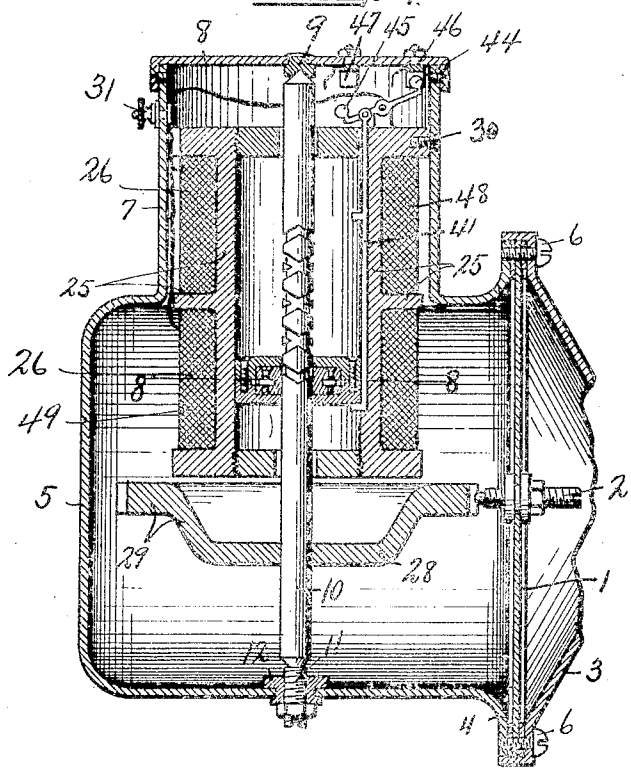
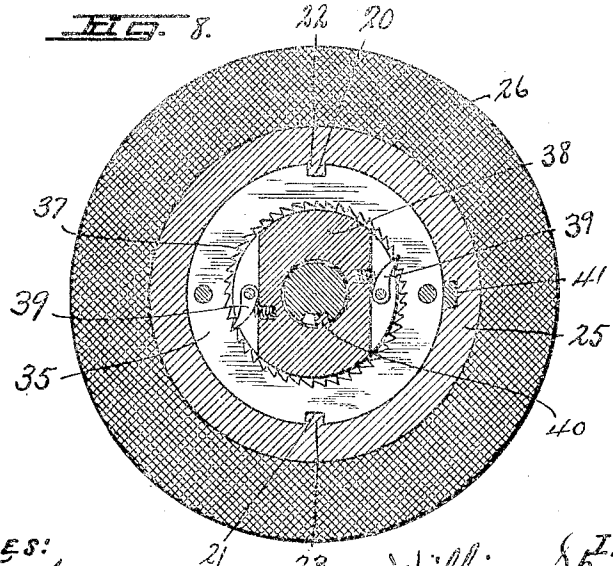


FIG. 8.



WITNESSES:

H. Hurst.

Viola Howland

INVENTOR

William Sparks

BY Howard P. Denison

ATTORNEY.

W. SPARKS.

SIGNAL.

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3 SHEETS—SHEET 3.

Fig. 9.

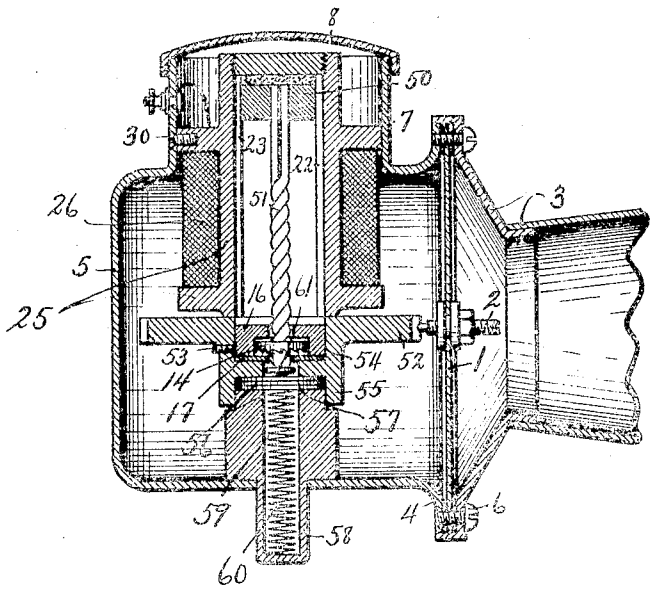


Fig. 10.

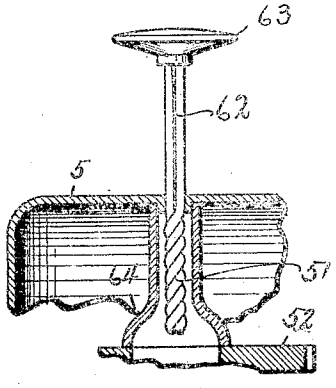
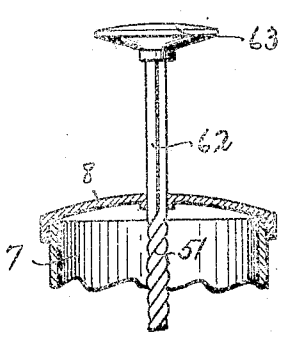


Fig. 11.



WITNESSES:

A. J. Burch

Viola Howland

INVENTOR

William Sparks

BY Howard P. Denison

ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM SPARKS, OF JACKSON, MICHIGAN, ASSIGNOR TO THE SPARKS-WITHINGTON COMPANY, A CORPORATION OF OHIO.

SIGNAL.

1,240,156. Specification of Letters Patent. Patented Sept. 11, 1917.

Application filed May 11, 1915. Serial No. 27,375.

To all whom it may concern:

Be it known that I, WILLIAM SPARKS, a citizen of the United States, and resident of Jackson, in the county of Jackson, in the State of Michigan, have invented new and useful Improvements in Signals, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in signals and more particularly to electrically operated signals of the mechanically actuated diaphragm type susceptible of various uses, but particularly applicable to automobiles, motor boats and other moving vehicles.

The primary object of the invention is to produce an electrically operated signal adapted to give an instantaneous alarm, of simple construction and which can be manufactured at a considerably reduced cost over electrically operated signals of the motor driven type.

A further object is to construct an electrically operated signal of this type which shall be capable of producing a continuous note or sound.

Other objects and advantages will appear from the following description taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of a signal made in accordance with this invention.

Fig. 2 is a vertical central section with the resonator partially broken away.

Fig. 3 is a cross section on line 3—3, Fig. 1.

Figs. 4, 5 and 6 are perspective views of the plunger parts.

Fig. 7 is a view similar to Fig. 2 of a modified and in many cases preferred construction.

Fig. 8 is a cross section on line 8—8, Fig. 7.

Fig. 9 is a sectional view similar to Fig. 2 of a modified form of signal.

Fig. 10 indicates a device in which the rotary toothed member is actuated by hand rather than by electric means.

Fig. 11 is similar to Fig. 10, using the inclosing shell of Fig. 9.

The invention comprises, as shown, a suitable diaphragm —1— having a central adjustable contact member —2—. The marginal portion of the diaphragm is secured between the base of a resonator —3— and the flanged end portion —4— of a rear case —5— by means of suitable screws —6—.

The rear case —5— is preferably provided with a suitable offset portion or dome —7— including in the construction shown a removable cap —8— having a threaded relation with the adjacent portion of the dome —7—.

The cap —8— is provided with a suitable bearing —9— for a shaft —10— having its other end journaled in a bearing —11— adjustable through a sleeve —12— mounted in the opposite side of the case —5—, said bearing provided with a suitable locking nut —13—.

The shaft —10— is preferably a square shaft, and for the greater portion of its length is twisted to form spiral pathways along which a suitable nut —14—, having a substantially square opening adapted to fit the shaft, is movable.

This nut is inclosed within and forms a portion of a plunger —15— comprising a cylindrical member —16— having a seat for the nut and a cap —17— adapted to be secured to the member —16— and provided with projections —18— adapted to co-act with ratchet teeth —19— upon one face of the nut —14— to prevent rotation of the nut under the conditions hereinafter specified.

The member —16— is provided with suitable grooves —20— and —21— formed in opposite sides thereof and adapted to receive and move longitudinally with respect to suitable fiber ways or guides —22— and —23—, formed upon the interior of the substantially cylindrical core —25— of a solenoid —26—. The lower end —27— of the core is offset and positioned within the dished portion —28— of a rotary actuator —29— rigidly mounted upon the shaft —10— and the plunger —15— is adapted to be separated from the portion —27— by a cushion —29'— of suitable material, as rubber.

The offsetting of the part —27— of the core and the dishing of the actuator —29— permits of a more extended movement of the plunger —15— along the shaft —10—. The core —25— is supported from the dome —7— of the casing by suitable screws —30—. The ends of the solenoid coils may

be connected to suitable binding posts having portions lying outside the casing —5—, as the binding post —31— shown.

It will be apparent that when the solenoid —26— is energized from any suitable source of electric power, the plunger —15— will be drawn upwardly along the shaft —10—. The seat formed in the member —16— and closed by the cover —17— is sufficiently deep to allow the nut —14— to lie in a position at which the teeth will not engage the projections —18— upon the cover.

In other words, the seat within the plunger is of sufficient depth or size to allow the nut —14— with the ratchet teeth thereon to move out of engagement with the projections upon the plunger so that the nut may freely rotate with respect to the plunger.

When the plunger is moved upwardly by the energized solenoid, the inertia of the shaft —10— and gravity cause the nut —14— to lie in contact with the cover —17— and the teeth —19— therefore engage the projections —18— upon the cover, thereby preventing rotation of the nut with respect to the portions —16— and —17— of the plunger while the plunger is being moved in an upward direction.

When the electric current is broken, the plunger tends to fall by gravity into the portion —27— and the inertia of the shaft —10— holds the nut —14— in contact with the member —16—, thereby withdrawing the teeth —19— from engagement with the projections —18—, whereby the nut —14— is allowed to freely rotate within the member —16— and the plunger is returned to starting position after each operation without rotation of the shaft —10— or the actuator —29—.

In Figs. 7 and 8, is shown a slightly varied and for many purposes preferred form of the invention by means of which a continuous rotation of the actuating member —29— may be produced. As shown, the shaft —10— is provided with two oppositely inclined spiral grooves —32— and —33—.

The plunger comprises an upper and a lower case member —34— and —35—, respectively, secured together by screws —36—. One of these portions, as the portion —35—, is provided with suitable ratchet teeth —37— upon its internal circumference and the inclosed actuating member —38— is provided with a pair of dogs —39— spring pressed into engagement with the teeth —37— to prevent rotation of the member —38— in one direction within the plunger —34—.

The member —38— is provided with a tongue —40— operating in the spiral grooves —32— and —33—, alternately and successively.

The actuating mechanism for the plunger —34— in this case comprises a double solenoid, such solenoids adapted to be alternately energized for successively drawing the plunger in reverse directions, such alternate energizing of the solenoids being controlled by the movement of the plunger, and for this purpose, a suitable rod —41— is slidably mounted in a groove in the inner face of a spool —25— and is provided with angular projecting portions —42— and —43— with which the plunger —34— is adapted to contact alternately at the respective limits of its movement in opposite directions for alternately bringing the contact points —44— and —45— into circuit closing relation with suitable terminals —46— and —47—, respectively, for alternately closing the circuit leading to the respective solenoids so arranged that when the plunger is at the limit of its movement in a downward direction, the circuit leading to the solenoid —48— will be energized to return the plunger upwardly and when the plunger reaches its limit of movement in an upward direction, it will contact with the flange —43—, raise the contact point —45— into circuit-closing relation with the terminal —47— and break the circuit through the contact —44— and the terminal —46—, whereby the solenoid —49— will be energized to return the plunger downwardly.

The operation of the actuator —38— within the plunger will be readily apparent. The plunger starting from the limit of its movement in a downward direction moves upwardly through the spiral groove —32— and as the actuator —38— is held against rotation in a direction from left to right, the shaft is thereby rotated in a direction from right to left.

When the plunger reaches the limit of its upward movement traveling in the spiral groove —32—, the shaft —10— continues to rotate in the direction from right to left, whereby the spiral groove —33— is carried toward the tongue —40— upon the actuator —38— and if the reverse movement is not applied immediately by the energizing of the solenoid —49—, the shaft carries the actuator —38— in its rotation from right to left, the projection —40— being positioned at all times in the reverse groove —33— and when the plunger is drawn downwardly by the solenoid —48—, the tongue —40— necessarily moves in the groove —33—, whereby a continuous rotation in the same direction of the shaft —10— is produced, resulting in a continuous movement of the rotary actuator —29— in the same direction so long as electrical current is supplied to the coils.

This same action takes place when the plunger starts in its upward movement the second time, the rotation of the shaft —10— always tending to cause the tongue —40—

to move into engagement with the proper groove for causing a continuous rotation of said shaft in the same direction.

The electrical connections necessary to a source of electrical power for energizing the solenoids may be of any well known and usual form not necessary to herein illustrate and describe, and suitable insulation in the forming of the solenoids and in the separation of the parts are herein shown, and further description is unnecessary.

In Fig. 9, I have shown a modified form of a one-way actuated signal in which the spiral shaft is the movable member and the toothed wheel is rotated by the clutch mechanism which is stationary therewith when the shaft is moved in one direction. In this structure the plunger —50— is rigidly mounted upon the end of the spiral shaft —51— and is movable in the core —25— along guideways —22— and —23— in the same manner as the plunger —15— shown in Fig. 2. The nut —14—, the cylindrical member —16— and the cap —17— are likewise the same as those shown in the structure of Fig. 2, except that the member —16— is rigidly connected to the toothed wheel —52— by any suitable means, as a set screw —53.

The wheel —52— has a depressed or cut-away portion —54— in which the clutch mechanism is preferably mounted. It likewise has a circumferential depending flange —55— mounted upon a cylindrical stepped bearing —56— supported from the wall of the case —5— and a suitable thrust bearing —57—, including rotary balls, is interposed between the wheel —52— and the bearing —56—. The case is provided with an offset tubular portion —58— closed at its outer end and registering with a conduit —59— through the bearing —56— which conduit in turn registers with the opening through the clutch member comprising the parts —14—, —16— and —17—, in which conduit and offset portion the spiral shaft —51— is movable, and a suitable spring —60— is interposed between a plate —61— upon the end of the spiral shaft and the closed end of the tubular boss —58—.

The operating mechanism is the same as shown in the structure of Fig. 2, comprising a suitable solenoid coil —26— adapted to draw the plunger —50— downwardly and thereby move the spiral shaft through the clutch mechanism, the nut —14— being locked against rotation with respect to the parts —16—, —17— and —52— during its downward movement in exactly the manner heretofore described, and free to be returned upwardly by the spring —60— without rotation of the toothed wheel —52—.

In Figs. 10 and 11, I have illustrated the shaft —51— as having a portion —62— projecting from the case —5— and provided with a knob —63— forming a handle for pushing the shaft —51— downwardly to rotate the toothed wheel —52— and omitting the solenoid and its connections.

In Fig. 10, a suitable sleeve —64— is provided surrounding the shaft 51 and having a flaring lower end, said sleeve being supported from the case —5— and having its flaring portion lying in close proximity to the upper surface of the wheel —52— to prevent the same from being lifted from its bearings, in the same manner as the core —25— performs said function in the structure of Fig. 9.

Although I have shown and described one particular method of operation and sequence of steps and mechanical and electrical arrangement of parts, I do not desire to limit myself to any specific form, construction or arrangement or any particular sequence of steps, as many changes may be made in the various details of operation, construction and arrangement without departing from the spirit of this invention as set forth in the appended claims, and I contemplate the movement as herein described and the method of operation and construction for various uses, such as self-starters for internal combustion engines, adapted to initiate the rotary movement of the crank shaft directly, in like manner as the shaft —10— is operated, or indirectly through suitable gear or friction connections.

What I claim is:

1. In a signal, a vibratory member, an actuator for vibrating the same, a shaft, a clutch mechanism, a spool surrounding the shaft, the shaft and the clutch mechanism capable of relative movement, means for transferring axial movement of one of said members into rotary movement of the other, one of said relatively movable members being secured to the actuator, means for preventing rotary movement of the other of said members, and a solenoid in connection with the spool for moving one of said members axially to rotate the other and thereby the actuator.

2. A signal comprising a diaphragm, a rotary shaft, a diaphragm actuator mounted upon the shaft and rotating therewith and adapted to coact with the diaphragm to force vibration of the latter as the former is rotated, a plunger movable longitudinally of the shaft, said plunger comprising a nut and an inclosing case, said nut and shaft having coöperating parts so formed and arranged that movement of the nut longitudinally of the shaft forces relative rotation of the shaft and nut, coöperating parts upon said case and nut for holding the nut from rotation when moved in one direction whereby rotation of the shaft is forced and allow-

ing rotation of said nut when moved in a reverse direction, and electrical means for moving said plunger along the shaft.

3. In a signal, a diaphragm, diaphragm vibrating means, a shaft upon which said means is mounted, a plunger movable longitudinally of the shaft, a solenoid including a core, coöperating parts on the plunger and core for preventing rotation of the plunger, said plunger comprising a case and an inclosed shaft actuating member and means for preventing rotation of said shaft actuating member with respect to said case when the plunger is moved in one direction along the shaft.

4. In a signal, a diaphragm, a diaphragm actuator, a shaft upon which said actuator is mounted, a plunger movable longitudinally of the shaft, a spool substantially concentric with the shaft and coöperating parts upon the spool and plunger for preventing rotation of the plunger as it moves longitudinally of the shaft, and means for moving the plunger along the shaft to rotate the shaft.

5. In a signal, a diaphragm, a diaphragm actuator, a shaft upon which said actuator is mounted, a plunger movable longitudinally of the shaft, a spool substantially concentric with the shaft and coöperating parts upon the spool and plunger for preventing rotation of the plunger as it moves longitudinally of the shaft, said shaft and plunger so formed that longitudinal movement of the plunger causes rotation of the shaft, and magnetizable means carried by the spool for moving the plunger along the shaft.

6. A signal comprising a diaphragm, a casing, a shaft rotatably mounted within the casing, a diaphragm actuator mounted upon the shaft and rotating therewith and adapted to coact with the diaphragm to force the vibration of the latter as the former is rotated, an operating member movable longitudinally of said shaft, said operating member and said shaft having coöperating parts so formed and arranged that longitudinal movement of said member forces relative rotation of said shaft and member, means for holding said member from rotation when moved in one direction, whereby rotation of said shaft is forced, and allowing rotation of said member when moved in a reverse direction, whereby the rotation of said shaft may continue in the same direction, and electrical means for moving said member along the shaft.

7. A signal comprising a diaphragm, a rotary shaft, a diaphragm actuator mounted upon the shaft and rotating therewith and adapted to coact with the diaphragm to force vibration of the latter as the former is rotated, a plunger movable longitudinally of the shaft, said plunger comprising a nut and an inclosing case, said nut and shaft having coöperating parts so formed and arranged that movement of the nut longitudinally of the shaft forces relative rotation of the shaft and nut, coöperating parts upon said case and nut for holding the nut from rotation when moved in one direction whereby rotation of the shaft is forced and allowing rotation of said nut when moved in a reverse direction, a spool surrounding the shaft, coöperating parts upon the spool and case for preventing rotation of the case, and a solenoid in connection with said spool for moving the plunger along the shaft.

In witness whereof I have hereunto set my hand this 29th day of April, 1915.

WILLIAM SPARKS.

Witnesses:

LILLIAN WUNDERLICH,

W. J. CORBETT.