Jan. 9, 1934. I. W. GREEN 1,942,811

SINGLE STROKE GONG

Filed May 24, 1929 2 Sheets-Sheet 1

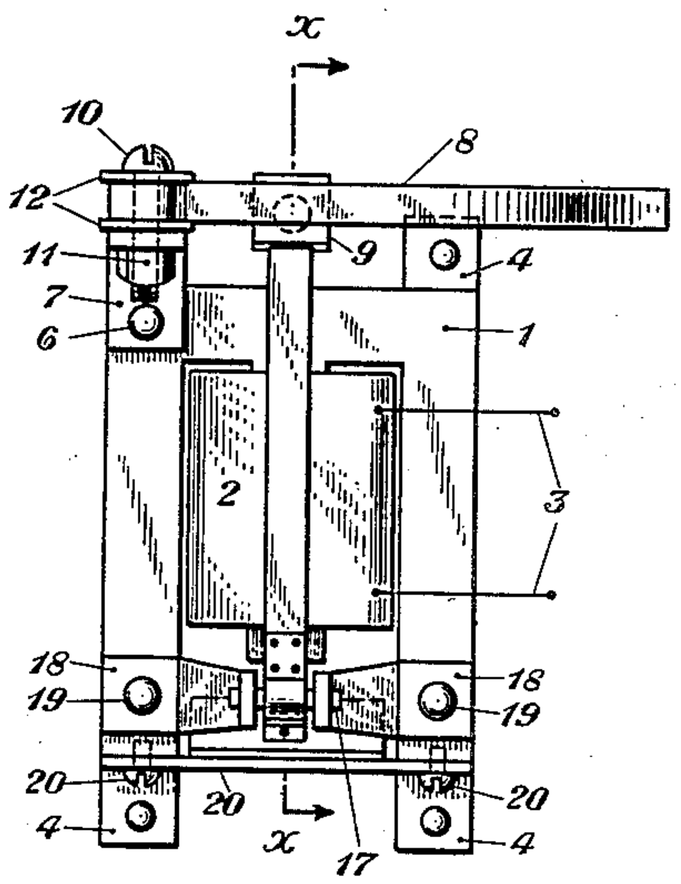

Fig. 1

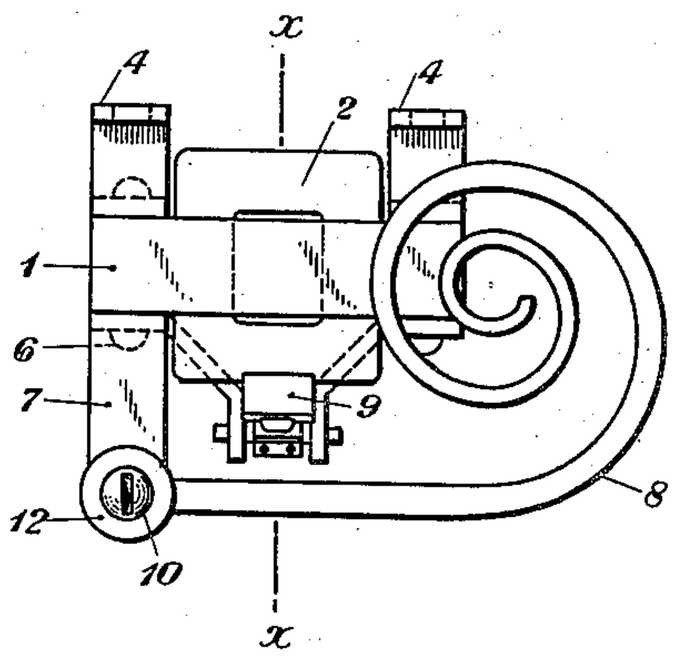

Fig. 2

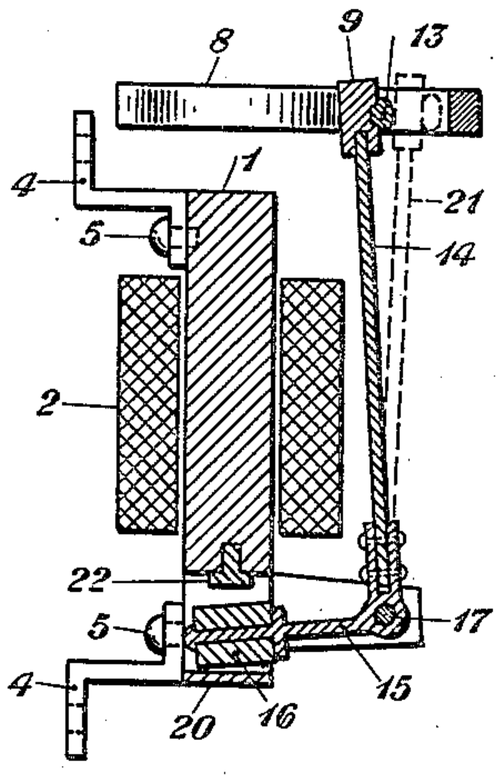

Fig. 3

INVENTOR
I. W. Green
BY
ATTORNEY

Jan. 9, 1934. I. W. GREEN 1,942,811

SINGLE STROKE GONG

Filed May 24, 1929 2 Sheets-Sheet 2

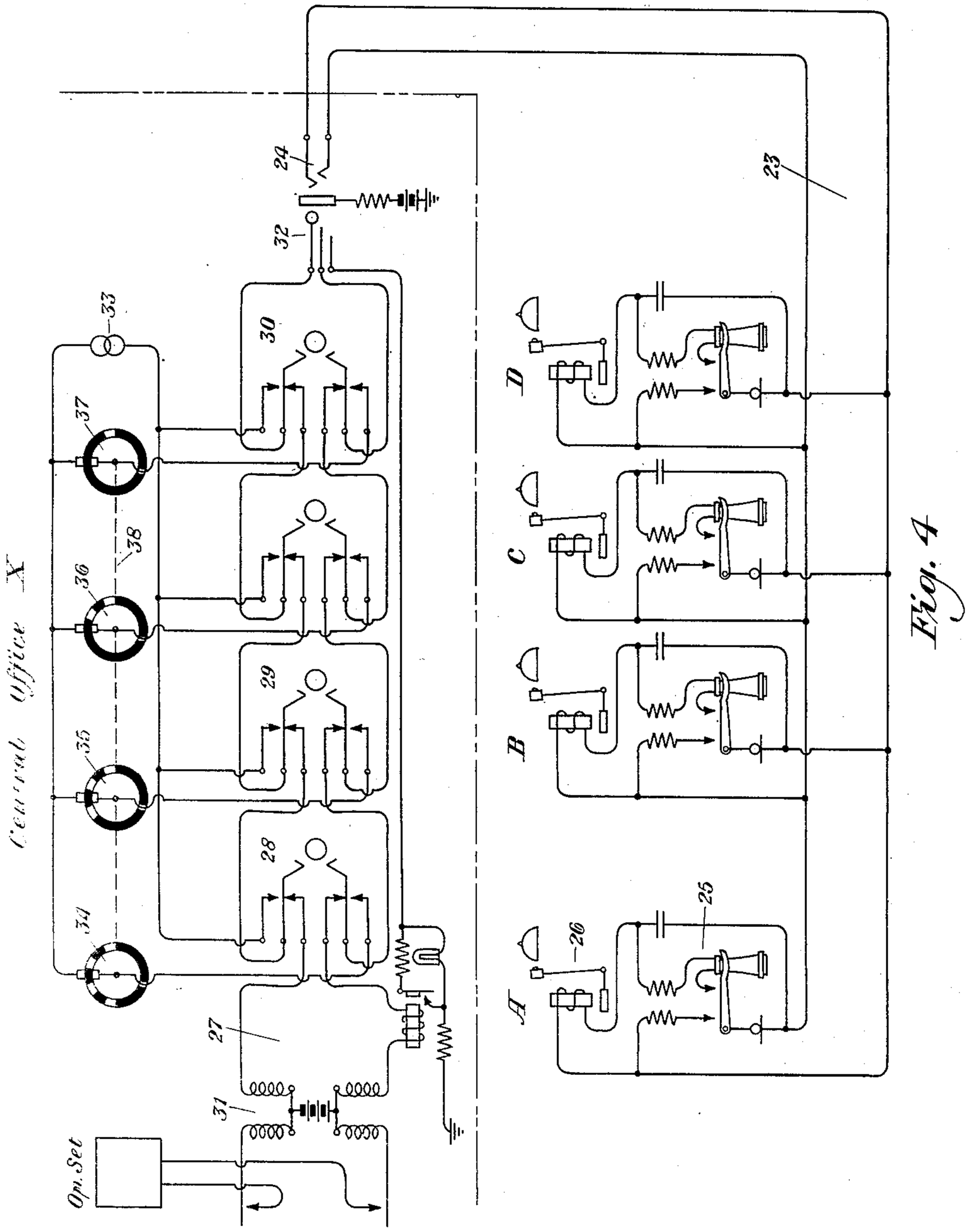

Fig. 4

INVENTOR
I. W. Green
BY J. E. & Co
ATTORNEY

Patented Jan. 9, 1934

1,942,811

UNITED STATES PATENT OFFICE

1,942,811

SINGLE STROKE GONG

Irving W. Green, Cranford, N. J., assignor to American Telephone and Telegraph Company, a corporation of New York

Application May 24, 1929. Serial No. 365,724

1 Claim. (Cl. 177—7)

This invention relates to electrically operated bells or gongs, and more particularly discloses a gong of the class operable from direct or alternating current and containing the feature that it strikes only once for each distinct application of current thereto irrespective of the length of time the current is applied during each such application.

An object of the invention is to furnish a gong of pleasing tone for use chiefly in code calling systems or at subscribers' stations on multi-party lines, which is operable from the usual sources of ringing current associated with telephone lines and which when operated from such a source will furnish a clear and loud signal.

The gong disclosed herein comprises an electromagnetic structure energized by the applied current to attract a movable armature, which latter has associated therewith a hammer of considerable mass suitably positioned to strike a gong affixed to the device. The hammer is affixed at one end of a flexible reed, the other end of which is rigidly affixed to the movable armature, with the complete structure, as thus associated, pivotally mounted upon the electromagnetic structure to be suitably operated for striking the gong upon energization.

The pivotal mounting of the hammer and armature structure is such that normally the hammer is held away from the gong while the device is energized as well as while it is deenergized. At the instant of energization, however, the hammer, due to its mass and the flexible reed mounting thereof, is caused to swing past its normally operated portion by a sufficient amount to strike the gong once with a sharp blow and thereafter to return to its normally operated position away from the gong. As a result of this feature, the hammer is caused to strike the gong only once for each distinct current energization of the magnetic structure.

Other features of the invention will be more clearly set forth in the subsequent detailed disclosure, given with reference to the drawings, of which Figure 1 shows a front elevation of the device; Fig. 2 shows a plan view of the same; while Fig. 3 shows a cross-section thereof taken along the line X X of Fig. 1 and looking in the direction of the arrows associated with the line X X. Fig. 4 shows in schematic form an application of a plurality of the devices to a multi-party subscriber's line.

Referring to Figs. 1, 2 and 3, the device comprises a core of magnetic material, preferably built up of laminations each having the shape of a letter E, as indicated in Fig. 1. Surrounding the central leg of the core 1 is a form wound coil 2 having terminals 3. Affixed to the core 1 by means of screws 5 are the mounting lugs 4, each having a hole drilled therethrough for reception of a screw or the like.

An additional mounting lug 7 is affixed to the magnetic structure 1 by means of screw 6, which lug is adapted to maintain the gong 8 in proper position relative to the hammer 9 to be struck thereby. The gong 8 is rigidly affixed to the lug 7 by means of the bolt 10 and nut 11 screw-threaded thereon cooperating with the washers 12. The bolt 10 passes through a hole in one end of the gong 8 and also a hole in the mounting lug 7, as indicated in Figs. 1 and 2.

The gong 8 illustrated in the drawings is the well-known type of so-called "cathedral" gong which is so often used in clock construction. It consists of a bar or a section of heavy wire of suitable metal bent into the shape of a spiral, being rigidly affixed at one end and free to vibrate at the other. The hammer strikes the gong adjacent the point of support, as indicated in Figs. 1 and 2.

The hammer 9 has associated therewith a leather-covered head 13 which is adapted to strike the gong 8 and thus provide a pleasing tone to the gong when struck. The hammer is affixed to one end of a flexible reed 14, the lower end of which is rigidly affixed to a member 15 which latter has rigidly associated therewith an armature 16. The structure comprising the hammer 9, reed 14, member 15 and armature 16 as thus associated, is pivotally mounted on the shaft 17. The shaft 17 is supported at each end in bearings comprising holes drilled through lugs 18, which latter are affixed, respectively, to the outer lugs of the magnetic structure 1 by means of screws 19, as shown. The armature 16 is of sufficient mass to normally rotate the hammer 9 away from the gong 8, as indicated in Fig. 3. The foot plate 20 affixed to the lower ends of the outer lugs of structure 1 by means of screws, as shown, acts as a rest for the armature 16 when the magnetic structure is deenergized and thus provides a limiting position for the hammer 9, as shown in Fig. 3, under this condition.

When a suitable voltage is applied to terminals 3, the resultant current flowing through the winding 2 energizes the magnetic structure 1 which, in turn, attracts the armature 16 of magnetic material against the central leg of the core and thus rotates the hammer 9 toward the gong 8. Normally, with the device energized, the

hammer 9 and reed 14 will be rotated to the position indicated by the dashed line 21, in which position, as indicated, the hammer will still be out of contact with the gong 8. The stop 22 affixed to the central leg of the core and which is of non-magnetic material to prevent "freezing" of the armature against the core of the magnet, limits the extent of rotation of the hammer 9 toward the gong 8 with the magnetic structure energized.

The dashed lines 21 show the position to which the hammer and reed would be rotated if the voltage were gradually applied to the terminals 3 so that the current slowly increased from zero to its maximum value. If, on the other hand, the voltage were suddenly applied to terminals 3, as is usually the case, the armature 16 would be jerked suddenly toward the central pole of the magnetic structure, and, as a result, the mass of the hammer 9 cooperating with the flexible shaft 14, would be caused to swing past its normally operated position, as indicated by the dashed lines 21, by a sufficient amount to strike the gong 8 a sharp blow, after which the hammer would swing back and soon come to rest in the position indicated by the lines 21, without again striking the gong. As a result of this overthrow feature it will at once become apparent that the hammer 9 will strike the gong 8 only once for each sustained energization of the magnetic structure irrespective of the length of time that the current through the winding 2 is maintained after being once applied. In order to cause the gong to strike again it will be necessary to interrupt momentarily the current flowing through the winding 2 for a sufficient interval to allow the armature 16 to release and then to reapply the current to cause the armature to again be attracted.

Owing to the mass of the movable structure including the hammer 9 and the armature 16, the armature does not pull up at the instant current is applied to winding 2, since a certain amount of energy must be stored in the movable structure in the form of kinetic energy. As a result of this feature, when the gong is operated from alternating current, the energy of several cycles thereof is stored in the movable structure during the operating interval. As a result of this feature, the electro-acoustical efficiency of the device is quite high so that the gong will be struck loudly when the device is energized by current of a relatively low magnitude such as is delivered from the ringing generators associated with telephone lines.

Fig. 4 illustrates a specific use of gongs of the type illustrated in Figs. 1 to 3, inclusive. In Fig. 4 such gongs are used as signaling devices at subscribers' stations on a multi-party subscriber's line. Referring to the drawings, four subscribers' stations A, B, C and D are associated with the subscriber's loop circuit 23, which latter terminates at central office X in jack 24. Each subscriber's station comprises the usual subscriber's subset 25, together with a gong 26 which illustrates schematically a gong of the type disclosed in connection with Figs. 1 to 3, inclusive. At the central office X an A-operator's cord circuit 27 has associated therewith a plurality of keys 28 to 30, inclusive, serially interposed between the repeating coil 31 and the terminating plug 32 for connecting the cord circuit to the subscriber's loop.

With all of the keys 28 to 30, inclusive, in their normal positions, as shown, the repeating coil 31 is connected between the tip and ring conductors of plug 32, and in turn across the loop circuit 33, assuming plug 32 to be inserted in jack 24. The operation of any key 28 to 30, inclusive, will connect a source of ringing current 33 across the loop circuit 23 through the corresponding interrupter 34 to 37, inclusive. The interrupters 34 to 37, inclusive, are rigidly affixed to a common shaft indicated by dashed line 38, and are thus caused to rotate simultaneously at a constant speed by motor-driving means not shown. The purpose of these interrupters is to furnish a means for "ringing" on the subscriber's loop circuit. Thus it will be noted that interrupter 37 completes the circuit from the generator 33 to the subscriber's loop circuit 23 through operated contacts of key 30 only once during each revolution of the interrupter. Interrupter 36, on the other hand, completes the circuit for two distinct intervals during each revolution thereof, interrupter 35 for three distinct intervals during each revolution, and interrupter 34 for four distinct intervals. Thus assuming any given key 28 to 30, inclusive, operated, the ringing current will be applied to all of the gongs 26 associated with subscribers' lines A to D, inclusive, each time a conductive segment of the corresponding interrupter comes under the brushes and will cause the gong to strike once for each such conductive segment. By operating the proper key, the operator at the central office may cause the gongs associated with stations A to D to be rung in accordance with any desired one of the four codes furnished by the interrupters. Each subscriber, of course, at stations A to D, inclusive, will listen for his own code and will answer the same when he hears it rung.

There are certain advantages to the utilization of gongs of the type indicated schematically at 26 at subscribers' stations on multi-party lines as compared to the usual type of ringing equipment which has been used in the past in such cases. With the usual type of ringer at the subscriber's station, it frequently happens that the bell rings on false impulses or during dialing operations from some other station on the loop circuit. The gong of the present disclosure is not apt to do this since, as was mentioned above, it integrates the energy of several cycles before operating, so that a single false pulse, or several widely separated pulses, will not furnish sufficient energy to operate the same. Another advantage of the single-stroke gong over the usual type of ringer occurs where it is desirable to have a loud signal at the subscriber's station. The ordinary type of ringer of course operates once for each cycle of ringing current, and since the energy per cycle is small, the bell of course cannot be rung very loudly. With the single-stroke gong, as explained above, the energy of a number of cycles of ringing current is indicated in causing the gong to operate, so that it gives a much louder signal for a given magnitude of current. The single-stroke gong has an additional advantage in that it may readily produce a soft and pleasing tone. Furtherfore, the code ringing system illustrated in Fig. 4 of course requires no signaling grounds at the subscribers' stations on multi-party lines such as is required in the case of present types of selective party line ringing.

While the invention has been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit

of the invention as defined by the appended claim.

What is claimed is:

An electrically operated acoustical device including a core of substantially E-shaped form, a coil mounted upon the central arm of the E-shaped member, a gong of spiral formation carried on a corner of the closed end of the E-shaped core, an armature pivotally mounted at one extremity on the open end of the core, a flexible member extending adjacent the central leg of the E-shaped form, said flexible member being mounted at one extremity on the pivoted end of said armature and having a weighted hammer at its free end lying adjacent said gong, and supporting means for said armature including brackets secured to the outer legs of the E-shaped core and having a pin pivoted to said brackets which forms a common pivotal point for the armature and flexible member.

IRVING W. GREEN.