No. 840,995. PATENTED JAN. 8, 1907.

W. W. DEAN.

METHOD OF POLYSTATION SIGNALING.

APPLICATION FILED AUG. 9, 1905.

Fig. 1.

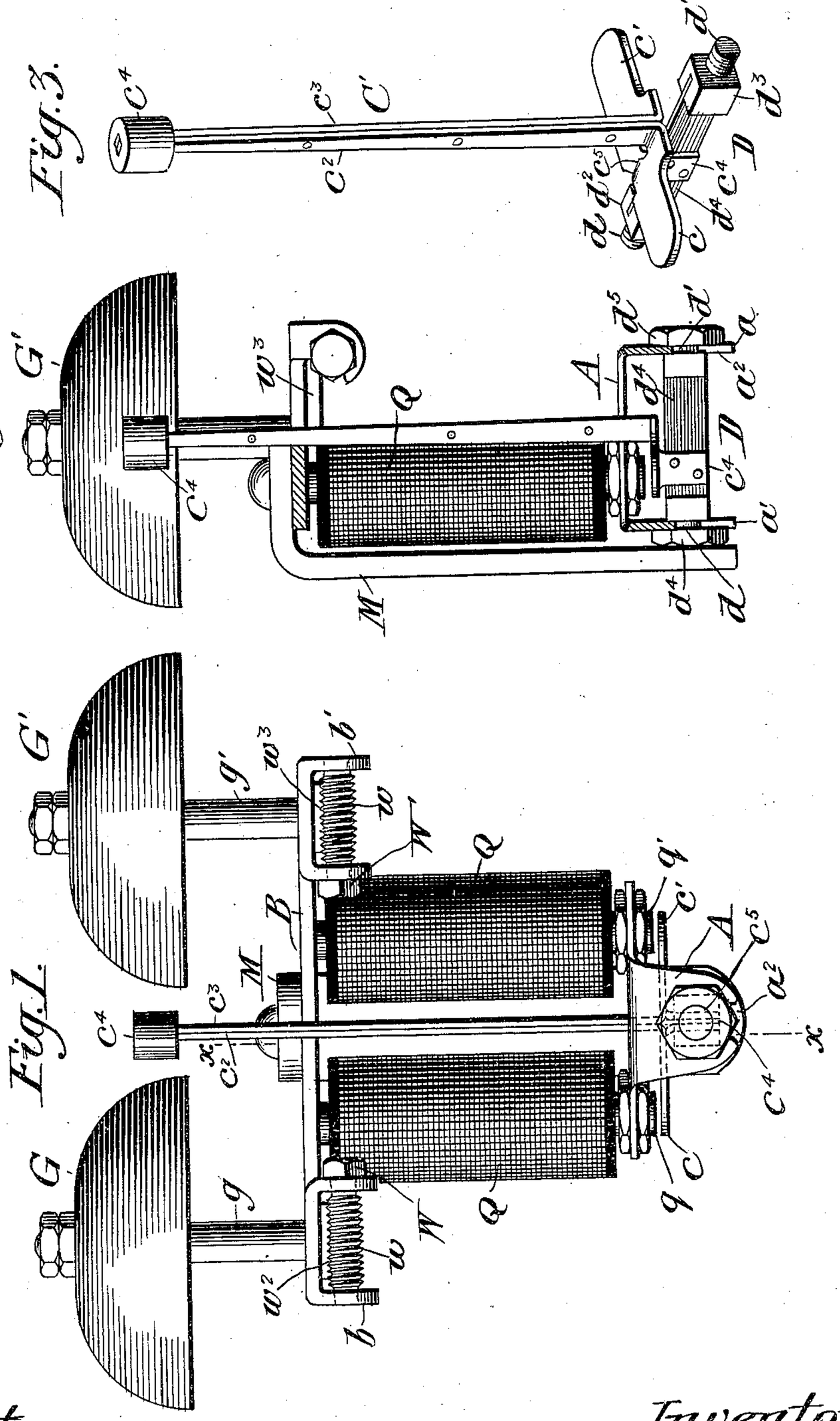

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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METHOD OF POLYSTATION SIGNALING.

No. 840,995. Specification of Letters Patent. Patented Jan. 8, 1907.

Original application filed May 19, 1905, Serial No. 261,132. Divided and this application filed August 9, 1905. Serial No. 273,460.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Methods of Polystation Signaling, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to electrical signaling, and particularly to what is known as "harmonic" or "selective" signaling for telephone systems of the type disclosed in my application filed May 19, 1905, Serial No. 261,132, of which the present application is a division. In such systems where more than one station is served over a single line modern standard practice calls for the employment of signaling means by which one station may be called up without alarming the other or any of the others, if there be several.

In former systems devised by me I have employed a number of tuned vibrating reeds at the several stations, each reed responding to a certain frequency of alternating or intermittent current only. The reeds employed constituted the clapper-rods of polarized ringers, and the clappers were adjusted to strike the gongs without the armatures touching the pole-pieces. With such an arrangement the initial rate or period of vibration of each clapper-rod is somewhat modified by contact with the gongs, and hence I found it necessary to resort to undertuning or overtuning the current or the mechanical parts in order that the current throw upon the line to ring a particular station should correspond in periodicity to the modified or operative periodicity of the reed and clapper at the desired substation. My present invention, while, as I have stated, it includes the feature of a tuned reed at each station, is an improvement in every way and is to be distinguished from my former inventions by the following radically-different principle and method of operation: In the former case I was forced to use gongs of different sizes, and it was necessary to have a very nice adjustment of relative frequencies, as well as a careful adjustment of the moving mechanical parts. In the present case I abandon all overtuning and undertuning entirely and adjust my reed to respond to its own natural frequency, and this being determined the current can be supplied at a corresponding frequency with absolute certainty. In order to overcome the modifying effects of the gong-strokes, I use three expedients—the first, a very stiff spring-mounting for the armature and clapper-rod; second, I expose the armature to a cumulatively-increasing force as it vibrates, and, third, I expose the naked pole-pieces to the ends of the armature and so adjust the gongs that each end of the armature will strike its pole-piece before the clapper-rod touches the gong, the clapper then springing over to strike the gong, and thus getting a very quick return. In practice the distance between the clapper and the gong may be, say, one thirty-second of an inch. With this construction and adjustment I get a very sharp, clear, and powerful tone from the gongs and perfect certainty of of operation in selection.

It will be observed that my invention really covers both a method and the apparatus for practicing the method. In the present case I shall describe some specific features, such as a spring-mounting of the armature and the means for tuning by sliding the clapper up and down the rod; but it is quite obvious that my method is independent of these or any other specific limitations, being practicable with many different forms of apparatus.

My invention will be fully understood upon reading the following detailed description in connection with the accompanying drawings, forming a part hereof, in which—

Figure 1 is a side view of a polarized signal bell or ringer embodying my invention. Fig. 2 is a section on the line $x\,x$ of Fig. 1 looking to the right, and Fig. 3 is a perspective view of the clapper-rod with its connected parts removed.

Referring to the drawings, Q Q′ is a pair of ringer-magnets mounted upon the yoke B, which also carries the bent permanent magnet M, as shown. The cores $q\ q'$ of the electromagnets protrude at the lower ends, and upon them or upon the sleeve surrounding them is carried the armature-yoke A. This is of non-magnetic material extending from pole to pole and adjustably clamped thereto and having front and back downwardly-turned extensions $a\ a'$, slotted, as shown at a^2, for the reception of the studs $d\ d'$ on the armature-support D. These studs are

formed upon the terminal blocks d^2 d^3, connected by the stiff spring d^4, whose ends are riveted or otherwise secured in slots in the blocks. The studs are threaded and receive the nuts d^4 d^5, which clamp the extensions of the yoke firmly upon the blocks d^2 d^3, thereby securing the structure D in place. The armature C is formed integral with the clapper-rod C′, out of punchings, in two halves, a "right" and a "left." Of course in making the blanks these would be all the same, but in forming up the right would be turned one way and the left the other. Each left blank has a wing c, a leaf c^4, and a long stem c^2. Each right blank has a wing c', a leaf c^5, and a stem c^3. In assembling these parts the spring d^4 is placed between the two leaves c^4 and c^5, which are riveted together through the spring. The stems c^2 and c^3 are then also riveted together, and the cylindrical clapper c^4 is placed upon the rod thus produced. The ends of the spring d^4 being secured in the blocks d^2 d^3, the structure of Fig. 3 is complete and is ready for assembling in the complete ringer, as shown in Figs. 1 and 2. My selective reed is thus formed of the parts D and C′, and its exact period is determined, or, in other words, it is tuned by moving the clapper c^4 up or down until the exact pitch is reached which is desired. Of course in making these bells in quantities it is possible to determine the exact point upon the clapper-rod upon which the clapper of a given weight must be placed to give the desired result.

In operation when current of any particular frequency is thrown upon the line the reed or clapper-rod of corresponding period will commence to buzz, and as it buzzes the armature-wings c c' will approach to and recede from the pole-pieces q q'. During each approach and recession the amplitude of vibration is increased, and the force exerted by the pole-pieces is increased correspondingly. Action and reaction thus succeeding and reinforcing each the other, the cumulative force soon causes one armature end to forcibly strike its pole-piece, whereupon it will stop; but the clapper c^4 will continue its travel, the clapper-rod C′ springing to permit this. The clapper strikes the gong and instantly recoils. All this on account of the magnitude of the cumulative force at the time of stroke is accomplished substantially in the natural period of the parts. Hence the recoil from one side stroke assists in the opposite stroke, or, to put it another way, energy is stored up in the yielding clapper C′ to snap back and start the next stroke, the innate capabilities of all the parts being thus utilized and current, spring, and stroke all acting well together.

In order that the adjustment of the gongs may be not only accurate but permanent, I mount each gong G or G′ upon a post g or g', carried upon a pivoted adjuster w^2 or w^3, pivoted at its rear end and threaded at its forward end to engage a worm w or w'. Each worm has a head W or W′, and its shank is mounted to turn in drop-bearings b b', formed upon the yoke B. By means of a wrench the worms can be turned to adjust the gongs exactly, and when so adjusted no ordinary use or misuse will move them.

It will be apparent from the foregoing description that my method consists in exact tuning, but mechanical overthrow, as contradistinguished from exact adjustment without any overthrow but with overtuning. The present method may be stated in a few words, as follows: A reed is cumulatively flexed to store up energy, the point of reversal or cut-off of the energy being determined at this mechanism, leaving the reed or moving body to give the actual stroke and to take the corresponding recovery by means of the stored energy thus suddenly concentrated and released. It will be observed that the instantaneous stroke is of great importance. The sudden stoppage of the energizing-armature is of importance in order to give this instantaneous stroke, and the use of stiff and normally unresponsive parts is of importance in order to prevent the storing up of energy in beats of any but the particular frequency called for. It is to be observed that I make the spring d^4 stiff, and by reason of the cross-connection thereon of the leaves of the armature there is a torsional—that is to say, a very strong—resistance to the first movements on the part of the armature. The spring d^4 itself may be tuned like a reed; but whether it is or not it is so stiff that no momentary current impulses will budge the armature, this only being accomplished by the normal increments of the proper periodic currents.

I am aware that there are many changes in detail that may be made in the invention thus described without departing from the spirit or the principles involved, and I wish it understood quite clearly that I do not limit myself to the specific form shown for my ringer, but include within the scope of the claims which I shall make all possible forms by which the invention may be practiced—that is to say, by which the principles upon which I rely may be incorporated and brought under control.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The method of selective, harmonic signaling, which consists in vibrating a tuned body by means of periodic increments of energy, causing said energy to be stored in said body until a desired totality is reached, then instantaneously interrupting the vibration and utilizing the stored energy to flex the body to produce a stroke of such short dura-

tion as not appreciably to retard or alter the normal or periodic movement of the vibrating body.

2. The method of selective, harmonic signaling which comprises the following steps: communicating to a stiff tuned reed, successive, small increments of periodic energy of proper frequency and thereby raising it from a state of inaction to a state of active vibration, storing up energy in said reed, and vibrating the same with gradually-increasing amplitudes, and finally at the point of maximum amplification, interposing a positive stop to render dead a portion of the vibrating reed structure, whereby the entire cumulative energy will be imparted suddenly to the remainder of the reed structure to produce a stroke or sounding movement at such accelerated velocity as not to retard or alter the normal periodic vibration of the reed structure as a whole.

3. The method of selective, harmonic signaling, which consists in vibrating a stiff tuned body as a whole by means of periodic increments of energy, thereby causing said entire body to start from a state of inaction, storing up energy in said body, thus vibrating the same as a whole with gradually-increasing amplitudes until a desired totality is reached, then instantaneously interrupting said vibration, whereby the stored-up energy is utilized to flex the body to produce a stroke of such short duration that the retardation or alteration of the natural rate of vibration is rendered negligible.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM W. DEAN.

Witnesses:
A. D. T. LIBBY,
GEO. A. SCOVILLE.