II. THE ELECTRIC CHIME.

BY GEORGE M. HOPKINS.

To secure practice in mechanics or in electrical work, the amateur may as well construct something for actual use. A very useful and pleasing electro-mechanical device is an electric chime to be used as a door bell or call bell, or in connection with a clock. It serves its purpose as a call and gives an ever-changing series of harmonic notes.

The first step toward the construction of this device is to purchase the toy known as the tubophone, and select three of the tubes which produce a chord, or if the maker prefers it, he may buy a piece of mandrel drawn brass tubing, ⅝ inch external diameter, with walls $\frac{1}{32}$ inch thick, and cut off three pieces respectively 7⅝, 8⅜, and 9⅜ inches in length; each of these should be laid upon two short pieces of soft woolen cord, with the cord touching at nodal points, that is, at exactly one-quarter of the length from the end. Arranged in this way the tubes give out a clear note when struck with a small wooden mallet. By comparing these notes with those of a piano or other musical instrument, the tubes may be tuned. The pitch is raised by shortening the tube, but as there is no practical way of lowering the pitch after the tube has once been shortened, it would be advisable to cut the tubes a little longer than the measurements given. A baseboard having a short standard is provided, and to the upper portion of the standard is secured a board into which are driven three pairs of wire nails, the nails in each pair corresponding in position with the nodes of one of the tubes. The tubes are suspended from these nails by soft cords passing around the tubes at the nodes or points of no vibration, leaving the tubes free to vibrate at the center and at the ends.

Now it remains to construct the electro-mechanical device for striking the tubes. To the baseboard are secured the angled ends of three strips of spring brass, $\frac{7}{32}$ inch wide and $\frac{1}{32}$ inch thick, which extend above the tubes and carry small wooden mallets in position to strike the middle portion of each tube. The mallets are secured to the springs by means of ordinary wood screws passing through the springs into the mallets.

Behind the springs, at or near their mid-length, is placed a diagonal strip of wood, having secured to its outer edge a strip of felt or chamois skin. The spring strikes this piece and allows the mallet to strike the tube and spring back without jarring. Behind the springs is supported a small shaft on which is placed a wooden cylinder about 1 inch in diameter and 2½ inches long. In the cylinder and opposite the springs are inserted wire nails, arranged to strike short inclined strips riveted to the springs. The nails are placed so that they will strike the inclined strips in different orders; for example: 1, 2, 3; 3, 2, 1; 2, 3, 1; 1, 3, 2.

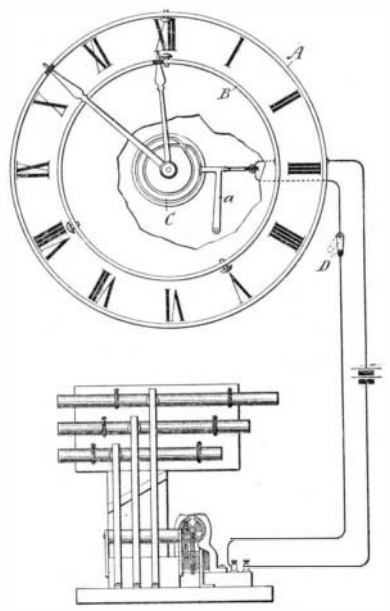
A toy electric motor having a three-pole armature is used for turning the cylinder, and two clock wheels and a pinion are employed for reducing the speed. A worm is placed on the armature shaft of the motor, which engages the first of the clock wheels. This worm may be cut in a lathe, but if this is inconvenient, a wire may be wound spirally around the armature shaft and soldered. It will, of course, be necessary to wind the spiral so that it will fit the teeth of the clock wheel, and the surplus solder should be scraped from the wire to diminish friction. The motor is provided with binding posts to receive the battery wires. One or two cells of dry battery will run the chime. The chime is used in place of an ordinary call or door bell, or it may be used in connection with a clock, as shown, for making calls at certain hours.

The push button shown in the sectional view is made to close the circuit when the chime is used in place of a call bell or door bell. The button is readily made by boring a small block, *A*, of hard wood in two diameters to receive the head and back of the pearl collar button, *B*, the back of which is held in place by the apertured piece of veneering secured to the face of the block by small screws, while the head of the button rests on a curved brass spring, *C*, secured in a slot in the back of the block, *A*, by a screw. The outer end of the spring projects beyond the side of the block to receive one of the circuit wires. This slot is filled below the spring with insulating material, and a brass plate, *D*, is secured to the back of the block, *A*, and has upon one edge an apertured ear for receiving the other circuit wire. The plate, *D*, is secured to the back of the block by small screws. The free end of the spring, *C*, is curved over to a point near the brass plate, *D*, so that when the spring is depressed by pressing the button, *B*, it will touch the plate and close the circuit.

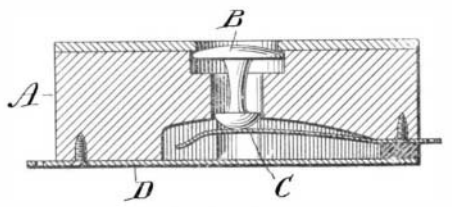
The annexed diagram shows an appliance which enables the chime to be used in connection with a clock. In front of the dial of an ordinary clock are secured the rings, *A*, *B*, made of $\frac{1}{16}$ inch square brass wire. The supports are of insulating material, and the rings are concentric with the arbor carrying the hands. The hands are bent outwardly to permit of extending over the rings without touching them, and to insure the hands against electrical contact with the rings a thin short sleeve of paper is slipped over each hand near the free end. Each ring has several small radial holes bored in it to receive the brass nails, the heads of which project sufficiently beyond the front surface of the rings to enable the hands to touch them as they pass.

The circuit wires connecting the battery and the chime are connected one with the outer ring, *A*, the other with one of the springs of the cut-out switch shown in the opening formed by the breaking away of the dial. The other spring is connected with the inner ring, *B*. The springs are insulated from each other.

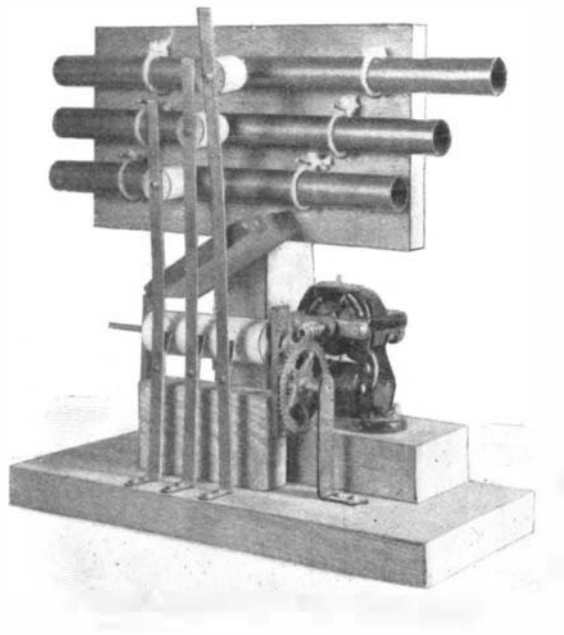
On the sleeve which carries the hour hand is mounted the crossed slotted cam, *C*, also shown detached in the larger figure. In the slot of this cam is a boat-shaped follower which slides easily in the slot



CHIME WITH CLOCK CONNECTION.



PUSH BUTTON.



ELECTRIC CHIME.

and is longer than the width of the slot, so that it can, in following the slot, take the inner and outer portions of the slot in alternation. The follower is pivoted to the angled lever, *a*, which is pushed by the cam between the parallel springs and withdrawn from them in alternation once in 12 hours. The object of this arrangement is to cut out the chime at night and put it in the circuit in the daytime. The cam, *C*, and the angled lever, *a*, are insulated from the clock movement.

A switch, *D*, is provided for throwing the device out of action at any time.

It will be seen that the hour hand must come into contact with the nail on the inner circle and the minute hand must touch the nail in the outer circle to complete the circuit, and cause the chime to sound. The duration of the chiming is limited by the time the minute hand is in contact with the nail. The clock when arranged as here shown sets off the chime at 8 o'clock, 12 o'clock and 5 o'clock. It is now about to ring the chime for 12 o'clock.

The Automobile Exhibition at Grand Central Palace.

Practically the whole of the exhibits which were displayed in the late exhibit under the auspices of the Automobile Club of America, at Madison Square Garden, are to be seen at the Grand Central Palace Exposition of this city, which is to run for two weeks from November 14. A novelty which attracts considerable attention is an automobile propelled by liquid air. The machine is practically a locomobile carriage with liquid air storage cylinders substituted for the boiler and water and naphtha tanks of the locomobile. There are several new types of steam engines designed for automobile work; one of these is a vertical two-cylinder engine, not unlike those used in the locomobile, in which a rotary valve operated by bevel gearing on the crank shaft replaces the link motion of the latter engine. There is also shown a two-cylinder rotary engine with a valve gear and reversing motion of extreme simplicity. Another exhibit that attracts considerable attention is that of the E. R. Thomas Motor Company, Buffalo, N. Y., which includes a particularly handsome motor bicycle known as the Auto-Bi. This machine conforms without any variation in its general outline to the standard bicycle. A 1½ horse power motor and tank are carried within the diamond frame, and power is transmitted to the rear wheel by means of a leather belt. The weight of this bicycle, which is beautifully finished, is 75 pounds complete.

The heavy loads which are imposed upon the axle bearings of the automobiles renders the ball bearing unequal to the service required, except in the case of the lighter machines. The best results are obtained with bearings of the roller type. One of the most successful of these, which has been doing good work in the cab service of New York city, is made by the American Roller Bearing Company. It is a straight bearing with an end-adjustment but no diametric adjustment. The bearing consists of a set of main rollers to sustain the weight running in races in the hub and on the axle. These main rollers are separated and guided by intermediate smaller rollers, which carry no weight and act as separators merely. The whole bearing is assembled in such a way that the parallelism of the main rollers is carefully preserved. We were shown a roller which, after one and a half years in electrical cab service, failed to show any wear that could be detected by the micrometer gage.

The Woods Motor Vehicle Company and the Waverley Factory exhibited pleasing designs of their several electric vehicles embodying improved features of motor construction.

Sawdust as Fuel in Austria.

Consul Hughes, of Coburg, says that in Austria, where everything in the shape of fuel is being carefully investigated, sawdust is impregnated with a mixture of tarry substances and heated to the proper temperature; it is then passed over a plate of iron heated by steam, from which a screw conveyor takes it to a press, where it is compressed into briquettes of the required size. The press turns out nineteen per minute, weighing two-fifths of a pound each, and measuring 6 by 2½ by 1½ inches. The caloric power is about the same as that of lignite, with but 4 per cent of ash. One factory produced last year over 7,000,000 briquettes, costing about 16 cents per thousand, and selling at from 95 cents to $1.

The Current Supplement.

The current SUPPLEMENT, No. 1299, is of unusual interest and variety. "The Section of Agriculture and Alimentation, Paris Exposition," is described and illustrated. "The Eucalyptus" is by Nicolas Pike. "Physical Growth in a Child" is an interesting anthropological article. "Sven Hedin's Travels in Thibet" is by H. K. Geissel. "A Scottish National Antarctic Expedition" is fully described. "Symbolic Rocks of Newbury and Byfield, Mass.," is by Horace C. Hovey, and is illustrated by eight engravings. "Pan-American Exposition Notes" are published for the first time. These will be published in nearly every number. "How Crucibles are Made" is an interesting technical article.

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(Illustrated articles are marked with an asterisk.)