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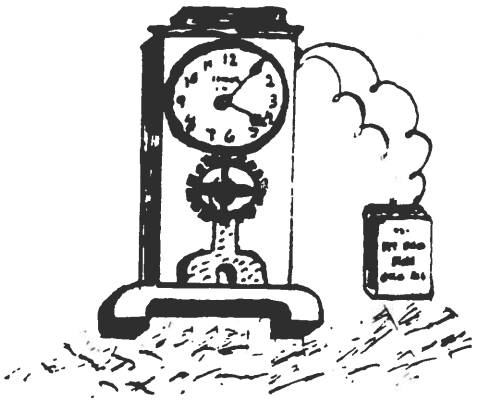
Martin C. Feldman, Editor



Hello fellow enthusiasts:

We are very pleased to bring you this month, through the contribution of various members, an entire issue devoted to a clock attributed to Mr. S.A. Kennedy and originally patented on December 3, 1867 by S. A. Kennedy, S. W. Holt and J. Gerlach.

Kennedy's electric clock produced a great deal of controversy in its time as the design was similar to that of a clock made by Alexander Bain in Scotland in 1845. However, the importance of this clock is not so much in its design but rather in its introduction in the United States as what is probably one of the earliest commercial electro-mechanical clocks. Its production was short-lived and was never a great success for a number of reasons; most of which are known to the collectors in our society! This limited production and eventual scarcity has made this particular clock a very desirable collectible. Two such clocks are known to exist in this country with one being permanently exhibited in the NAWCC Museum. A number of years ago this clock was restored by a few N.Y. members of the EHS but unfortunately the Museum has not been able to keep the clock running consistently. The clock is plagued by a number of fine adjustments which must be maintained in order for it to function with any degree of regularity.

Enclosed with this issue is a 2nd dues reminder. If you have not paid yet, please do so or we will be unable to send you future issues. Thank you.

Enjoy this issue!

Electromagnetically yours,

Martin C. Feldman,FNAWCC

PROSPECTUS

OF THE

KENNEDY

ELECTRIC CLOCK COMPANY.

UNDER LETTERS PATENT FROM THE UNITED STATES.

OFFICE OF THE CO.,

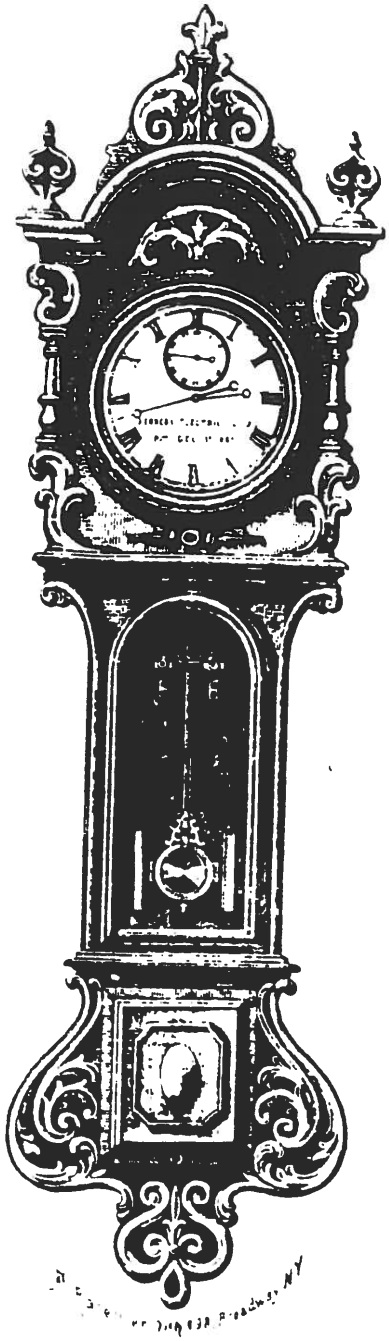
~~257~~ BROADWAY, NEW YORK.

482

NEW YORK:
HYDE BROTHERS & CO., PRINTERS,
99 MAIDEN LANE.

1869.

Kennedy Electric Clock.
Pat'd Dec. 3d. 1867



PROSPECTUS.

This Company is organized under the manufacturing laws of the State of New York, for the purpose of manufacturing and selling the "KENNEDY ELECTRIC CLOCK," and disposing of rights to sell and manufacture the same, they being the sole and exclusive owners of the right, title and interest in the Patent issued therefor by the United States, Dec. 3d, 1867.

This Clock is the invention of Mr. S. A. KENNEDY, Electrician, long associated with Prof. S. F. B. MORSE, and Prof. BACHE, late of the U. S. Coast Survey, in their scientific pursuits. It has been thoroughly tested by actual use, for a sufficient length of time to prove itself worthy of all that is claimed for it, and has been examined by many practical Clock-makers and scientific gentlemen, with much interest and care, all of whom pronounce it one of the most useful and practical inventions of the age.

In most cases it can be operated by a battery composed of Zinc and Carbon, or Zinc and Copper, placed a few feet under the surface of the earth, (connected with the clock by wires,) which will supply sufficient electricity to run the clock for many years, and probably for ages, without further attention; or it can, in *all* cases, be operated by a "one fluid" battery placed in an apartment in the case, which only requires to be supplied with a little Sulphate of Copper, (Copperas,) once in six or eight months.

The advantages claimed for this Clock over any or all others, are, in part, as follows:

IT NEVER REQUIRES WINDING UP.

IT IS NOT LIABLE TO GET OUT OF ORDER.

Its mechanism is much simpler than that of ordinary

clocks—the entire clock-train consisting of one wheel and a rachet; and the liability to disarrangement or getting out of order proportionately reduced.

Weights or Springs are entirely dispensed with,—and the *resistance* and *friction* caused thereby, together with the consequent wear upon the works, altogether avoided.

The regularity of the movement of the clock is not affected by any ordinary cause of disturbance, such as the trembling produced by the passage of a train of cars or other vehicles, heavily loaded, or by machinery, engines, etc., wherever used.

It never requires *oiling*—therefore the liability to *gumming* and collecting *dirt* and *dust*, and the consequent necessity for frequent cleaning, are entirely done away with.

It is regulated by a simple thumb-screw at the top of the pendulum, the operation being performed without stopping the clock.

It is not affected by the *dryness* or *humidity* of the atmosphere.

It is much less affected by *heat* and *cold* than any other clock.

IT IS THE BEST AND MOST RELIABLE TIME-KEEPER EVER USED. Because when once thoroughly regulated, it requires no further attention.

It is less expensive than any other clock that accomplishes the same purposes, as the chief cost of elaborate and complicated machinery is, in this clock, dispensed with.

A single clock and battery can be connected with numerous extra dials, in as many different rooms or localities, thereby securing uniform time throughout buildings, or from the principal office of a railway to all the stations on their line.

In this clock, the power (electricity) is applied to the pendulum,—by which the machinery is moved; in all other clocks this principle is reversed, the motive power (weights or springs) being applied to the machinery—by which the

pendulum is moved. It will at once be apparent to every intelligent mind that the constant intense strain and pressure upon the machinery by the old method.—the friction resulting therefrom,—the frequent oiling necessitated thereby. —the liability to disarrangement or getting out of order, —the constant variations as the motive power becomes weaker when nearly run down, or stronger when newly wound up,—*are all overcome*: and that in this clock the machinery is absolutely subjected to no pressure or resistance whatever, and so long as the pendulum performs its office, the movement of the clock must be *regular and invariable.*

For the above and other reasons, this clock pre-eminently commends itself to the use of Railways, Factories, Machine Shops, Banks, Banking and Insurance Offices, Hotels, Public Buildings, Stores, Residences, and all other places where correct and reliable time is required; the principle can also be readily adapted to clocks of the largest dimensions, for Towers, etc.

PRESS NOTICES.

AN ELECTRICAL CLOCK in the Rotunda of the Philadelphia Merchants' Exchange has a running gear of the simplest description, consisting merely of two cog wheels and a rachet wheel. The driving power is supplied by a weak galvanic battery, the currents from which, transmitted through two galvanometer coils placed one on each side of the clock case, act upon steel bar magnets set within the pendulum ball. The latter swings between the two coils, so that when one of them is "positively charged" the ball is attracted until by contact it becomes similarly electrified, and consequently repelled, then swinging over to the "negative" coil, it becomes negatively charged, again repelled, and thus the vibrations are kept up indefinitely, or as long as the battery continues working. The alternate positive and negative charges are made and broken by a simple slide bar moved by a wire pin on the pendulum rod.—*Scientific American.*

AN INGENIOUS ELECTRICAL CLOCK.

For several weeks past, there has been in the rotunda of the Merchants' Exchange a novel and ingenious clock, driven by electricity, the running gear of which is of the simplest description. The mechanism that moves the hands consists simply of two cog-wheels and a rachet wheel. This is the whole of it. The driving power is supplied by a weak galvanic battery, the currents from which, transmitted through two coils of wire, act upon steel bar magnets set within the pendulum ball. The mode of operation is as follows: The wires from the positive and negative poles of the battery lead to, or rather are continued, in the two coils just mentioned, which are called galvanometers, and whenever the circuit is complete, one of these coils, is "positively" charged, and the other is "negatively" charged. One of these coils is on the right-hand side of the clock case and the other on the left side, both so situated near the bottom of the case that the ball of the pendulum swings into an open space in the centre of either coil. When the pendulum ball reaches the "positive" coil, it becomes "positively" charged, and is instantly *repelled* according to the well-known law of electricity that any two substances similarly electrified repel each other; and then swinging over to the "negative" coil it there becomes "negatively" charged, and is repelled from that side over to the positive coil again; and thus it is driven from side to side forever, as long as the current of electricity is kept up by the battery. The alternate, pos

itive and negative charges are made and broken by a simple slide bar moved by a wire pin on the pendulum rod. The clock requires no winding, all the parts being moved automatically, and no attention after it is once set and regulated, except to place a spoonful of acid in the battery about twice a year. Clocks made upon the same principle by the inventor of this one have been running for several years, and have been left without attention, and without stopping, in a house closed up from November to July. The one at the Exchange has been there about three weeks, and keeps as correct time as the best watches.

It will be seen that as the currents of electricity supplied by the battery furnish all the motive power, the clock will "go" as long as these currents are kept up.

It is a beautiful and very ingenious piece of mechanism, in which abstract science is applied to every-day art. The inventor is Mr. S. A. Kennedy, an experienced electrician of this city.—*Philadelphia Ledger.*

ELECTRICITY AND CLOCK WORK.

Electricity, combined with clock-work, has been attempted both in Europe and this country, but never yet met with perfect success. We were yesterday shown a clock, which is worked entirely by a current of electricity, in combination with permanent magnets, and which is the nearest approach to "perpetual motion" that may ever be effected. It is the invention of one of our fellow-townsmen, who is well known among electricians. It will never get out of order. The clock has two compartments, the lower and smaller of which contains a small battery, consisting of a pint and a half of sulphuric fluid, with zinc and platina.

There is no "winding up" or other causes for a disarrangement of the works. The upper compartment contains the mechanical and electrical machinery. The mechanical portion is surprising for its simplicity. The pendulum has an automatic circuit connector, so that when it swings to the right, the positive current, passing around the positive polarized magnet, repels it to the left, meeting the negative current, which in turn, in connection with the negative polarized magnet, repels it back to the right, and so on, in uniform and regular beat.

The movement of the pendulum is registered by very simple mechanism to drive the hands. The patentee of this important invention (which seems destined to create a revolution in the clock business) Mr. Kennedy, intends placing one of the clocks in the Merchants' Exchange Rooms during the next week. At present it can be seen at No. 134 South Tenth Street.—*Phil. Morning Post.*

KENNEDY ELECTRIC CLOCK

An exhibition of this clock, to gentlemen of the press, was made on Wednesday, at the rooms of the company in this city. The clock is impelled by the motion of the pendulum, and is of extremely simple construction. The pendulum ball contains a permanent magnet, which is alternately repelled by oblong helices placed on either side of it at a proper distance. The helices connect with a zinc and carbon earth battery, and the circuit is alternately broken by a commutator attached to the pendulum rod, which is of rosewood, baked and saturated with paraffine.

The clock will run without winding, or any other attention, after the primary adjustments are made. It is said that its regularity and accuracy are superior to clocks of any other construction. We may, at some future time, give a more extended description of this invention.—*Scientific American, Oct.* 7, 1868.

MAGNETIC TIME.

There are on exhibition at No. 181 Broadway, several clocks which are of much more than ordinary interest to scientific and business men. They are time-pieces run by electricity, made under the patent of Mr. S. A. Kennedy, of Philadelphia, by the Kennedy Electric Clock Company. Electricity from a small battery is applied directly to the pendulum of these clocks as motive power, and all the machinery required consists of one ratchet and two cog-wheels for the regulation of the hands. All the old weights, springs, and endless conglomeration of wheels are done away with; and in their places are two galvanic coils into which the pendulum ball swings, and a simple slide bar, moved by a pin on the pendulum, which breaks the electric current at each vibration of the latter. But simplicity is only the first recommendation of the electric clock. It requires no winding up—indeed, virtually, no care; and it must keep as nearly perfect time as possible. A battery of the very simplest construction will draw from the ground sufficient electricity to run it, and a hundred clocks may be run by the same battery as well as one. The advantage of such an invention for railroads, manufactories, and large establishments of every description, is seen in a moment; but we are assured that it is practicable for every possible use to which a clock is put, and that it will furnish cheaper and more reliable time than any time-piece now made. At any rate, it is worth seeing and examining by all.—*Home Journal, Sep.* 30, 1868.

An exhibition of an electric clock, the invention of Mr. S. A. Kennedy, formerly of the United States Coast Survey, was given on Wednesday af-

ternoon, Sept. 23d, at No. 481 Broadway, to a large company of railroad directors, scientific gentlemen and journalists. Two specimens of the clock were in operation. The motive power of the first is supplied by a galvanic battery, the currents from which, transmitted through two galvanometer coils placed one on each side of the clock case, act upon steel bar magnets lodged within the pendulum ball.

A light steel wire, worked by a pin in the pendulum, cuts off the electric current from each coil as soon as it has performed its office of repulsion, and lets it on again when the force is again required. The largest clock is supplied with its motive power from the earth, a quantity of carbon being encased in zinc, to which is attached copper wires connecting with galvanometers. The advantages of the invention are, that the clock never requires winding up, is not liable to get out of order, and is exceedingly simple in construction—the entire machine consisting of but three wheels. For railroad purposes this invention will be of much importance, since the same pair of wires may be employed to regulate a number of dials at great distances apart.—*Frank Leslie's Illustrated Newspaper, Oct.* 10, 1868.

THE KENNEDY ELECTRIC CLOCK was exhibited yesterday at 481 Broadway, to a number of journalists and scientific men. It is an astonishing machine. So simple a clock never was invented before. Its mechanism consists solely of a pendulum, holding two magnets, and one wheel moving the hands on the dial-face. Springs, weights, and winding up are dispensed with altogether. The pendulum is kept in movement by two wires connected with the earth. One is furnished with a piece of zinc where it reaches the ground; the other passes through a piece of carbon. One of these wires supplies a current of positive, the other of negative electricity. Each is connected with a coil opposite to the magnets, fixed on the pendulum on each side. The electricity of these magnets is of the same character as that supplied from the earth and concentrated in the coil on its side of the pendulum. Accordingly, when it swings up to that coil it is repelled, and made to swing back toward the other side, where it is similarly repelled. An ingenious little arrangement cuts off the electricity from each coil as soon as it has performed its office of repulsion, and lets it on again as soon as the repulsive force is once more needed.

The movement of the pendulum is regulated by screws, according to the intensity of the electric currents from the earth. The same pair of wires may be employed to move a number of clocks at great distances apart, making them keep time with absolute equality. For railroad purposes this will be of immense utility. The clock can also be kept going by a stationary battery, if from any circumstance it should become difficult to connect the wires with the earth.

Altogether, it seems to us that MR. KENNEDY's invention is one of extraordinary value. The cheapness with which his clocks can be made, and

the long time that they will last, will not be among the least of their recommendations for common use.—*The Sun, Sept.* 24, 1868.

AN INGENIOUS CLOCK.

A most ingenious mechanical work was placed on exhibition at No. 481 Broadway yesterday. It is known as the "KENNEDY ELECTRIC CLOCK." The running gear is of the simplest description. Springs, weights, and winding are dispensed with.

The mechanism consists of a pendulum holding two magnets, and one wheel moving the hands on the dial-face. The motive power is supplied by a weak galvanic battery, the currents from which, transmitted through two coils of wire, act upon steel bar magnets set within the pendulum ball. One of the wires is charged positively and the other negatively, and they are placed near the bottom of the case, so that the ball of the pendulum swings into an open space in the centre of either coil. When the pendulum ball reaches the positive coil it becomes positively charged; it is repelled and swinging over to the negative coil, becomes negatively charged, and is again repelled. It is thus driven from side to side, as long as the current of electricity is kept up by the battery. The alternate charges are made and broken by a simple slide-bar moved by a wire pin on the pendulum rod. The only attention the clock requires is to have a spoonful of acid placed in the battery about twice a year.

The Company also make clocks which do not require even this attention. They are intended for banking houses and other permanent institutions. The wires are extended to the ground, one passing through a piece of zinc, and the other through a piece of carbon.

It is said that several clocks can be made to keep exact time at long distances apart, by wires extending from one battery.—*Evening Post, Sept.* 24, 1868.

Remarks of Prof. R. E. ROGERS, in his lecture on Electricity before the Teachers' Institute, at Horticultural Hall, Philadelphia, Feb. 19, 1868.

Professor Rogers then remarked that, as exhibiting one of the many applications of galvanic electricity and magnetism to useful purposes, he would call attention to a magnetic clock before the audience, the ingenious invention of Mr. S. A. Kennedy, which, from its simplicity of construction and little liability to derangement, promised to prove a success.

It dispenses with all weights and springs, and has in its moving mechanism only a pendulum, two cog-wheels, and a ratchet, the whole being controlled by a feeble galvanic battery, to overcome the friction and the resistance of the air. He stated that the criticism that a variation in the force of the battery would impair the regularity of the instrument as a time-keeper, was without foundation, since it is a well known law that a pendulum of given length will oscillate in the same time whether its arc be a long or a short one.

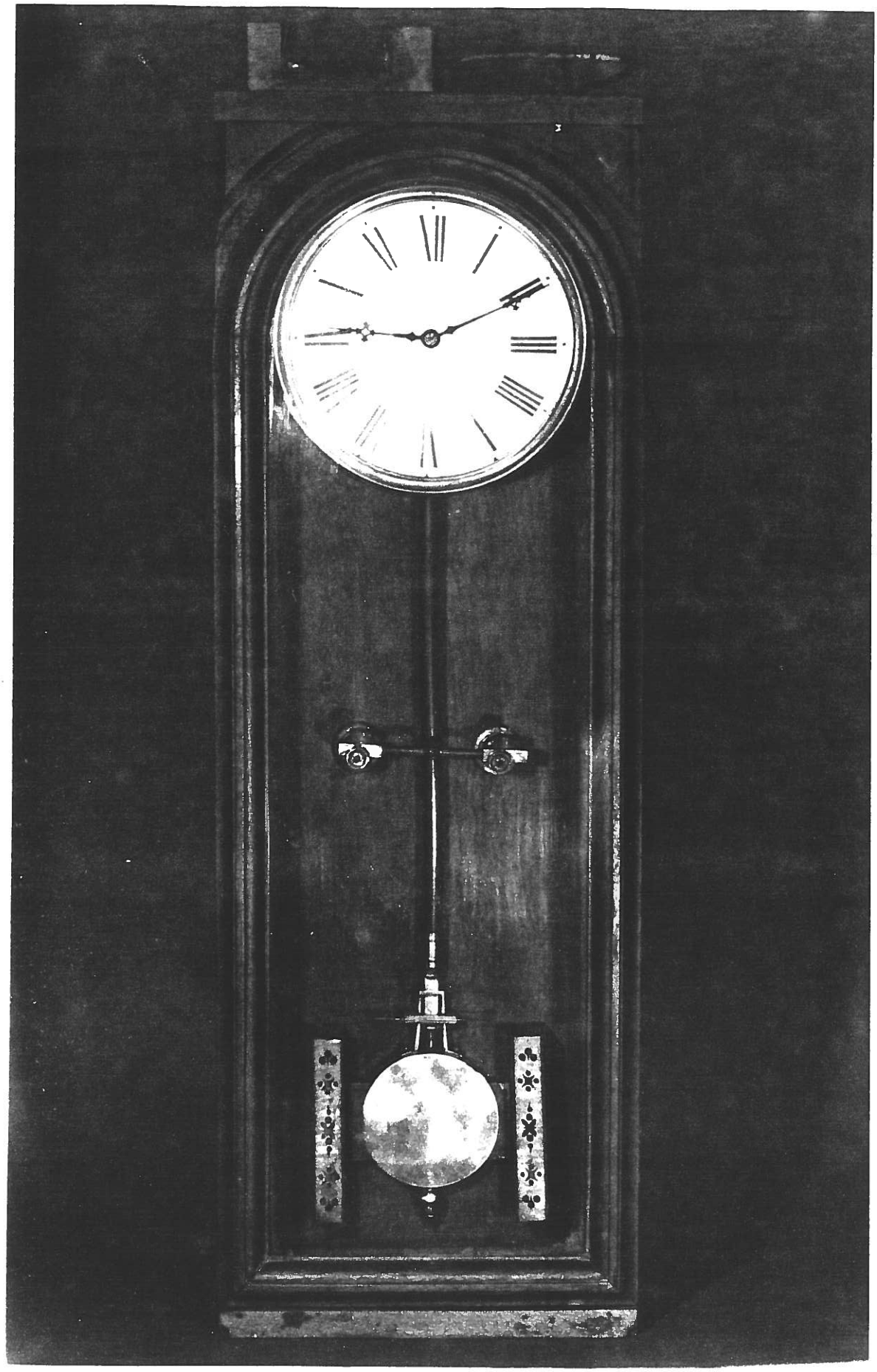
In addition to the foregoing, the following named papers have volunteered favorable notices.

"AMERICAN ARTIZAN," Sept. 30, 1868.
THE STOCKHOLDER, Oct. 6, 1868.
JEWISH MESSENGER, Sep. 30, 1868.
DAILY STAR, Sept. 24, 1868.
THE EVENING COMMONWEALTH, Sept. 24, 1868.
NEW YORK TIMES, Oct. 4, 1868.
JOURNAL OF COMMERCE, Sept. 24, 1868,
and many other prominent Journals.

In offering the "KENNEDY ELECTRIC CLOCK" to public favor, the Company feel every confidence in asserting that it possesses obvious and substantial advantages over any other clock ever in use, in its simplicity of construction, its perfect reliability as a correct time-keeper, the uniformity of its power and action, freedom from all care and trouble in attending to it or keeping it in order; in short, liable to no kind of difficulties or objections, being at once perfect and complete in all its parts. It only requires to be seen and appreciated and it will commend itself to general use.

The Company are now ready to take orders, and to manufacture and deliver Clocks, having already a large number ordered and in process of manufacture; also, to treat with responsible parties for the sale of rights under the patent.

The Public are respectfully invited to visit our rooms and examine the Clocks in operation.



THE KENNEDY CLOCK IN THE NAWCC MUSEUM

S. A. KENNEDY.

Electric Clock

No. 99,321. Patented Feb. 1, 1870.

Fig. 1

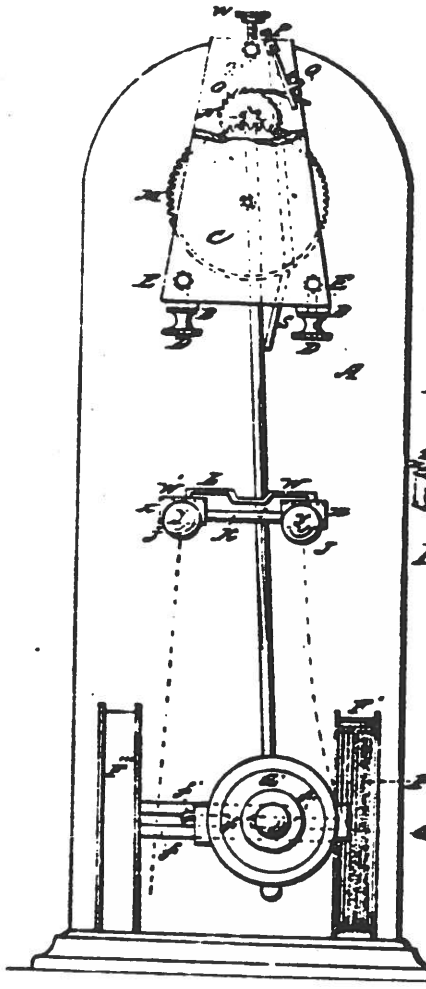


Fig. 2

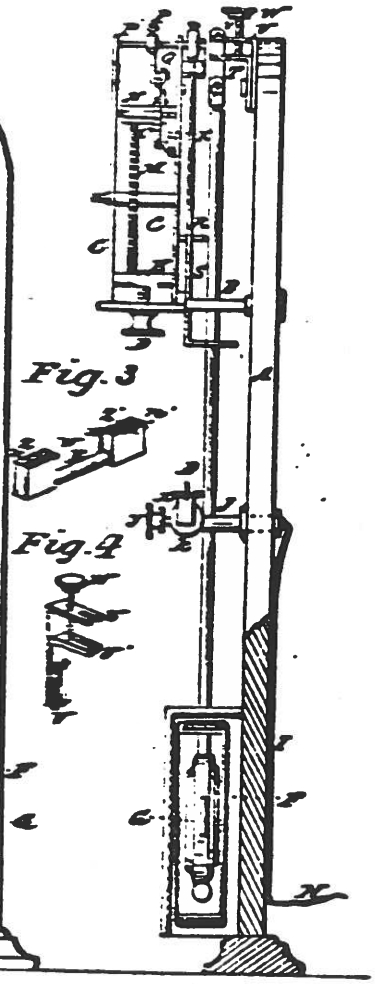


Fig. 3

Fig. 4

Witnesses:

Gustave Dietrich

Wm. F. Clarke

Inventor:

S. A. Kennedy

per Munn & Co

Attorneys

United States Patent Office.

SAMUEL A. KENNEDY, OF ATTLEBOROUGH, PENNSYLVANIA, ASSIGNOR TO THE KENNEDY ELECTRIC-CLOCK COMPANY, OF NEW YORK CITY.

Letters Patent No. 99,321, dated February 1, 1870.

IMPROVEMENT IN ELECTRIC CLOCKS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, SAMUEL A. KENNEDY, of Attleborough, in the county of Bucks, and State of Pennsylvania, have invented a new and useful Improvement in Electric Clocks; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

The nature of the present invention consists principally in the employment of a single wheel in the clock-train to carry the dial-movement, which wheel is driven directly by the pinion of the ratchet-wheel, thus diminishing the resistance in the clock-train, so that the motive-power which is applied through the pendulum, may also be decreased, and the clock rendered more simple in construction, and more accurate in operation, as will be fully understood from the following description, in which—

Figure 1 represents a front elevation of my improved electric clock, parts being broken away in order to show its construction more fully.

Figure 2 is a side view of the same.

Figure 3 is a perspective view of the bridge.

Figure 4, is a perspective view of the adjustable holder for the pendulum.

Similar letters of reference indicate corresponding parts.

A represents a board or tablet, corresponding to the back of the clock-case, to which the several parts of the clock are attached, and from which project arms B B, on which the upright plates C C are supported.

The arms B B are flattened and slotted on that portion on which the plates C C rest, which plates are held secure to the arms B B, by means of screws D D, which run into the pillars E E, which extend between plates C C, as shown.

The electric coil F, enclosed within an ornamental case, F', is a hollow oblong, adapted in form and position to receive the end of a permanent magnet, G, which is carried by or forms part of the pendulum G'; but I also propose, in some cases, to reverse the position of the coil and magnet, using the electric coil on the pendulum, and making the magnet stationary. In either case, the joint repulsion between the coil and magnet, keeps up the oscillations of the pendulum.

Upon the side of the pendulum, opposite the case F', is placed a similar case, F'', merely for ornamental purposes, and containing no coil.

The position of the cases F' and F'', is adjusted by the slotted arm *f*, and the screw *f'*, whereby they are also attached to the back of the case A

The terminals of the electric coil F, extend through the board or tablet A, one connecting directly with the battery, the other extending up to the pillar or support J of the bridge K, which latter is composed of some suitable non-conducting material, and over the top of which, at *z z'*, and from at *x x'*, extend metallic strips to connect with the screws *y y'* of the arms *j f*.

The two supports J J' always remain electrically insulated from each other, except when connected by the metallic slide L, the points of which move in a guiding-groove, *w w'*, which extends across the upper face of the plates *z z'*, and the bridge K, substantially as shown.

The slide L is formed of a single bar of metal, having a depression in its centre, and a shoulder at each side of the depression, as shown, against which shoulders, the pin *l*, projecting from the front of the pendulum, strikes, and thus, by the oscillations of the pendulum, the slide L is moved alternately right and left, and thus the points of the slide L alternately travel upon and beyond the metallic strips *z z'*.

When these points rest upon the strips *z z'*, the battery-circuit is complete through the coil, via the supports I I. The direction of the current must be such that both the coil F and the magnet *m* must present like polarities toward each other.

The circuit is closed at *z z'*, after the magnet *m* has passed into the coil F, and just before the pendulum arrives at the point of rest, when, by the natural repulsion of coil and magnet, the pendulum is driven back to the other end of its arc of oscillation, but just before arriving there, the pin *i* takes the slide L back, and, the circuit is again interrupted, and remains broken, until the pendulum has returned, and the magnet re-entered the coil, as before described.

The lever S, suspended from the rock-shaft P', is moved aside by the pendulum, but returning by its own gravity, drives the clock-train.

The arm in which the pawl *p* is pivoted, is also attached to the rock-shaft P' by the screw P, which serves to clamp and hold the said arm at any desired angle, and by adjusting screw P, the extent of the catch for the pawl may be regulated.

The adjustment of the pawl is also assisted by means of the set-screw Q, which operates on the heel of the pawl.

N is a pinion on the shaft of the ratchet-wheel O, which pinion meshes in the teeth of the train-wheel M, and imparts motion thereto.

By this arrangement of a single train-wheel with the ratchet-wheel, the resistance is diminished, and less driving-power is required.

In order to render the resistance to the pendulum constant, the spaces through which the weight or lever S is carried, must be always equal. To secure this equality of distance, I employ the stop-pin R, or other suitable device, to arrest the descent of the lever S at a fixed point, where the pendulum, by passing on, leaves it, and returning, receives it again.

The pendulum-rod is constructed of wood, kiln-dried,

and filled in with paraffine, glycerine, or other like substance, so as to prevent absorption of moisture.

T is a spring, on which the pendulum hangs. This spring is inserted in slits in the adjustable brackets U U. The portion marked U, is provided with a slot, V, so that it may be moved up or down on the spring T, by turning the thumb-screw W for the purpose of regulating the oscillations of the pendulum.

X is a spring, which bears on the shaft of pinion N, to prevent any retrograde motion thereof.

Having thus described my invention,

What I claim as new, and desire to secure by Letters Patent, is—

1. The method of vibrating a pendulum, having a magnet attached thereto, by the repulsion of a single electric coil, always having the same polarity as the end of the magnet opposite thereto, and whose connection with the battery is intermittently broken.

2. For the use and purposes of an electric clock, the employment of a clock-train, consisting of a single wheel, M, driven directly by the pinion of the ratchet, which is in turn driven by the pendulum-lever.

3. Regulating the angle and extent of catch of the driving-pawl of a clock, by means of the rock-shaft I' and screw P, arranged and operated in the manner described.

4. The combination of the set-screw W, slide U, and its parts, and the spring T at the top of the pendulum, to adjust the length of the latter, substantially as herein shown and described.

5. Rendering the resistance of the lever S to the pendulum uniform, by always arresting the gravitating movement of said lever at a fixed point, in the manner described.

6. Also, the manner of adjusting the position of the electric coil F, by having a slotted bar, Y, with set-screw extending through it into the board or tablet A, substantially as shown.

SAMUEL A. KENNEDY.

Witnesses:
WM. MARTINDELL,
JOE. J. MARTINDELL.

MART

NOTICE: ALL MART ANNOUNCEMENTS ARE PRINTED FREE! Send material to, M. Feldman, 6 Stewart Place, Spring Valley, N.Y. 10977

WANTED: Information, pictures, copies of ads for Waltham Electric Clock Co. wall clock having 90 beat pendulum, 10" dial with no seconds bit. Anthony Prasil, 2179 Titus Ave. Rochester, N.Y. 14622

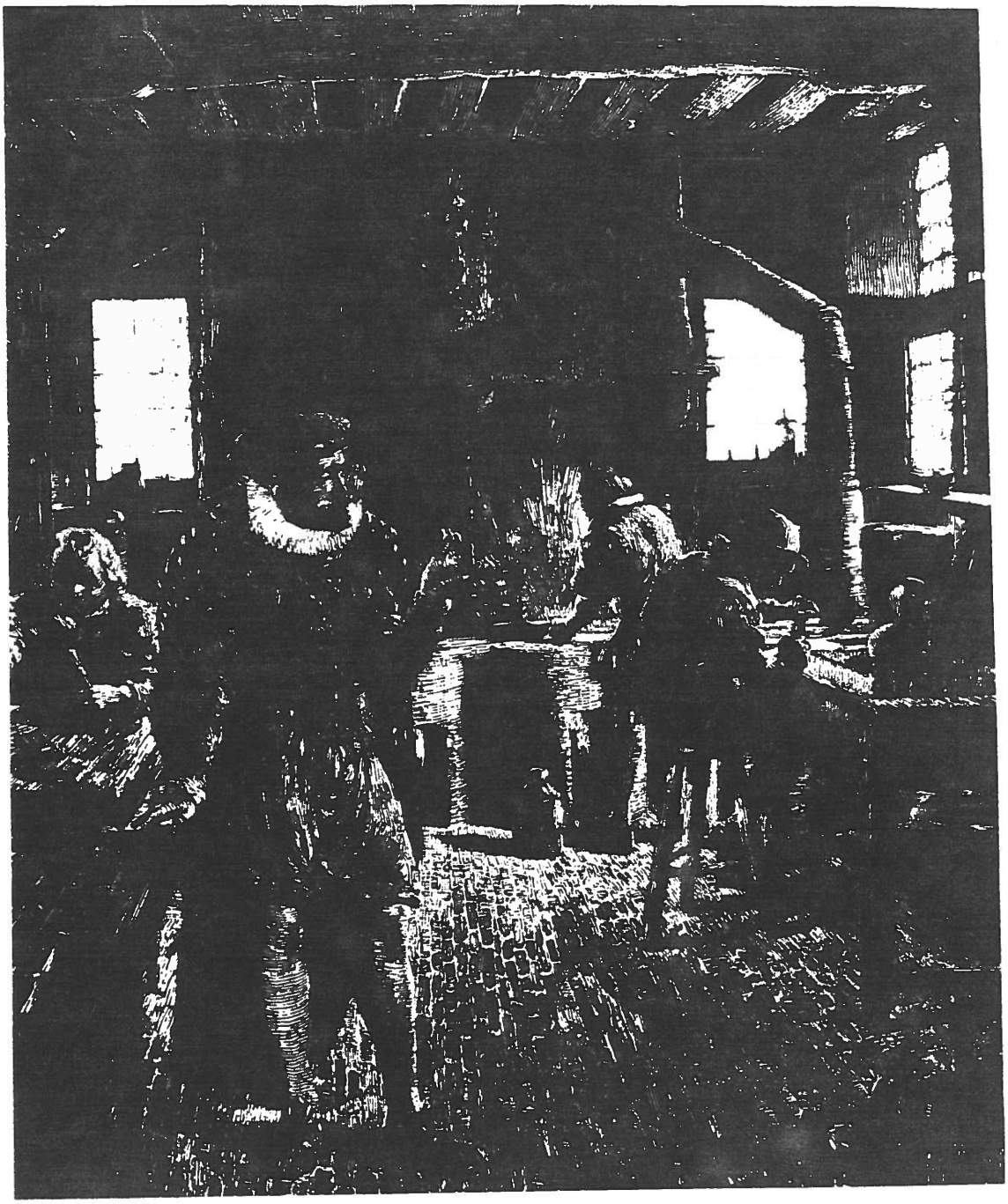
FOR SALE: VERY HIGH QUALITY EARLY BATTERY CLOCKS for the serious collector by Synchronome, Gents, Vaucanson, Leroy, Fully restored. C. Roth, 2 Circle Lane, Roslyn Heights, N.Y. 11577

WANTED: "Junker" early battery clocks, movements, parts, etc. Send details and $ wanted.ELECTRICAL CLOCK LITERATURE for possible reprinting in our Journal. M. Feldman, 6 Stewart Place, Spring Valley, N.Y. 10977

REPAIRS: ALL EARLY BATTERY CLOCKS including Pooles, Barrs, Tiffany Never-Winds, Eurekas, etc. SPECIALIZING IN BULLE CLOCK USING ORIGINAL PARTS. One month maximum time for all repairs. M. Feldman, 6 Stewart Place, Spring Valley, N.Y. 10977

WANTED: Unusual Electrical Clocks, A. Marx, 105 Bayeau Rd. New Rochelle, N.Y. 10804

WANTED: Remote movements or complete dials also entire magneto or magnets only for Magneta Clock. Write or phone, Elmer Crum,8510 Harms Road, Skokie, ILL. or after 7 p.m. C.S.T. Tel. Area Code-965-0188



TEAR OFF AT DOTTED LINE

Please renew my membership in the EHS-Chapter 78 of the NAWCC for 1986.
Enclosed is $10 for dues payable to EHS/% Martin Swetsky.

NAME: _____ NAWCC #_____

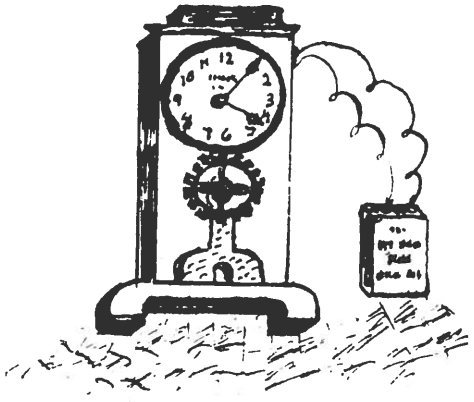
ADDRESS: _____

"HELP KEEP YE OLDE PRINT SHOPPE GOING"

Mail to: M. Swetsky % EHS #78
1910 Coney Island Avenue
Brooklyn, NY 11230

The
JOURNAL
OF THE
ELECTRICAL HOROLOGY SOCIETY
Chapter No 78

April-June 1986
VOLUME XKK--ISSUES #3-4
Martin C. Feldman, Editor



Hello fellow enthusiasts:

In this issue we bring you the completion of the Kennedy Clock manuscript which was begun in our last issue but space precluded printing the earliest patent. The quality is the best we can offer as the master copy leaves a lot to be desired. Of particular interest is the absence of the electro-magnetic coils which normally are located one at each side in the bottom of the case. If you compare the actual production model photograph printed in the last issue with the patent diagram in this issue the discrepancy becomes apparent. However, the coils do appear in the 1870 patent.

We are also printing a flyer describing the Imperial Clock Corp. master clock and are beginning the reprinting of the Standard Electric Time System For Industrial Plants catalog originally publishied April, 1909.

On behalf of the officers and myself, we all wish you a very happy and healthy summer.

Enjoy this issue!

Electromagnetically yours,

Martin C. Feldman,FNAWCC

A Modern Clock

ELECTRIC SELF-RUNNING

You would not buy a key winding and setting watch for service, nor would you buy a new automobile without a starter, so why buy a clock that you have the continual annoyance of winding when you can buy the IMPERIAL ELECTRIC CLOCK that 2 dry cells will run for 1 to 2 years without any attention whatsoever.

The IMPERIAL CLOCK is unsurpassed in accuracy and faithful performance. The IMPERIAL CLOCK is manufactured and sold under letters patent of the United States. It is the only electric clock that is made in appropriate cases for the home. It is weight driven with but one contact, the most simplified electric clock made, almost impossible to get out of order. When batteries become exhausted it requires only a minute to replace new ones, as every detail in making this operation convenient has been looked after.

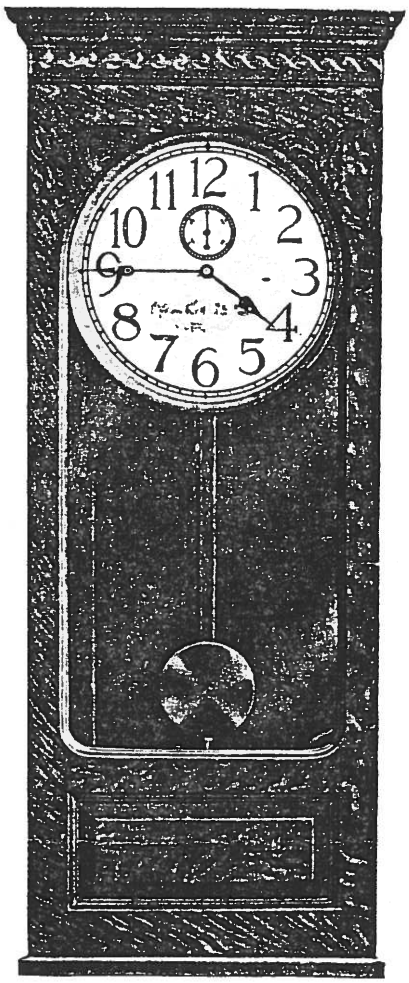
Imperial Clock Corp.

Factory Now Located at HIGHLAND, ILLINOIS

THE IMPERIAL CLOCK CORPORATION, COLLINSVILLE, ILL.

We furnish two Batteries with the Clock. The Clock comes to you ready to run. Use Standard Batteries No. 6, which can be bought anywhere.

Imperial Regulator No. 44



DIMENSIONS

Length 46 inches, width 18 inches, 12 inch silvered dial, Arabic numerals, second hand.

FINISH

This clock is stained, filled, shellaced, glazed, given 4 coats of varnish. It is hand rubbed with punice stone and water and hand polished, insuring the highest finish obtainable. They are finished in either Mahogany or solid Oak, out of selected lumber, and constructed by skilled Cabinet makers. This case has a high grade piano lock which is invisible when the clock is closed.

MOVEMENT

The movement is the Imperial Electric 80 dead beat Graham Escapement, milled wheels, burnished and polished pivots and arbors, extra heavy brass plates, constructed along the finest lines of modern clock making, spun brass pendulum. Movement is fastened on cast iron bracket to insure greatest rigidity.

A High Grade Reliable Time Keeper

It is used a great deal as a jeweler's regulator, and in offices where correct time is essential. A wonderful looking clock.

Sheet 1 of 2 Sheets

S. A. Kennedy

Electric Clock.

No. 71624 Patented Dec. 3, 1867.

Fig. 1

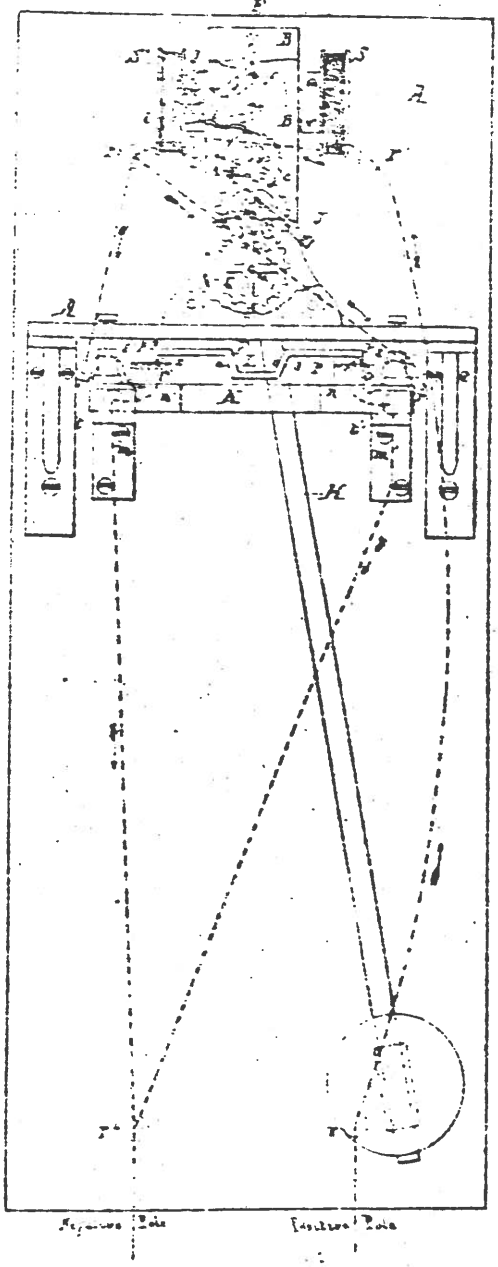
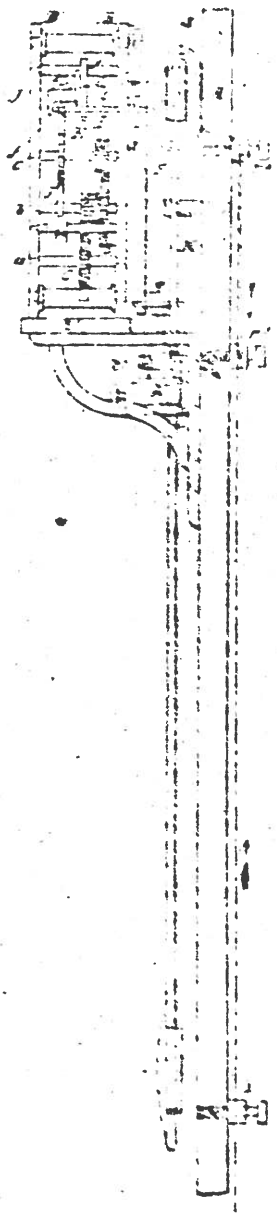


Fig. 2



Witnesses

Inventors

Sheet 2, 2 Sheets

S. A. Kennedy.

Electric Clock.

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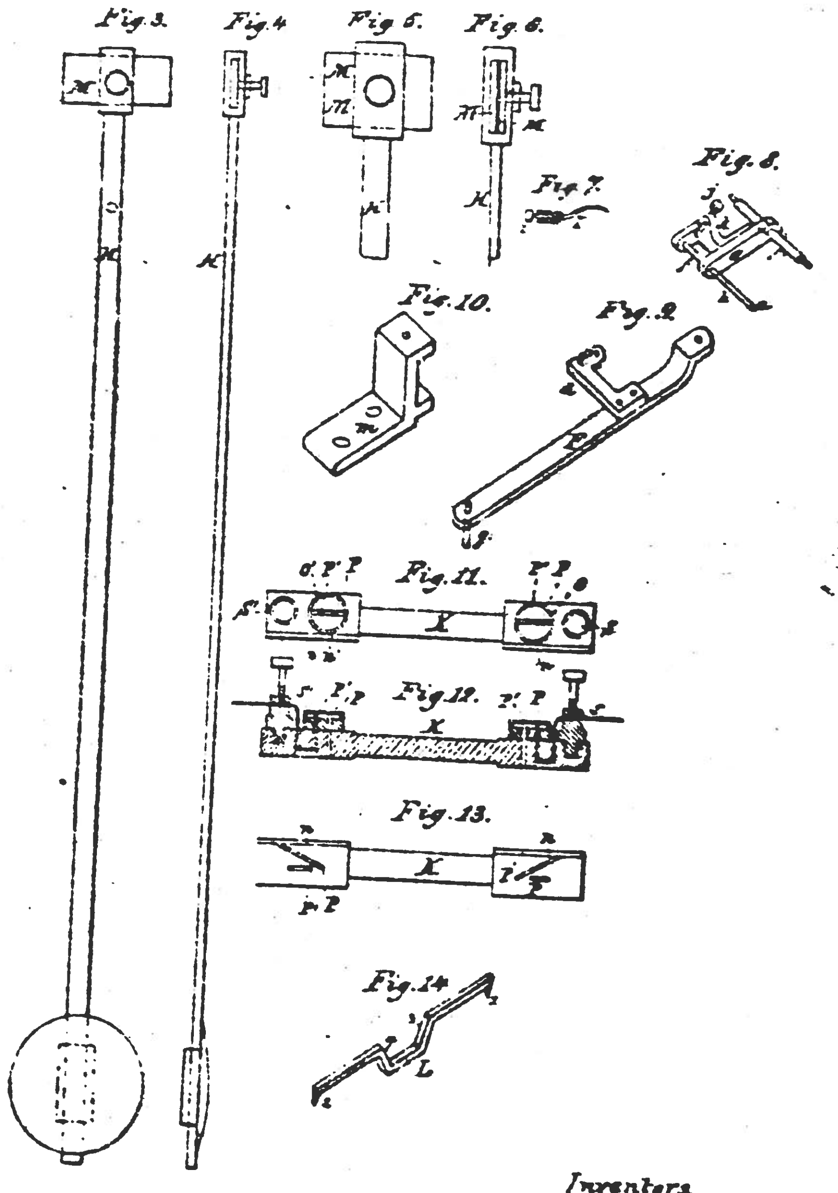


Witnesses

Inventors

UNITED STATES PATENT OFFICE.

S. A. KENNEDY, OF ATTLEBOROUGH, AND S. W. HOLT AND J. GERLACH, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN ELECTRIC CLOCKS.

Specification forming part of Letters Patent No. 71,624, dated December 3, 1867.

To all whom it may concern:

Be it known that we, SAMUEL A. KENNEDY, of Attleborough, Bucks county, in the State of Pennsylvania, and S. W. HOLT and JOSEPH GERLACH, of the city and county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Electric Clocks; and we do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of our invention mainly consists in forming and breaking the connection with the positive and negative poles of a battery by means of a vibrating bar operated by the pendulum, and arranged and operating as hereinafter described.

In the accompanying drawings, which make a part of this specification, Figure 1 is a front elevation of the improved clock. Fig. 2 is an edge view of the same. Fig. 3 is a front view of the pendulum H and magnetic bar M in connection. Fig. 4 is an edge view of the same. Fig. 5 is a front view of a modification of the said bar and pendulum. Fig. 6 is an edge view of the same. Fig. 7 is a vertical section of the pawl I. Fig. 8 is an isometrical view of the locked bar G and parts in connection therewith. Fig. 9 is a like view of the lever F. Fig. 10 is a like view of one of the brackets, *m*. Fig. 11 is a top view of the bridge K. Fig. 12 is a vertical section of the same. Fig. 13 is a bottom view of the said bridge. Fig. 14 is an isometrical view of the bar L.

A is a board to which the several parts of the clock are attached.

A′ is a shelf which supports the vertical plates B B that support the journals of the shafts *a b c* of the center wheel, C, the second-wheel D, and the ratchet-wheel E.

F is a vertical lever, which is actuated by the pendulum H, for giving an automatic motion to the ratchet-wheel E, there being a slot-hole, *e*, in the lever, which receives the pin *f* of the locked bar G, in which the pawl I is hung by means of the horizontal rod *f*. The rear end of the said bar G is permanently fixed to the rock-shaft *f*′. At each vibration of the pendulum from right to left the pawl is drawn outward from the ratchet-wheel by the pendulum bearing against the pin *g* of the said lever F, and when the pendulum swings back to the right the weight of the lever and the forked bar forces the pawl forward until the arm *h* of said bar bears against the edge of the contiguous vertical plate B.

There is a set-screw, *j*, in the lug *k* of the forked bar G, by which the heel end of the pawl is borne down more or less to give a longer or shorter catch of the pawl to regulate the motion of the ratchet-wheel; and there is a set-screw, *l*, in the heel of the pawl for equalizing the balance of do., so as to prevent its falling too hard upon the ratchet.

J is the click-lever.

K is an adjustable bridge, supported by the brackets *m* and *m*′. The bridge is provided with plates *n* and *n*′, that communicate with the magnetic wires, there being insulated projections *o o*′, which have wires *p p*′ and *p p*′ connected with the main-circuit wires.

L is a bar for changing the circuit, it having points 1 2, which communicate alternately at each motion of the pendulum with the wires *p* and *p*′ in the projections *o* and *o*′, the pin *q* of the pendulum bearing alternately against the vertical parts 3 and 4 of the bar, and thus changing the points 1 and 2 with the wires *p p*′ and *p p*′, so as to change the current.

The points 1 and 2 of the bar L, and the upper ends of the circuit-wires *p p*′, in the projections *o o*′ of the bridge K, are of gold. The said projections *o* and *o*′ have grooved facings, as seen in Figs. 11 and 12, to guide the points 1 and 2 of the bar L. The former facing is made of brass and the latter of agate.

The pendulum H is shown in detail, Figs. 3 and 4, Sheet No. 2, the forked bar G and parts attached in Fig. 8, the lever F in Fig. 9, one of the brackets, *m*, in Fig. 10, the bridge K in Figs. 11, 12, and 13, and the sliding bar L in Fig. 14. The arm *h* and pin *e* may be an extension of the rod *f* in the forked bar G, as represented in Fig. 8.

The pendulum H has a magnetized bar, M, which is actuated to produce the vibration of the pendulum by the galvanometers S and S′, that are, in the drawings, placed above the center of motion. They may, however, be

placed below the center, when desired, as the same result would be produced. We contemplate using four or more galvanometers when we want a powerful current, and also having a plurality of the magnetized bars M in the pendulum H. In Figs. 5 and 6 four are represented, which are insulated on their bearings by means of a thin coating of wax, or otherwise.

The circuit-wire, commencing with the platinum or positive pole of a battery, passes through the button r, and thence through the button r' to the galvanometer S, and from that to S', as indicated by the arrows, and through the button r^2, and thence through the button r^3, and through the stud s on the bridge K; thence through the projection o, where it forms the point p. The wire passes from thence through the screw t, which communicates with the bracket m, to which is connected the wire leading to the negative pole of the battery through the button r^4. The current is formed when the pendulum is swung to the right, as represented in the drawings; but when it is swung to the left it moves the sliding-bar L so as to bring the points 1 and 2 into connection with the points p' p' of the projections o and o', thus changing the current as it passes from r^2 to r^3, thence through the stud s', and thence to the point p' in the projection o' on the bridge K, where it communicates with the sliding bar L, at the point 2, and passes through said bar to its point 1, where it communicates with the wire p in the projection o; thence to screw t' in the bracket m', communicating with the wire leading to the negative pole of the battery through button r^4. When the pendulum comes into the position as it now stands the polarized bar M is in connection with the galvanometer S', and being repelled by the same the motion of the pendulum is changed from right to left, and when it reaches the galvanometer S the sliding bar L closes the circuit with the said galvanometer, and the pendulum is again repelled back to the right, and thus the movement is continuously kept up.

What we claim as new, and desire to secure by Letters Patent, is—

1. The combination and arrangement of two or more galvanometers with one or more polarized steel bars, combined with the pendulum, and arranged either above or below the center of motion, substantially as described, and for the purpose set forth.

2. Producing a double automatic circuit by means of the combination of the pendulum H with the sliding bar L, arranged and operating in relation to the electric wires p and p', which project to the surface of the projections o and o' of the bridge K, substantially as described, and for the purpose specified.

3. The combination and arrangement of the electric wires with the batteries, the galvanometers S and S', the sliding bar or circuit-changer L, and the bridge K, so as to produce a double-acting circuit by means of the motions of the pendulum, substantially as described.

4. The combination of the ratchet-wheel E with the pendulum H, by means of the lever F, forked bar G, and pawl I, arranged and operating in relation to each other substantially as described, and for the purpose specified.

5. The combination of the ratchet-wheel shaft e with the shaft a, by means of the wheels C and D, and pinions V and V', substantially as represented.

6. The combination of the set-screw j with the forked bar G and pawl I, substantially as and for the purpose set forth.

In testimony that the above is our invention we have hereunto set our hands and affixed our seals this 29th day of March, 1867.

SAML. A. KENNEDY. [L. S.]
S. W. HOLT. [L. S.]
JOS. GERLACH. [L. S.]

Witnesses:
JOHN WHITE,
STEPHEN USTICK.

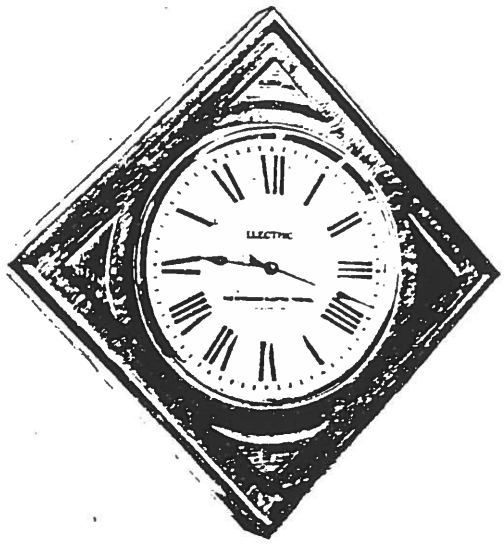
THE INDUSTRIAL INSTRUMENT COMPANY

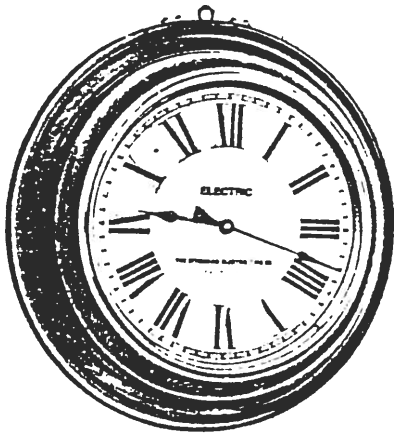
General Office

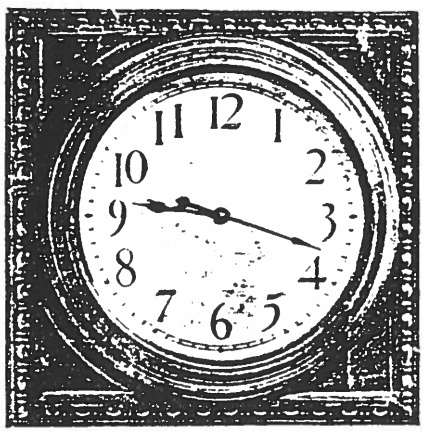
NEW YORK, 50 Church St. Hudson Terminal — FOXBORO, MASS., U.S.A. — CHICAGO, Monadnock Building

BULLETIN No. 22 — APRIL, 1909

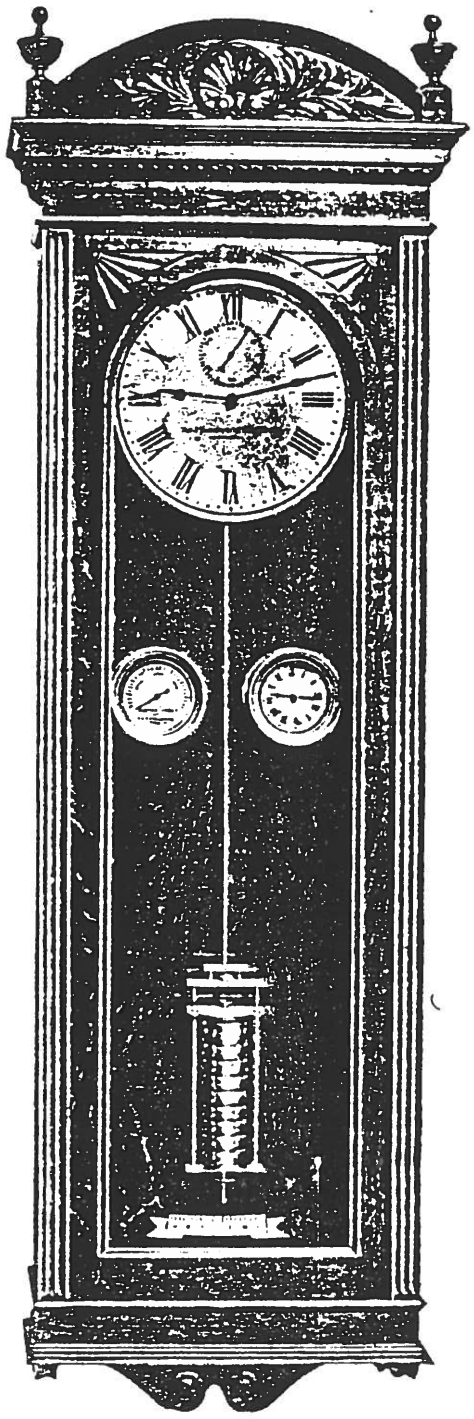
Standard Electric Time Systems
For Industrial Plants



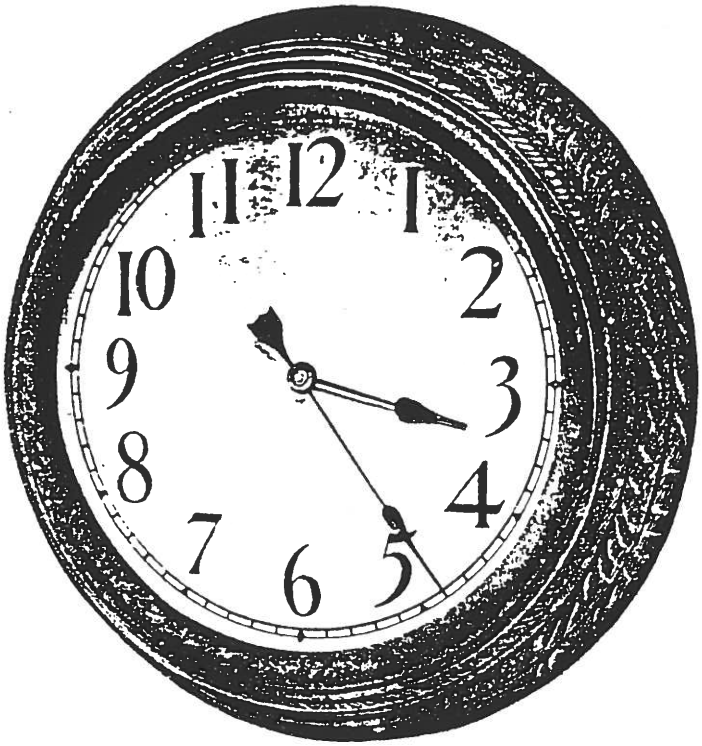




SECONDARY CLOCKS OPERATED ELECTRICALLY THROUGH THE MASTER CLOCK



ELECTRIC SELF-WINDING MASTER CLOCK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MEASURING TIME

CHRONOMETRY, or the science of measuring time, has many branches, many uses and many implements. In it all men are interested.

This interest may vary from that taken in the highest scientific measuring of time, or the recording of minute intervals by means of the most precise chronometers or chronographs, to the ordinary winding clocks and watches of more or less doubtful accuracy. These domestic timekeepers are vastly more numerous than any other, since they can be made for an amount within the reach of almost any one, and keep time that is close enough for many individual requirements.

In public or semi-public places it is necessary, however, to measure and indicate time with greater precision and, above all, to prevent discrepancies occurring between different time indicators and the standard time.

The time factor enters so generally into the purchase of labor and into the productive capacities of machines that it is a potent consideration in most industrial undertakings.

A system, therefore, which is capable of maintaining a high degree of precision in measuring time, and which insures the synchronous operation of all timing devices, requiring no winding or setting, is one sure to appeal strongly to the engineering and industrial world.

This bulletin will, therefore, be devoted to the presentation of some engineering data on the system manufactured by The Standard Electric Time Company, and a few of the applications of this system to industrial work.

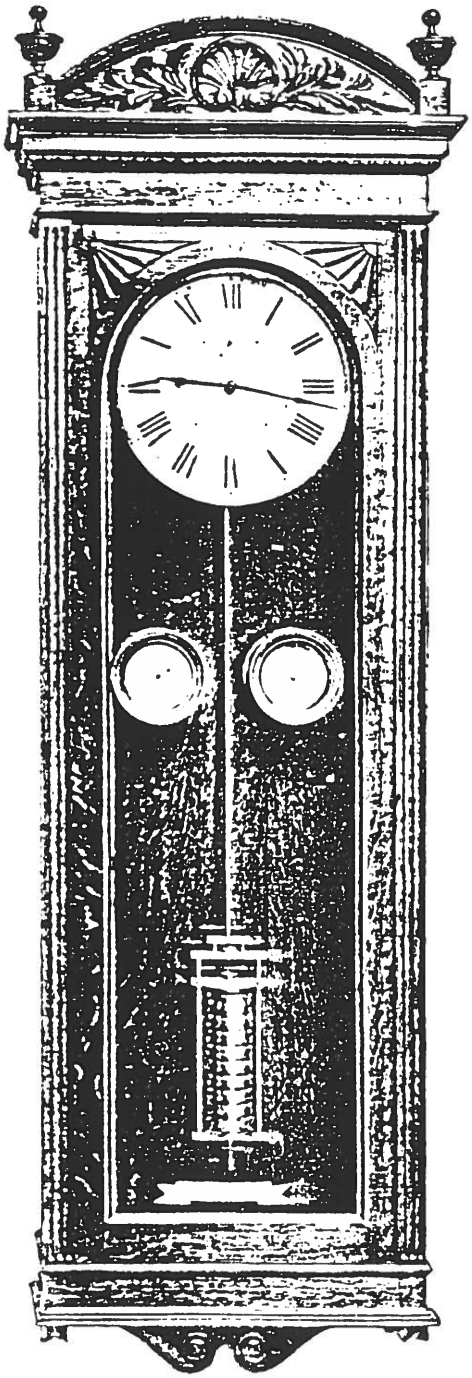


Fig. 12

No. 30. SELF WINDING MASTER CLOCK OR REGULATOR

No. 1 Movement, Cut Steel Pinions, Mercurial Compensating Pendulum, seconds beat; Dial 12 inches in diameter; Quartered Oak Case, 72 inches high, 20 inches wide; Pilot Dial and Battery Gauge in Case. Escapement with screw adjustment.

Price of Single Circuit, Metal Pendulum No. 30 Clock . . . $210.00
Price with Mercurial Compensating Pendulum 270.00

AN OUTLINE OF THE STANDARD SYSTEM

THE "Standard" time system consists of an electric self-winding Master Clock or regulator, through which electrical energy is sent out at precise time intervals to the secondary apparatus which is driven thereby.

It is, therefore, an electric system, automatically operated, the energy for the operation of which is supplied from a primary or storage battery, the size and character of which depend on the requirements of the system to be installed.

The Master Clock has a pendulum escapement, and is so designed and made that it is capable of the closest regulation. From month to month it may be checked against observatory time and corrected if necessary. Every possible care is exercised in making the Master Clock an accurate timekeeper, since it controls all the other time-measuring devices in this system, so that their precision is equal to its own.

This is accomplished by operating all the secondary timekeeping instruments through the Master Clock, as will be described more in detail below.

Any number of secondary devices may be controlled by one Master Clock. These may be located wherever it is advantageous to have time indicated, or timing devices controlled, in one building, plant or community. Similarly, the Master Clock controls the Program clock, which is designed to automatically actuate signal bells or other apparatus.

Since only low voltage electric connections are necessary between the Master Clock and the other parts of a Standard Time System, it is elastic in its adaptability and presents no wiring difficulties not found in telephone or telegraph work.

On the sixtieth second the Master Clock closes the battery circuit to the Secondary apparatus directly or through relays, thus energizing their operating magnets for one-third of a second, or long enough for the secondary circuit devices to be brought into synchronism with the Master.

In the Standard Systems, therefore, the hands of the Master Clock move every second, but the secondary apparatus is actuated once a minute on the sixtieth second. Systems have also been designed in which the Secondary clocks move on the thirtieth and sixtieth seconds, or oftener per minute if necessary.

The bearing of this minute impulse system on precision may be illustrated by an application in testing work when simultaneous readings should be taken. The clocks from which the observers take their time are in synchronism, no matter how many nor how widely separated, provided they are controlled through the same Master. In even fine watches or independent clocks this uniformity is an impossibility.

Close attention and judgment must be exercised in observing the minute and second hands of the ordinary watches and clocks so as to take readings exactly on the minute. With the "Standard" System of Secondary Clocks the operator need only watch the clock as the time approaches for taking readings, and precisely on the minute the minute hand will move forward, thus giving a clean-cut time signal that cannot be mistaken, and requires no judgment for its interpretation.

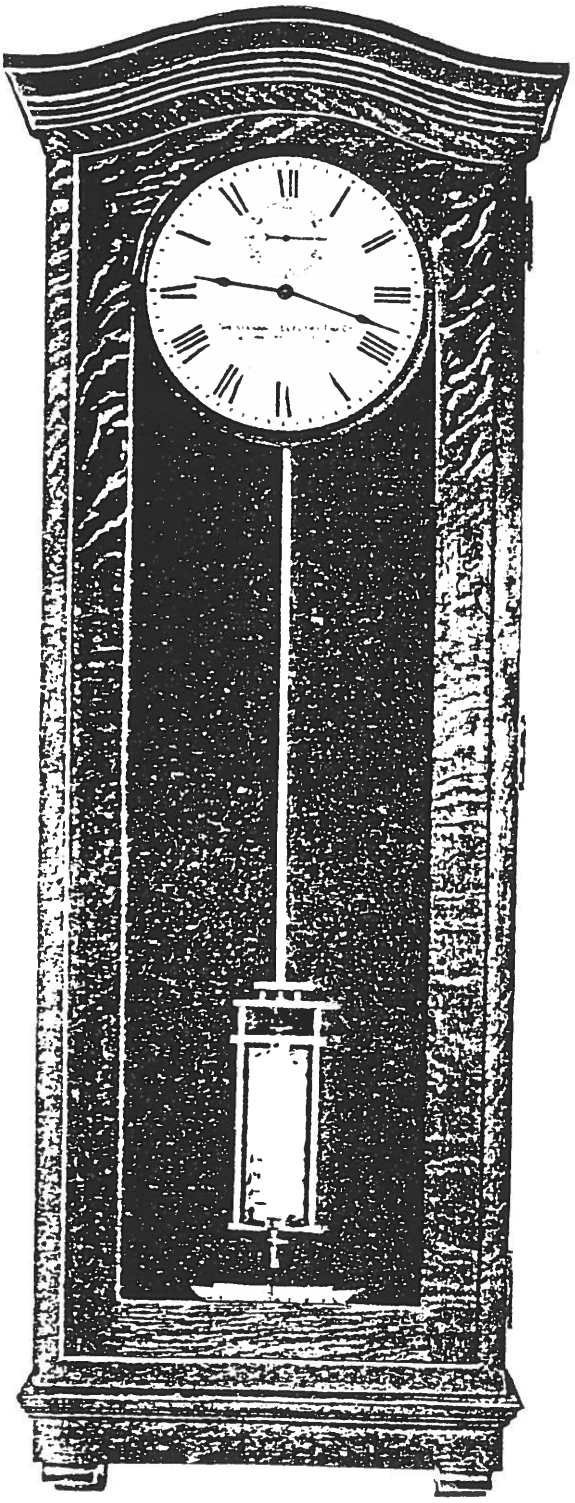


Fig. 480

No. 40. SELF WINDING MASTER CLOCK

With No. 1 Movement, Cut Steel Pinions, Mercurial Compensating Pendulum, Seconds Beat. Pilot Dial and Battery Gauge in Case. Escapement provided with screw adjustment. Diameter of Dial, 12 inches; Height of Case, 63 inches; Width, 23 inches; made of Quartered Oak

Price, $140 00

THE MASTER CLOCK

SINCE the Master Clock is the distributor of time in the "Standard" System, its design has received the closest study, and the mechanical and electrical details that have been adopted are those approved by long experience.

The resulting Master Clock mechanism is extremely simple in its present form, and embodies the fewest working parts.

The base of the clock frame holds the winding magnet, the circuit to which is closed once per minute.

The clock spring is of helical form mounted on a sleeve concentric with the main arbor bearing the hands. One end is attached to the main wheel and the other to the ratchet winding wheel. This winding wheel is driven by a pawl from the winding magnet armature, one impulse of which winds the spring an amount which will drive the clock one minute, when it is again wound to its stop. This spring has a reserve power sufficient to run the movement for fifty-four minutes without any battery connection, thus assuring the operation even after the winding battery has given fifteen or eighteen months' service, and is in need of repair; that is, the movement would have to miss fifty-four times from weak battery before it would stop. A contact key in the Master Clock case permits a test of the battery from time to time if desirable.

In this design the spring is kept at a practically constant tension, assuring the closest regulation. It does not have to operate through an attendant train of reducing gears as in common practice.

Being pioneers in the development of electric clocks, twenty-five years' experience has taught that having a positive mechanical and electrical principle, success lies in the simplicity yet positiveness of the circuit-closing apparatus.

In the "Standard" Master Clock, therefore, there has been used for many years a contact device patented by the makers which is simple, durable and positive. An insulated arm is mounted on the verge staff and oscillates with each beat of the pendulum. This arm projects downward so that the path described by its end is tangent to the circle described by the end of a contact arm fixed to the escape arbor and rotating with same. Once per minute, therefore, the rotating arm comes in the path of the oscillating arm and a positive rubbing contact is effected for one-third of a second. This rubbing contact is in the same direction of motion as the clock movement, and is made at the end of the arc described by the pendulum, so as not to oppose the accelerating impulse. Consequently a self-cleaning friction contact is made without any retarding effect on the clock movement or driving power.

This contact is flexible and positive in operation. It insures the minimum current consumption with the sure operation of Secondary apparatus; resulting in reliable service, long life of battery and minimum maintenance expense. These contact pieces are iridium platinum tipped to make them durable. Provision is made for their renewal if it should be necessary.

The escapement of the "Standard" Master Clock is provided with screw adjustments. This is an important feature which permits the regulation of the beat, even if the clock is not exactly plumb.

The pendulum is usually of the seconds beat type. The metal compensating form of pendulum is capable of close regulation, but for the finest precision work a mercurial compensating pendulum having micrometer adjustment is employed.

The selection of the proper materials for the parts in the Master Clock affects its wearing qualities to such a degree that attention has been given to the smallest details so as to produce

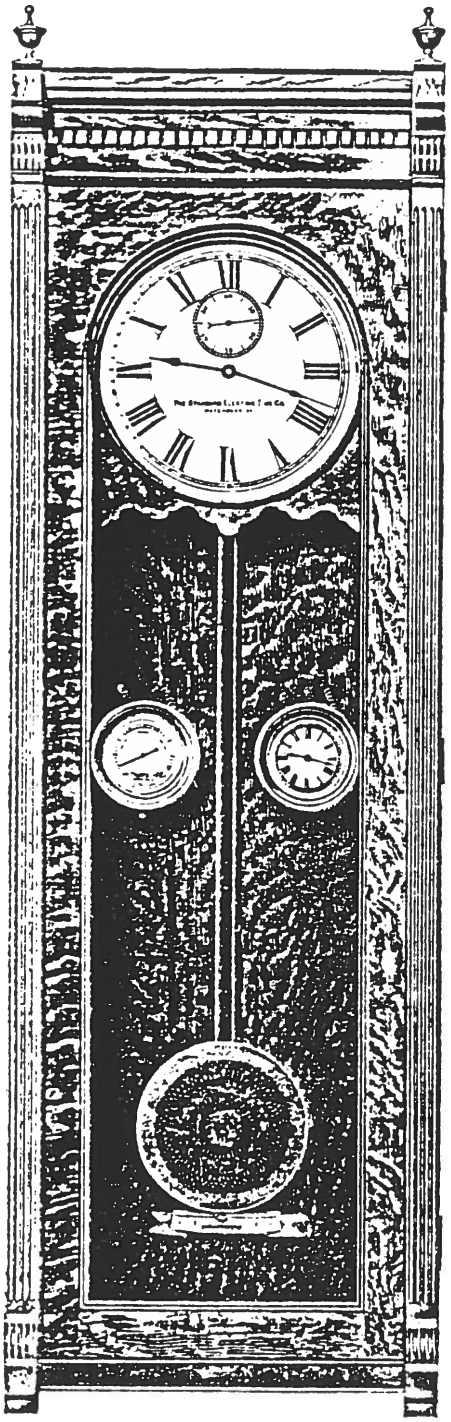


Fig. 560

No. 20. SELF WINDING MASTER CLOCK OR REGULATOR

With No. 1 Movement, Cut Steel Pinions, and Seconds Beat, Metal Compensating Pendulum. Dial 12 inches in diameter. Quartered Oak Case, 64 inches high, 20 inches wide. Pilot Dial and Battery Gauge in Case

Price for Single Circuit System No. 20 Clock, $198.00

a mechanism of component serviceable parts. The "Standard" Clock is a machine always in motion; hence the parts are made as durable as they can be devised.

The Master Clock case is usually made of selected quartered oak, though it may be of other wood, and will be finished to match standing woodwork, if sample is furnished. It is handsome in design and finish so as to be an ornament to any office in which it is located. Access to the clock and the necessary buttons and switches that may be located in the case is given by a door which is provided with lock and key.

Convenient connections for the clock circuits are placed in a space for this purpose at the top of the clock case where they are easily accessible.

Besides the dial of the Master Clock, which is usually twelve inches in diameter, the case contains a battery gauge which is automatically cut in once a minute, so that the battery strength can be noted. Also a pilot dial or small Secondary Clock for every Secondary Clock circuit controlled by the Master.

These pilot dials are in synchronism with the clocks on their particular circuits, and, therefore, show absolutely that these secondary circuits are in unison with the Master.

Switches in the Master Clock are used in starting or setting the Secondary clocks, the pilot dials indicating the Secondary circuit time facilitate this work.

For winding the Master Clock two cells of No. 3 Samson or battery equally efficient are employed. Other cells of similar type are used for the Secondary Clock circuits, bell circuits, etc. When more than three circuits are to be installed, especially in the industrial application of this system, a duplicate set of B. T. or C. T. Storage Battery should be used (size of battery depending on requirements of system). For further data see pages 34 to 38.

With such installations the best practice is to charge the battery and distribute its energy through a separate switchboard fitted with a "Standard" charging and automatic circuit breaker, voltmeter, etc. In this case all switches, keys, circuit indicators, etc., are located on this board.

Switches for the control of moderate-sized equipment may be located in the extension base of the Master Clock, or for a system of more than four circuits at some convenient location in the same room with the Master and Program clocks.

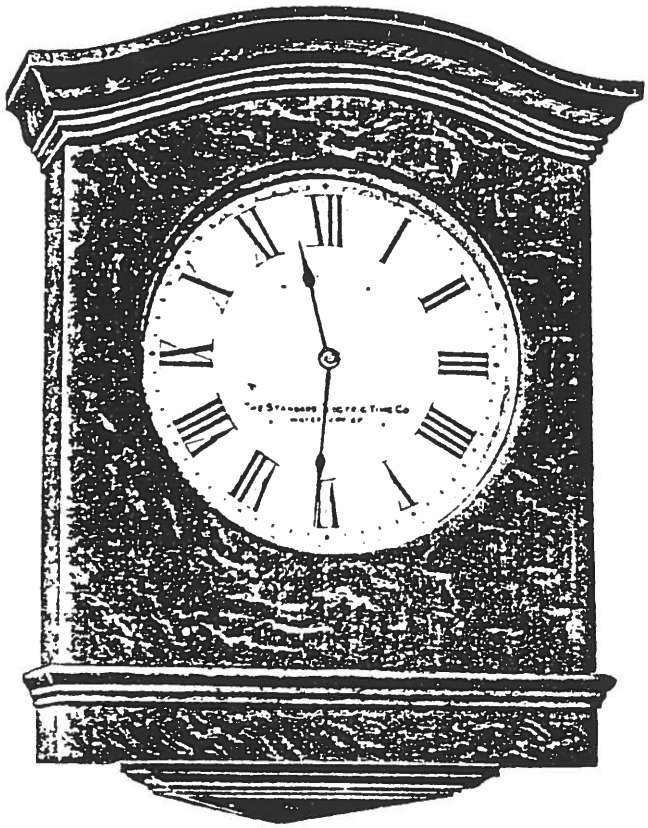


Fig. 15

SELF WINDING CLOCK, 120 BEAT

May be used as an Individual Clock, or any number of these Clocks may be synchronized by a Master Clock. The operating batteries are placed in the Clock Case

PRICES

12 inch dial, $35.00 14 inch dial, $40.00

MART

NOTICE: ALL MART ANNOUNCEMENTS ARE PRINTED FREE! Send material to, M. Feldman, 6 Stewart Place, Spring Valley, N.Y. 10977

WANTED: Information, pictures, copies of ads for Waltham Electric Clock Co. wall clock having 90 beat pendulum, 10" dial with no seconds bit. Anthony Prasil, 2179 Titus Ave. Rochester, N.Y. 14622

FOR SALE: VERY HIGH QUALITY EARLY BATTERY CLOCKS for the serious collector by Synchronome, Gents, Vaucanson, Leroy, Fully restored. C. Roth, 2 Circle Lane, Roslyn Heights, N.Y. 11577

WANTED: "Junker" early battery clocks, movements, parts, etc. Send details and $ wanted.ELECTRICAL CLOCK LITERATURE for possible reprinting in our Journal. M. Feldman, 6 Stewart Place, Spring Valley, N.Y. 10977

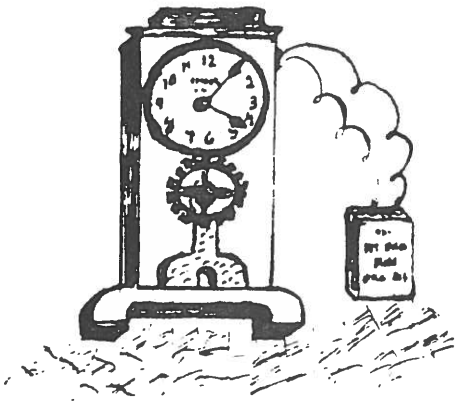
REPAIRS: ALL EARLY BATTERY CLOCKS including Pooles, Barrs, Tiffany Never-Winds, Eurekas, etc. SPECIALIZING IN BULLE CLOCK USING ORIGINAL PARTS. One month maximum time for all repairs. M. Feldman, 6 Stewart Place, Spring Valley, N.Y. 10977

WANTED: Unusual Electrical Clocks, A. Marx, 105 Bayeau Rd. New Rochelle, N.Y. 10804

WANTED: Remote movements or complete dials also entire magneto or magnets only for Magneta Clock. Write or phone, Elmer Crum,8510 Harms Road, Skokie, ILL. or after 7 p.m. C.S.T. Tel. Area Code-965-0188

The
JOURNAL
OF THE
ELECTRICAL HOROLOGY SOCIETY
Chapter No 78

July-September 1986
October-December 1986
VOLUME XII-Issues #3-4;7-8
Martin C. Feldman, Editor



Hello fellow enthusiasts:

This combined extra-paged issue marks the last issue you will receive under my editorship. With it Volume XII of the Journal of the Electrical Horology Society is completed. However, this is NOT the end of the Journal nor of the Society. With your continued support both will remain vital for many years to come. I hope you will all give your support to the new Officers and Editorial Board.

It has been a little over 14 years since the first issue of the Journal was published in mimiographed form. Since then well over 1000 pages of information relating to electrical horology have been sent out to our members. Original articles, out-of-print catalogs, repair manuals, and patents were among the contents of the Journals and I hope, at least, most of the material was of interest and more importantly, of use, in our stated goal of, "dissemination of knowledge about early electrical timepieces."

I wish to thank all the members who contributed material to the Journal for publication and also those who did not contribute material as well. Because, without everyone's support be it in material, spirit, financial and time we would not have been able to remain the NAWCC Chapter with the longest continuous regular publication!

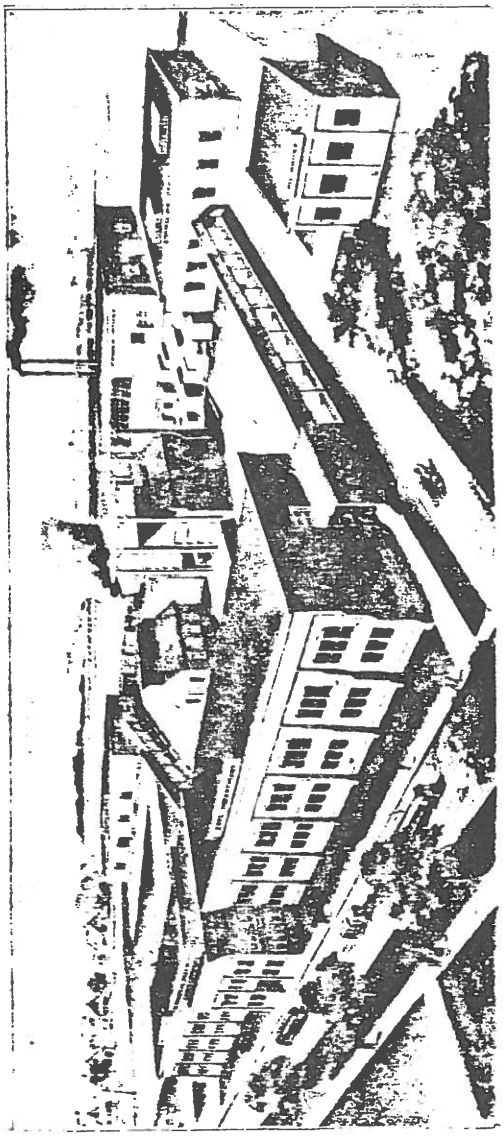
I wish the incoming Officers and Editorial Board all the good luck in their efforts with Chapter 78. With your support and mine we shall have a successful organization which will grow for many years to come.

Electromagnetically yours,

Martin C. Feldman, FNAWCC

Martin C. Feldman

THE NATIONAL SELF-WINDING CLOCK COMPANY, CHAMPAIGN, ILLINOIS.



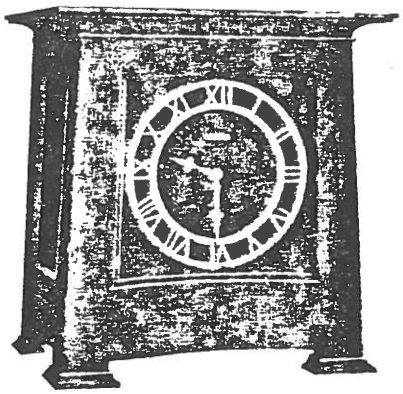
General Offices and Factory of The National Self-Winding Clock Company, Champaign, Illinois.

¶ We present for your consideration a line of Self-Winding Clocks adaptable for use where ever accurate time is desired.

¶ A clock for the home that winds itself, and strikes the hour and half-hour.

¶ A clock for the office that winds itself and keeps a dependable time for all occasions.

National Self-Winding Clock Company,
CHAMPAIGN, ILLINOIS.



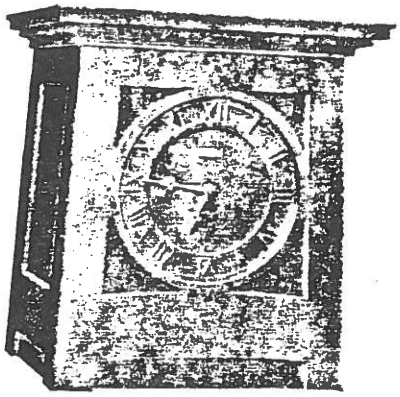
Cabinet Style No. 6.

Pendulum movement
Hour and half-hour strike
Patent regulator
Dial diameter 6 inches
Finished in gold
Height 11⅝ inches, width 11 inches
Quarter sawed oak case, Price $12.00
Mahogany case, Price $14.00

¶ SPECIAL—Cabinet Style No. 6 same as above in Quarter sawed oak case—Time only—Price $10.50
Solid Mahogany case—Time only—Price $12.50

¶ The National Self-Winding Clock is wound automatically by an electric current from cells of a dry battery contained within the case and is the first successful self-winding clock movement ever made that is so simple and practical that any jeweler can take it to pieces, clean and oil if necessary, and put it together again; with as little delay as in the cleaning of the ordinary clock.

¶ The electric mechanism never forgets the winding time—consequently the clock winds itself continuously without attention.

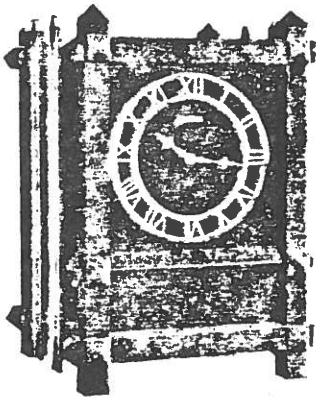


Cabinet Style No. 7

Pendulum movement
Hour and half-hour strike
Patent regulator
Dial diameter 6 inches
Finished in gold
Height 12½ inches, width 11 inches
Quarter sawed oak case, Price $12.00
Mahogany case, Price $14.00

¶ SPECIAL—Cabinet Style No. 7 same as above in Quarter sawed oak case—Time only—Price $10.50
Solid Mahogany case—Time only—Price $12.50

¶ The National Self-Winding Clock is run by a spring electrically wound once in every seven to eight minutes. The device technically termed the "contact" (by means of which the electrical current is caused to act upon the magnets and wind the clock) is theoretically and practically perfect. It is a contact which instantly solders and unsolders the wire, thereby restoring at the time of contact, the full capacity of the wire and eliminating entirely the contact troubles, which have caused failures in all electric clocks up to the present time.



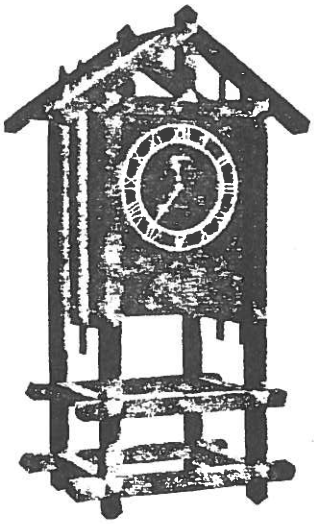
Mission Style No. 49

Pendulum movement
Hour and half hour strike
Patent regulator
Dial diameter 6 inches
Finished in gold
Height 13 inches, width 9¾ inches
Mission oak case
Price $9.00

¶ SPECIAL—Mission style No. 49 same as above—Time only—Price $7.50

¶ The time of winding is less than one-fortieth of a second in each seven to eight minutes—no wasted electrical energy can occur as the proper winding of the spring opens the circuit—thus making the life of the batteries many times longer than in those where the contact is limited by the motion of the train of the clock and contact is only broken when the movement of the clock breaks it.

¶ The National Self-Winding Clock is so superior to old fashioned key-winding clocks that it will replace them as surely as the stem-winding watch displaced



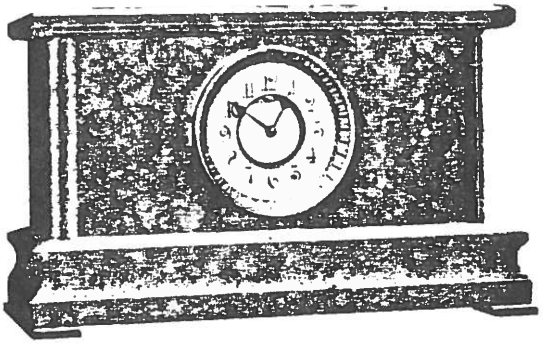
Mission Style No. 48

Pendulum movement
Hour and half-hour strike
Patent regulator
Dial diameter 6 inches
Finished in gold
Height 24 inches, width 13 inches
Mission oak case
Price $10.00

¶ SPECIAL—Mission style No. 48 same as above—Time only—Price $8.50

the key-winding watch. Aside from the great convenience of never having to wind, the time is more accurate than that of the key-winding clock, as the spring tension is as uniform as in weight clocks, on account of being wound every seven to eight minutes. Even tension in the out-of-date key-winding clocks is impossible with the spring wound once in seven or eight days, as the strong tension on such a spring when fully wound, causes the clock to gain during the first two or three days, and lose during the last three or four days.

¶ The National Self-Winding Clock is the only self-winding, striking, mantle clock made in the United States. There is sufficient power in addition to winding the clock, to also wind the striker for the hour and half-hour.



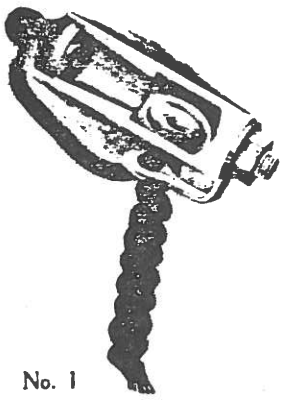
Mission Style No. 47

Pendulum movement—Hour and half-hour strike—Patent regulator—Dial diameter 5½ inches—Height 10½ inches, width 17¾ inches—Quarter sawed mission oak case—Porcelain dial—Price $11.50—Paper dial $10.50

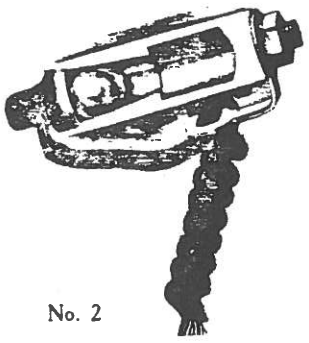
¶ SPECIAL—Mission style No. 47 same as above—Time only—Porcelain dial $9.50—Paper dial $8.50

¶ The National Self-Winding Clock is regulated through a slot in the dial, and once properly regulated will last a life-time without other attention than occasionally setting and replacing the batteries in twelve to eighteen months—one set of batteries have lasted 33 months. Batteries may be secured from your jeweler.

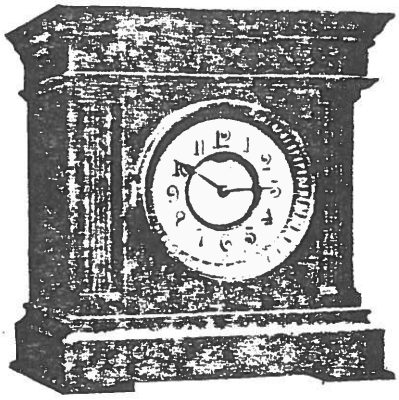
In illustration No. 1 is shown a sectional view of the contact tube in position immediately after the clock has wound itself. In illustration No. 2 the mercury is soldering the wire making the current complete and commencing the winding



No. 1



No. 2

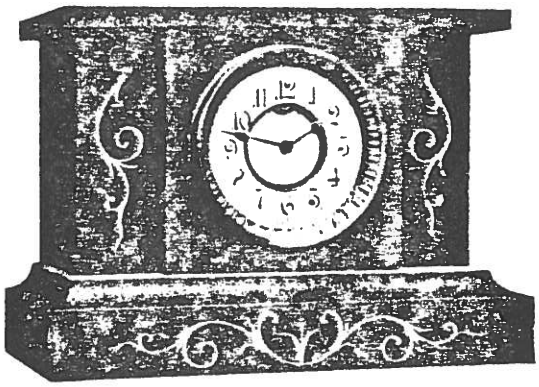


Style No. 4

Pendulum movement
Patent regulator
Hour and half-hour strike
Dial diameter 5½ inches
Arabic or Roman figures
Height 11⅛ inches, width 10¾ inches
Quarter sawed oak case, Porcelain dial
Price $11.30, Paper dial $10.30
Mahogany case, Porcelain dial,
Price $13.50, Paper dial $12.50

¶ SPECIAL—Style No. 4 same as above—Time only—Quarter sawed oak case—Price $8.75—Solid Mahogany case—Price $10.75

¶ The National Self-Winding Clock is made by the most expert clock makers it is possible for money to employ. The material used in every clock is of the very best grade, and the workmanship and finish, even to the minutest detail, is of the highest standard. Each and every clock receives a rigid inspection and thorough test. Thus assuring the purchaser a clock free from defects before leaving the factory.



Style No. 54

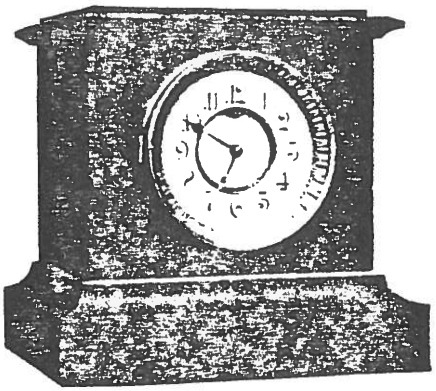
Pendulum movement
Hour and half-hour strike
Patent regulator
Dial diameter 5½ inches
Arabic or Roman figures
Height 10 inches, width 14⅜ inches
Black enameled finish, Porcelain dial
Price $10.75
Paper dial $9.75

¶ SPECIAL—Style No. 54 same as above—Time only—Price $8.25

¶ The National Self-Winding Clock is guaranteed to be free from imperfections and we will replace or repair, free of charge, within one year, any clock proving defective through material or workmanship.

¶ We know how good the material and workmanship on these clocks really is. We know they will do all we claim for them. We back our confidence with the above guarantee.

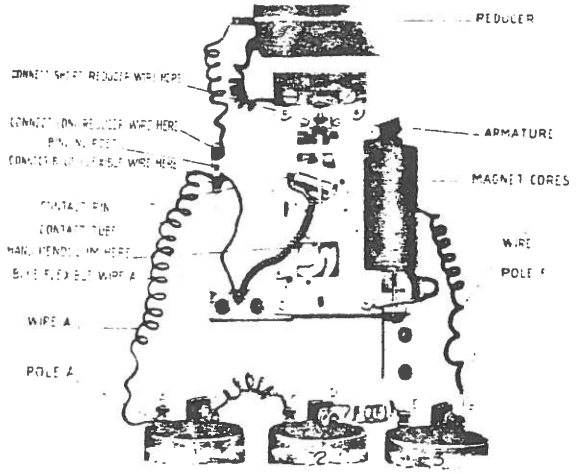
¶ The illustration on opposite page is an exact photograph of the movement and connections of a National Self-Winding Clock, showing the great simplicity of this wonderful invention. This illustration demonstrates how easy it is to connect the batteries.

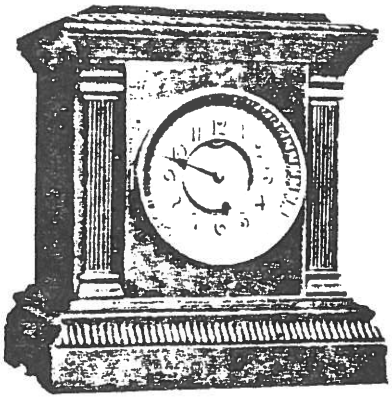


Style No. 50

Pendulum movement
Hour and half-hour strike
Patent regulator
Dial diameter 5½ inches
Arabic or Roman figures
Height 10½ inches, width 11 inches
Black enameled finish, Porcelain dial
Price $10.00
Paper dial $9.00

¶ SPECIAL—Style No. 50 same as above—Time only—Price $7.90



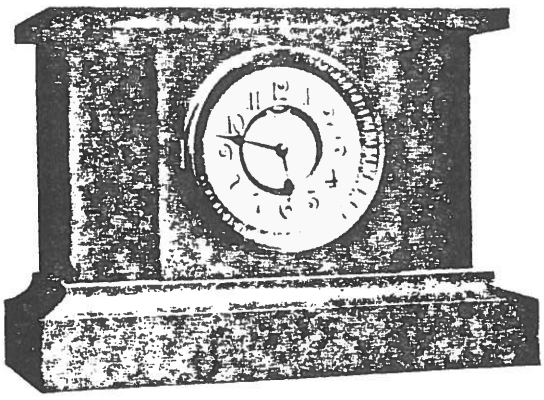


Style No. 5

Pendulum movement
Hour and half-hour strike
Patent regulator
Dial diameter 5½ inches
Arabic or Roman figures
Height 12¼ inches, width 11⅛ inches
Quarter sawed oak case
Porcelain dial, Price $10.90
Mahogany case, Porcelain dial
Price $13.00, Paper dial $12.00

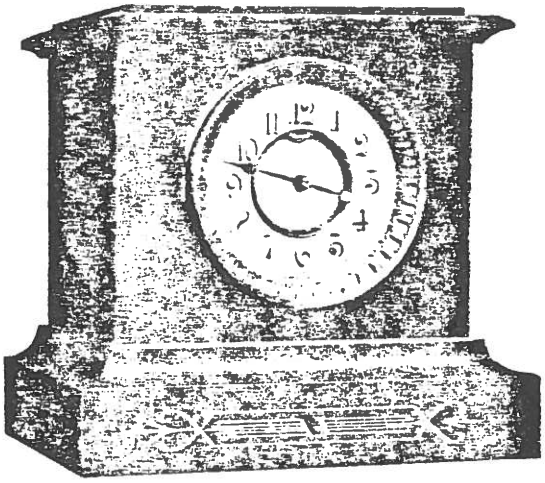
¶ SPECIAL—Style No. 5 same as above—Time only—Quarter sawed oak case—Price $8.40—Solid Mahogany case—Price $10.50

¶ Our pendulum movement is one of great simplicity, and with the many improvements we have embodied in perfecting the clock that winds itself, calls forth praise from jewelers everywhere.



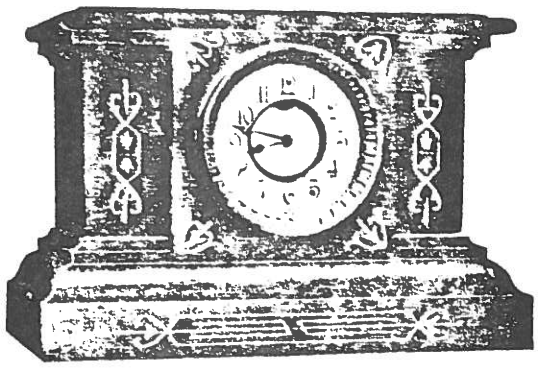
Style No. 51
Pendulum movement—Hour and half-hour strike—Patent regulator—Dial diameter 5½ inches—Arabic or Roman figures—Height 10 inches, width 14 inches—Black enameled finish—Porcelain dial—Price $10.50—Paper dial $9.50

¶ SPECIAL—Style No. 51—Time only—Price $8.25



Style No. 53
Pendulum movement—Hour and half-hour strike—Patent regulator—Dial diameter 5½ inches—Arabic or Roman figures—Height 10½ inches, width 11 inches—Black enameled finish—Porcelain dial—Price $10.25—Paper dial $9.25

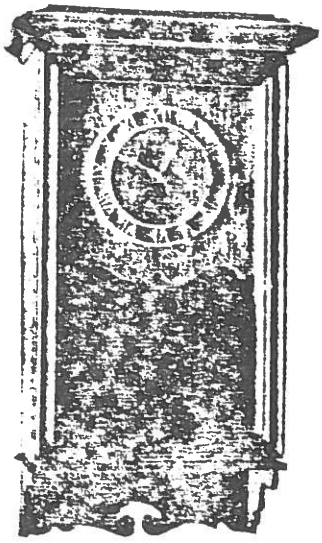
¶ SPECIAL—Style No. 53—Time only—Price $8.25



Style No. 55

Pendulum movement—Hour and half-hour strike—Patent regulator—Dial diameter 5½ inches—Arabic or Roman figures—Height 10 inches, width 16¼ inches—Black enameled finish.—Porcelain dial—Price $12.75—Paper dial $11.75

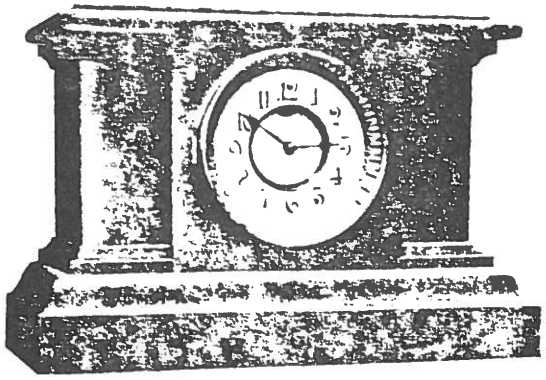
℄ SPECIAL—Style No. 55—Time only—Price $10.25



Hanging Clock No. 123

Pendulum movement—Hour and half-hour strike—Patent regulator—Dial diameter 6 inches—Finished in gold—Height 22½ inches, width 12½ inches Golden oak case—Price $9.50

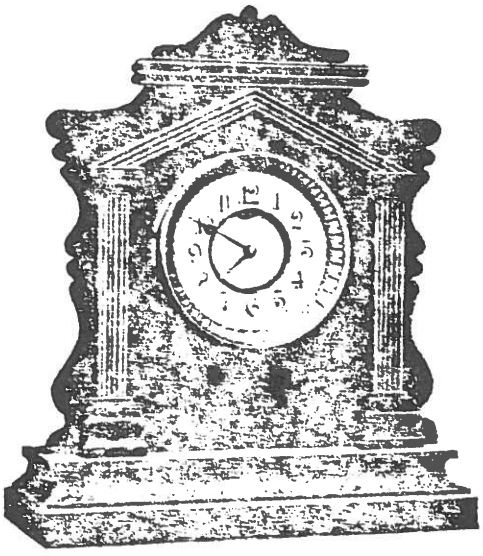
℄ SPECIAL—Style No. 123—Time only—Price $6.75



Style No. 52

Pendulum movement—Hour and half-hour strike—Patent regulator—Dial diameter 5½ inches—Arabic or Roman figures—Height 10 inches, width 16¼ inches—Black enameled finish—Porcelain dial—Price $12.50—Paper dial $11.50

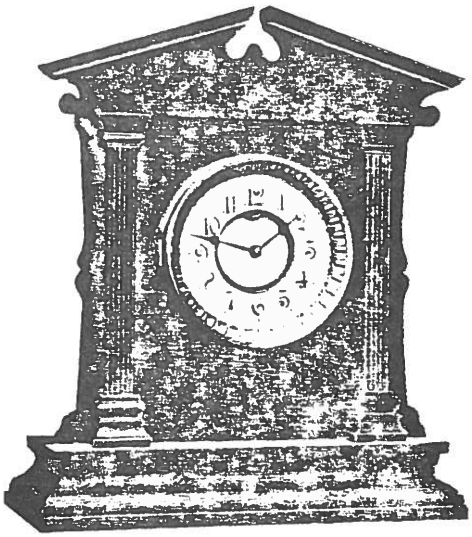
℄ SPECIAL—Style No. 52—Time only—Price $9.75



Cabinet Style No. 2

Pendulum movement—Hour and half-hour strike—Patent regulator—Dial diameter 5½ inches—Arabic or Roman figures—Height 15 inches, width 13 inches—Golden oak case or Mission finish—Porcelain dial—Price $9.00—Paper dial $8.00

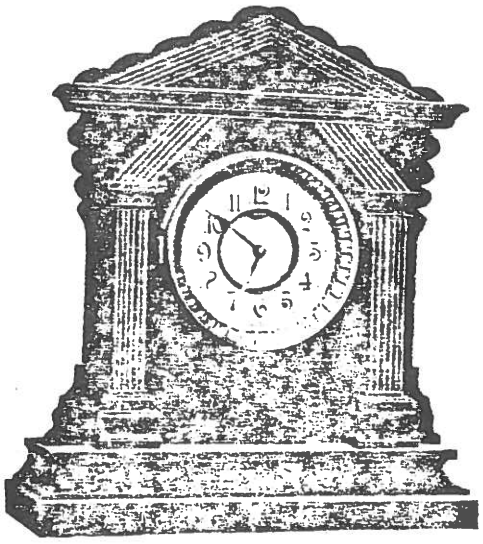
℄ SPECIAL—Style No. 2—Time only—Price $7.50



Cabinet Style No. 1

Pendulum movement—Hour and half-hour strike—Patent regulator—Dial diameter 5½ inches—Height 15 inches, width 13 inches—Golden oak case or Mission case - Porcelain dial—Price $9.00 - Paper dial $8.00

℄ SPECIAL - Style No. 1—Time only—Price $7.50



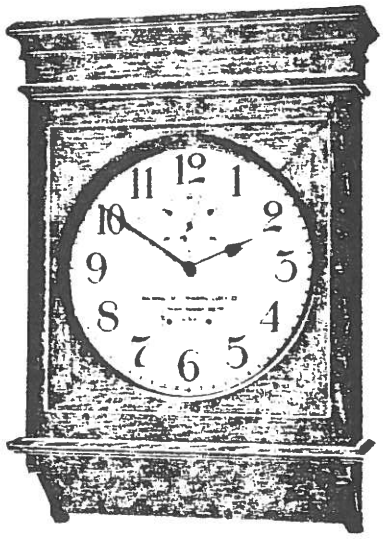
Cabinet Style No. 3

Pendulum movement—Hour and half-hour strike—Patent regulator—Dial diameter 5½ inches - Height 15 inches, width 13 inches—Golden oak case or Mission finish - Porcelain dial—Price $9.00 - Paper dial $8.00

℄ SPECIAL - Style No. 3—Time only—Price $7.50

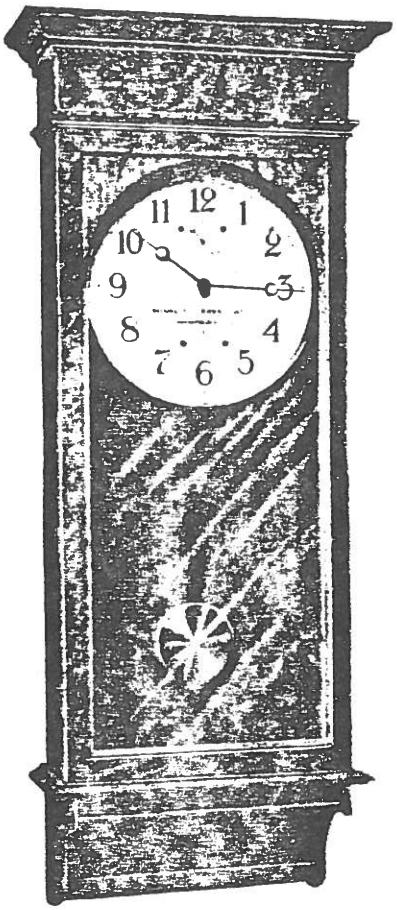
Style No. 46

Brown Mission or Weathered Oak case—Pendulum movement—Time only - Patent regulator Dial diameter 6 inches Finished in gold - Height 12 inches—Width 8 inches—Depth 7 inches—Retail price $6.75—Either finish of case



Office Clock No. 122

120 beat Pendulum movement—Time only - Dial diameter 12 inches - Arabic figures Quarter sawed oak case Height 26 inches, width 18 inches—Price $14.00



Office Clock No. 82

80 beat Pendulum movement
Time only
Dial diameter 12 inches
Arabic figures
Quarter sawed oak case
Height 3 feet 10 inches, width 19 inches
Price ~~$12~~ 00

Protection of Prices.

CONDITIONS OF SALE

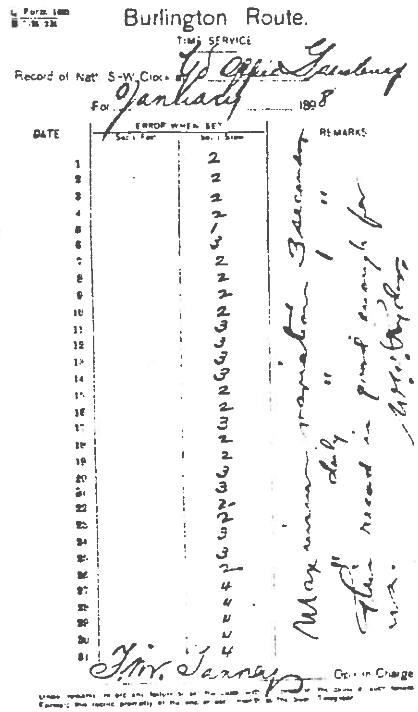
The National Self-Winding Clock is sold subject to the following conditions: The dealer may advertise and sell said National Self-Winding Clocks only to customers for their own use or others' use and not for re-sale; and must not advertise or sell any cataloged clock manufactured by the National Self-Winding Clock Company at less than catalog prices.

Acceptance of any of the cataloged clocks is assent to these conditions---any violation of which shall revest in said National Self-Winding Clock Company the title of such clocks in possession of the violator, and upon tendering the price paid by the holder of such clocks, the said company shall be entitled to retake possession of same.

NATIONAL SELF-WINDING CLOCK CO.

CHAMPAIGN, ILLINOIS

A record taken by the C., B. & Q. Ry. Co.



Burlington Route.

TIME SERVICE

Record of Nat'l S-W Clock at G. Office Galesburg

For January 1898

DATE	ERROR WHEN SET Sec's Fast	ERROR WHEN SET Sec's Slow	REMARKS
1		2	Maximum variation 3 seconds
2		2	" daily 1 "
3		2	This record is good enough for us.
4		2	
5		1	
6		3	
7		2	
8		2	
9		2	
10		2	
11		3	
12		3	
13		3	
14		3	
15		2	
16		2	
17		3	
18		2	
19		2	
20		3	
21		3	
22		2	
23		2	
24		3	
25		3	
26		2	
27		4	
28		4	
29		4	
30		4	
31		4	

F. W. Tarney Opr. in Charge

Styles made in both oak and mahogany, will be filled in oak unless otherwise specified. All orders filled with Arabic dials unless Roman are indicated.

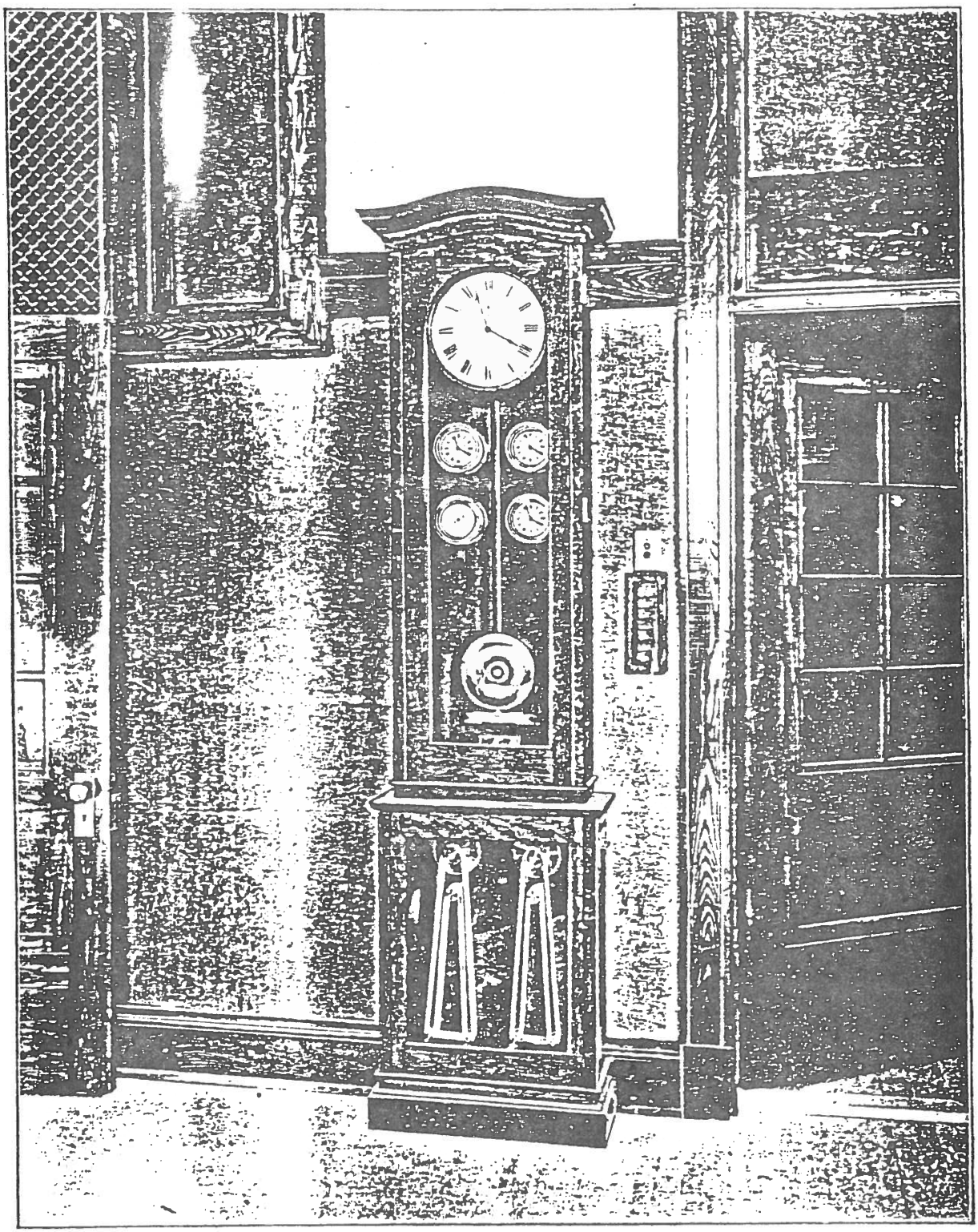


Fig. 447

THREE-CIRCUIT MASTER CLOCK

With two, four-circuit Program Clocks in base, controlling an equipment of

45 No. 1s Secondary Clocks
5 18-inch Double Dials
2 24-inch Outside Clocks
26 8-inch Gongs

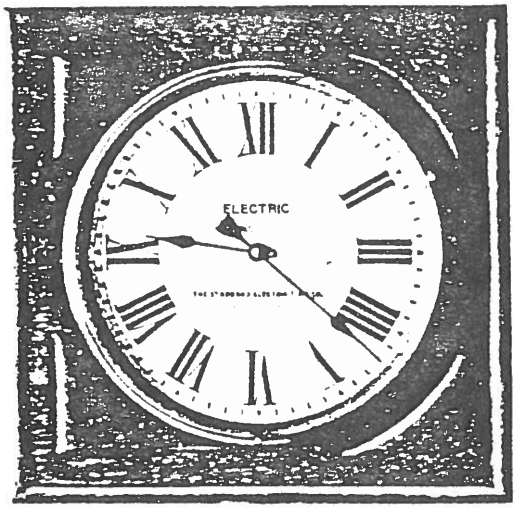


Fig. 22

No. 1 S. WOOD CASE SECONDARY CLOCK

PRICES

8 inch dial, $13.00	12 inch dial, $15.00
10 inch dial, 14.00	14 inch dial, 18.00

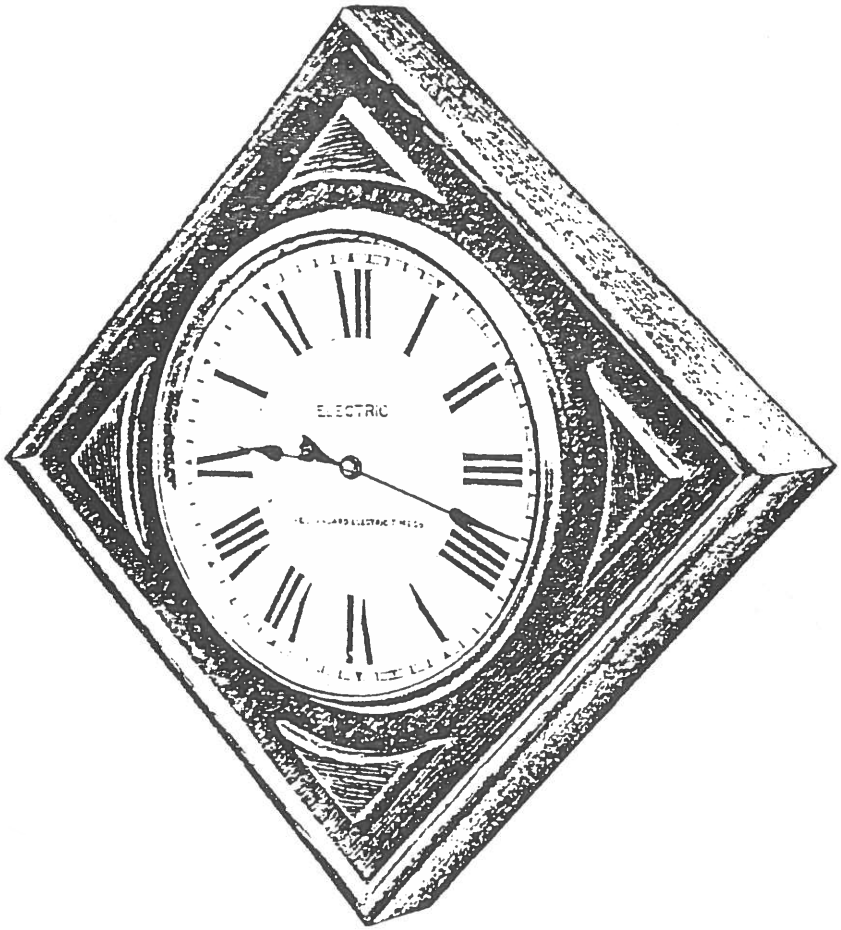


Fig. 27

No. 1 D. WOOD CASE SECONDARY CLOCK

PRICES

8 inch dial, $13.00	12 inch dial, $15.00
10 inch dial, 14.00	14 inch dial, 18.00

SECONDARY CLOCKS

SECONDARY Clocks are virtually so many dials to one Master Clock movement, and are limited only in size, distance and number by the strength of current supply and methods of distribution. They are actuated by current pulsations sent at exact periods, generally one minute, and transmitted on the first quarter of the first second of each period. There is no pendulum nor escapement and no springs to be wound, and excepting only the large tower movements, no bearings to be oiled. In all Secondary Clocks the movement is positively locked against vibration or shock.

It is a minute impulse movement of such construction and simplicity of operation as to make synchronism with the Master Clock positive.

The form, size and location of Secondary Clocks are, therefore, capable of varied modifications and can be adapted to all requirements. They may be located with reference to their appearance and utility rather than to their accessibility, since they do not have to be touched after installation. Their cases may be of any convenient or pleasing shape, and made of wood, marble or metal. Their action is not affected by vibration, thermal or barometric changes. Having no pendulum, expert care is not necessary in hanging these clocks. The matter of position and plumbness need be considered only as to appearance. When peculiar conditions require it, special adaptations of our movement can easily be made to meet them.

Secondary Clock dials can be furnished with tenths hour divisions instead of minutes, so as to facilitate keeping job time on the decimal system rather than in fractions. For convenience in calculations and simplicity this method has much in its favor. See page 16.

The Secondary Clocks shown in this bulletin are only a few of the great variety that have been made. It is requested, therefore, that any requirements as to size, form of dial, materials, finish and service be described so that they may be met.

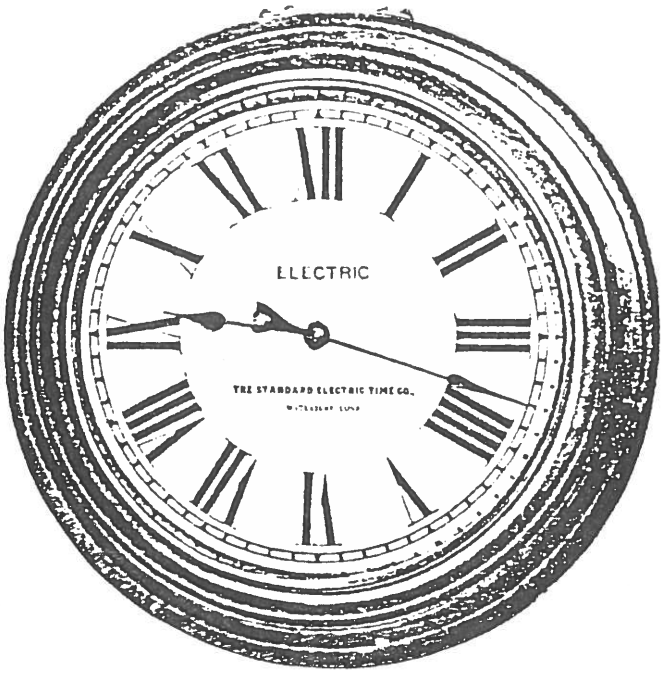


Fig. 21

No. 2. WOOD CASE SECONDARY CLOCK

See cut page 2 for 14 inch and larger

PRICES

8 inch dial, $16.00	10 inch dial, $17.00	12 inch dial, $18.00
14 inch dial, 25.00	18 inch dial, 37.50	24 inch dial, 45.00

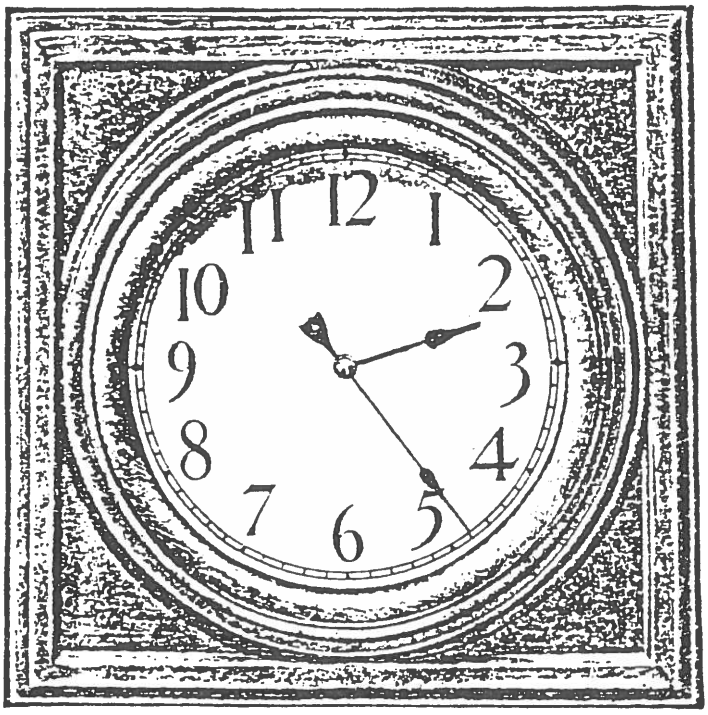


Fig. 17

No. 4A. WOOD CASE SECONDARY CLOCK

PRICES

12 inch dial, $25.00	18 inch dial, $40.00
14 inch dial, 30.00	24 inch dial, 50.00

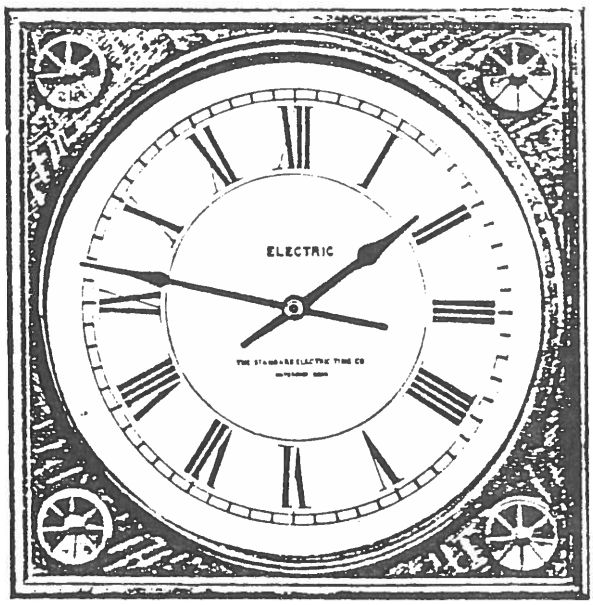


Fig. 23

No. 5. WOOD CASE SECONDARY CLOCK

PRICES

14 inch dial, $25.00 18 inch dial, $37.50 24 inch dial, $45.00

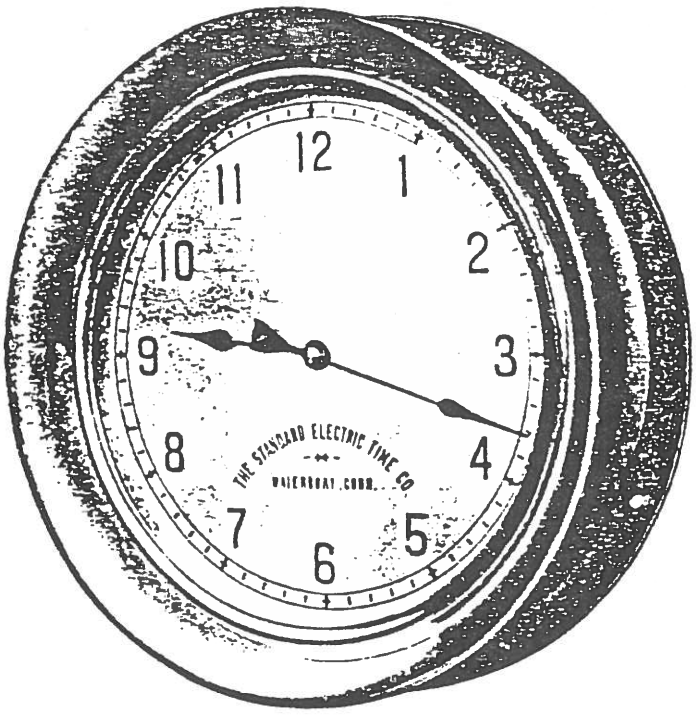


Fig. 457

METAL CASE SECONDARY CLOCK

These Cast Bronze or Iron Cases are designed to match other Switchboard Equipment and are dust-proof and durable

PRICES

	Bronze Case Nickel Plated	Iron Case Japanned	Bronze Case Polished
8 inch dial	$26.50	$23.00	$25.50
10 " "	31.50	26.00	29.50
12 " "	36.00	30.00	34.00
14 " "	43.00	35.00	41.00

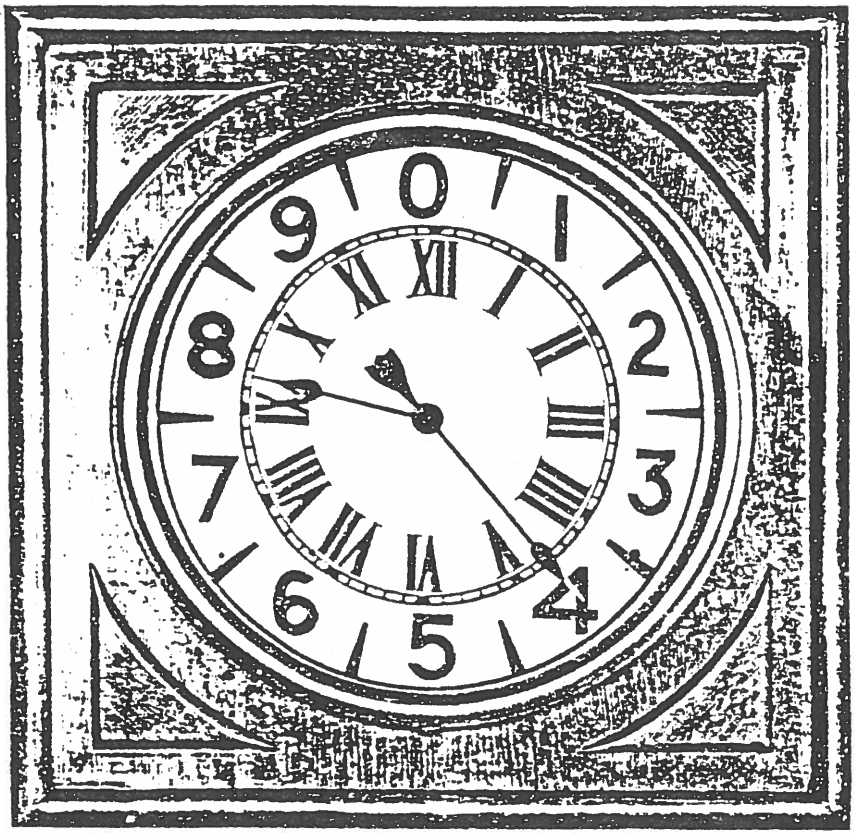


Fig. 479

DECIMAL DIAL, WOOD CASE, SECONDARY CLOCK

In addition to dividing the dial of this clock into hours and minutes, it has an outer scale from which tenths of hours may be read.

In calculating elapsed time, minutes and seconds are anything but convenient units, so that Secondary Clocks which indicate hours and decimals of hours will often greatly facilitate such work. This system is commended for the consideration of those who require the elapsed time for performing certain work, as in factory time-cost keeping, etc.

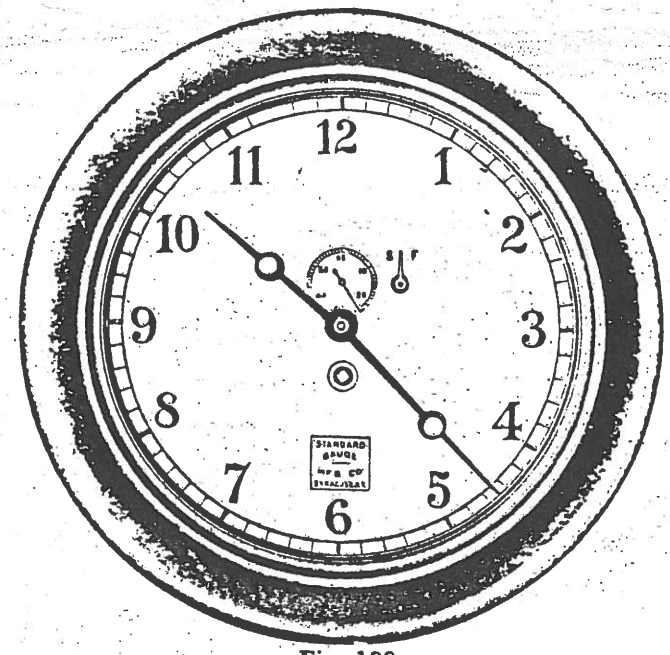


Fig. 199

MARINE AND LOCOMOTIVE CLOCKS

These clocks are not self-winding nor are they a part of the "Standard" Electric Time System. They are used where an electric system is not installed or where it may only be necessary to have one or two isolated clocks Well known winding clock movements, mounted in handsomely finished cast-metal cases, make these winding clocks serviceable for the work for which they are intended. All of the clocks used are eight-day movements.

SIZE	MOVEMENT	BRASS OR ALUMINUM CASE	COPPER PLATED OR N. P. PLATED
12 inch Dial	Howard	$75.00	$79.00
10 " "	"	60.00	63.00
8½ " "	"	50.00	52.00
6¾ " "	"	45.00	47.00
12 " "	Seth Thomas, No. 10A	46.00	48.00
10 " "	" " "	35.00	36.50
8½ " "	" " "	25.00	26.00
6¾ " "	" " "	21.00	22.00
12 " "	Boston	54.00	56.00
10 " "	"	41.00	43.00
8½ " "	"	30.00	31.00
6¾ " "	"	27.00	28.00
6 " "	"	25.00	26.00
5½ " "	"	24.50	25.50
5 " "	"	24.00	25.00
12 " "	Imported, full jeweled	58.00	60.00
10 " "	" " "	42.00	44.00
8½ " "	" " "	33.00	34.00
6¾ " "	" " "	26.00	27.00
6 " "	" " "	25.00	26.00
5½ " "	" " "	24.50	25.50
5 " "	" " "	24.00	25.00

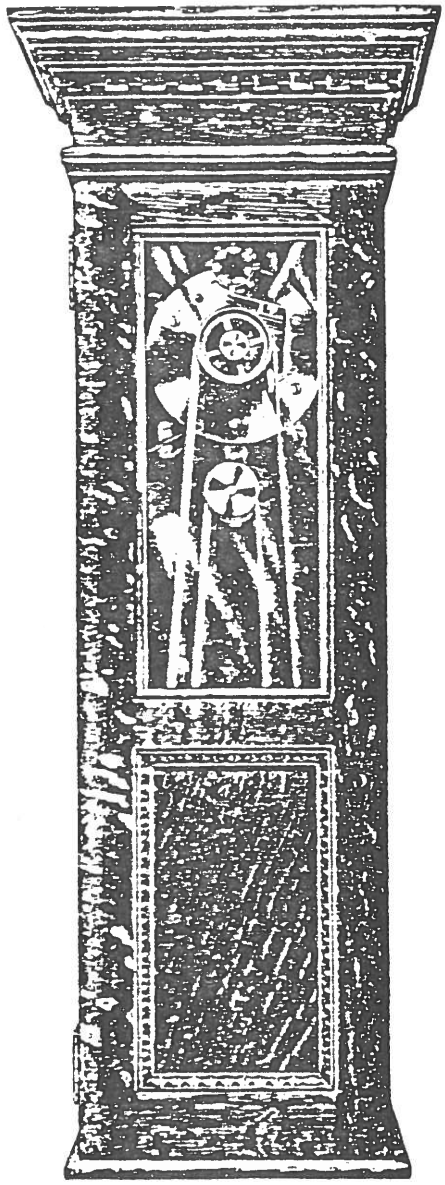


Fig. 33

FRONT VIEW OF PROGRAM CLOCK

Height 30½ inches, width 10 inches at top

PRICES

Two Circuit Clock	. . . . .		$90.00
Four " "	. . . . .		130.00
Six " "	. . . . .		175.00
Eight " "	. . . . .		215.00

PROGRAM CLOCKS

THERE are many acts, operations or events that should take place periodically, or according to some schedule that can be planned in advance.

Some of these must be performed by human operations, others can be left to a machine. In the first instance the Program Clock will signal automatically the time for the human agency to act, while in the second the clock will actuate a starting and stopping device for the machine, so that its operation as a unit will be automatic.

As a means of signaling it is absolutely precise and regular in its action, capable of giving different signals in different places, or different schedules of signals for different days, controlling these fixed and alternate schedules automatically and without attention.

It eliminates disputes as to the discrepancies or the irregularities in the time of signals, makes possible concerted and harmonious action, and induces punctuality and precision in the use of time.

As a means of actuating machines that should be started and stopped at fixed times its utility will be realized, for it not only eliminates expensive and uncertain human agency, but performs its function with unerring precision.

The mechanism to accomplish this consists of a Secondary Clock movement which, instead of driving hands, operates a cylinder which drives the program ribbons.

These program ribbons are made of heavy bond paper and marked on the edge with the hour and minute divisions. To insure the positive drive of the ribbons, holes are punched along their center lines, which engage pin teeth on the driving cylinder.

Program ribbons are made to move 6⅜ inches per hour. The three spools shown in Fig. 34 are idlers for keeping the program ribbons taut. A ribbon is capable of operating two independent programs, *i.e.*, one from either edge. Fig. 34, therefore, represents a "four-circuit Program Clock" capable of controlling four separate and distinct circuits of signal bells, whistle blowers or machines.

Each circuit is wired to a contact finger which presses lightly on the program ribbons near one edge. The common return contact is placed just under the ribbon, so that when the perforations in the ribbon, made for the time that the circuit should be closed, come under the finger, it is no longer insulated from the return and the circuit is completed. This program ribbon is actuated on the thirtieth second, so that the ringing or signaling circuit may be closed in the Program Clock when the other secondary apparatus moves. On the sixtieth second what is termed a five-seconds contact in the Master Clock finally closes the ringing or signaling circuits, and the signal is sounded on the circuit planned, as governed by the perforations in the ribbons for that minute. Were it not for the use of the five-seconds contact, the Program Clock itself would permit the signal to ring for a whole minute. This would be a needless wear on the batteries, and after the signal is given all the extra ringing would be only a source of disturbance.

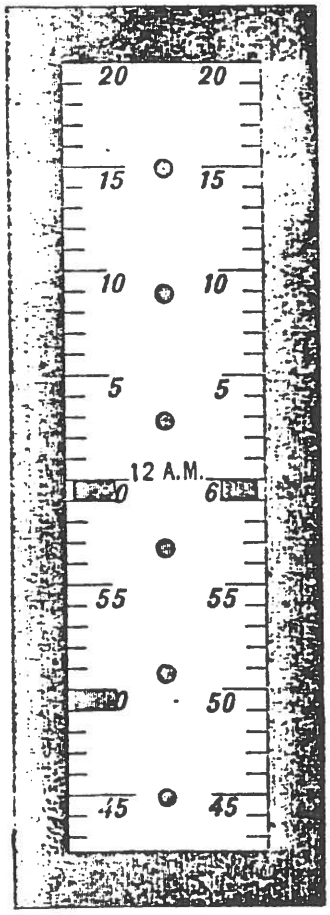


Fig. 40
Section of two-circuit Program Ribbon perforated near edges to ring one circuit at 11.50 and 12, and the other at 12 M.

Fig. 34

FOUR-CIRCUIT PROGRAM CLOCK, CASE OPEN

Made for two, four, six or eight circuits. Can be set at will for any schedule on any circuit.
The schedules can be arranged to automatically change for different days of week.
Strictly automatic in every particular.
Program Clocks may be mounted in Master Clock Cases if desired.

This ringing contact is adjustable from one to ten seconds in duration. A special contact will be furnished when a signal for a longer period is required.

The signal circuit can thus be energized for as many seconds as is desired, and precisely at the time for which the ribbon is punched.

The Program Ribbon is an endless strip spaced in one minute intervals and making a complete cycle in twelve hours, though they can be made twenty-four hours long. Directly above the sprocket carrying the ribbon is a cylinder (shown in Figs. 33 and 34) having a series of fourteen holes in alignment with each of the contact fingers. This cylinder is actuated in twelve-hour periods and makes one complete revolution per week.

A complete set of special-formed pins is furnished with each Program Clock, and one of these pins placed in the cylinder will hold the contact finger free from the ribbon during the twelve-hour period that the pin is in position, thus preventing that particular finger from making contact. An index on the front of the cylinder readily gives the proper location to accomplish the desired control of the automatic signals by twelve-hour periods.

The user can perforate the ribbon for his condition, a punch being provided for this purpose, and can so arrange the pins that any program or combination of programs can be used every day, different programs for night and day, or different programs for one or more days in the week and Sunday, or no program at all on certain days.

A switch is provided in the Program case for each circuit or schedule so that automatic signals can be discontinued for any desired length of time at will. Should a signal be required that is not part of a predetermined schedule, or is at uncertain periods, as for instance, signaling superintendents of factories, this may be given by push buttons that are provided on every Program case, and without interfering in any way with the regular arrangement of schedules.

Since the Program Ribbon is subjected to no strains and is made of tough, heavy stock, it will last indefinitely unless damaged by carelessness.

PROGRAM BELLS AND GONGS

THESE signaling bells are wired in parallel and as many Program circuits used as there are different schedules to be rung. An automatic whistle valve, or any other device, can also be actuated by the bell circuit that has the same schedule.

Not more than eight bells or gongs should be wired on one circuit, but any number may be controlled on one schedule or program circuit. Prices of bells and gongs will be furnished upon request.

After an elaborate system of bells or gongs has been installed it may sometimes be desirable to change certain bells on one circuit to another program. When such transposition is probable a connector board is used to which each bell or signaling device is wired, so that it is possible to switch any bell to any program at will.

TOWER CLOCKS

THE service demanded of a Tower Clock is so much harder than that of an ordinary Secondary Clock that a greater motive power must be used to operate positively the normally heavy hands, which may be made much heavier at times by sleet and snow. The Tower Clock should, furthermore, have timekeeping qualities that cannot be affected by extreme changes of temperature to which it is subjected.

In the "Standard" System the timekeeping is done by the Master Clock, which is far removed from the tower influences that militate against precision and reliability. It sends to the tower secondary mechanism an electric impulse exactly on the minute. This impulse closes a circuit to a small electric motor, which is capable of supplying an ample amount of energy for driving the hands under the hardest conditions. The electric energy for driving this motor is drawn from any convenient supply of either primary or storage batteries.

The motor is connected through a positive acting clutch and gear to a worm and gear allowing the motor to come up to speed and drive the hands ahead one minute.

After this work is performed the motor circuit is automatically broken, and the motor stops under its own friction; the worm and gear locking the movement against any vibration, shock or atmospheric disturbance, thus making the time divisions positive, and under the absolute control of the impulse from the Master Clock.

As seen in Fig. 455 the motor, gears and pilot dial for the Tower Clock are mounted on a stand, which is placed in the tower in such a position that shafts can be led out to the hands of the clock dial, placed on one, two, three or four sides of a tower as desired.

Since the time impulse is electrically transmitted from the accurate Master Clock, and since the operating energy is electrical, there is nothing to freeze nor run down, nor are there any heavy operating weights to make allowance for, and which constitute a serious menace to life and property owing to their liability to fall.

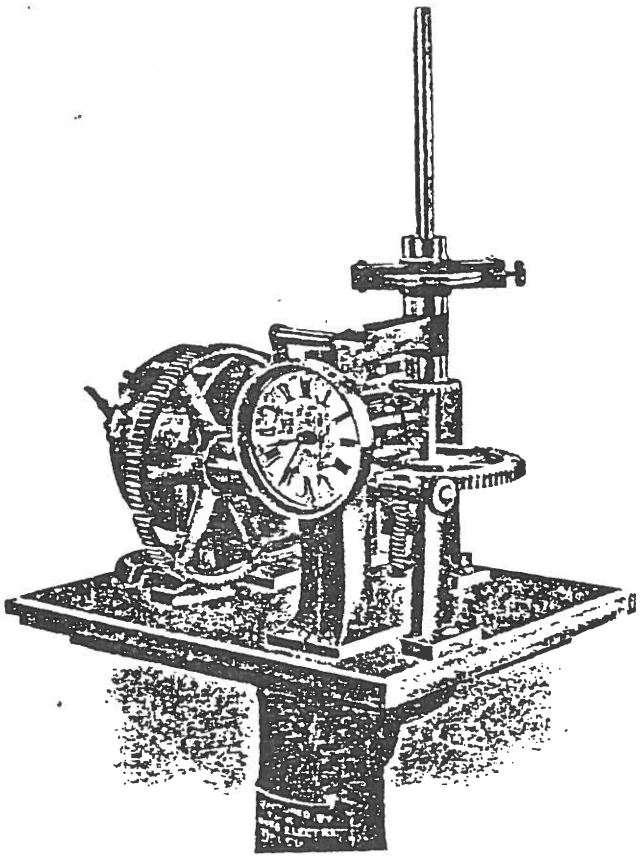


Fig. 455

No. 2. ELECTRIC "TOWER TIME" MOVEMENT

Controlled from Master Clock. Driven by small motor.
Hands can not be affected by sleet or snow.
No weights to fall; no winding.

Prices, which are given upon application, depend largely upon size and number of dials, etc.

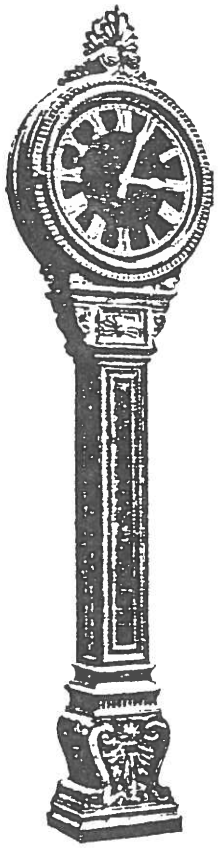


Fig. 454

STREET POST CLOCK, DOUBLE DIAL

This is a Secondary Clock operated from a Master Clock, therefore unaffected by weather. Dials black with gold numerals or ground glass for illumination.

USES OF STANDARD ELECTRIC TIME

IN any discussions of the application of "Standard" Electric Time systems to the problems affecting directly or indirectly the economy of operations in industrial plants, it should be borne in mind that the points brought out do not cover even briefly the economic field of application, which is constantly enlarging and in which there are such brilliant possibilities. Even the points mentioned are treated in a general rather than in a concrete manner, so that they will simply be suggestive to the reader who knows his own peculiar conditions, and can consider the direct or indirect financial value of precision in time measurements, automatic operation of machines, unfailing schedules of signals, and systematic time-cost keeping methods. These precise methods make possible the concerted and harmonious actions of bodies of men and a degree of discipline and moral effect which is impossible without this scientific and practical equipment.

Aside from the results it will accomplish, its simplicity and automatic character of operation commend it for use where even a few timekeepers are required, since it eliminates the winding, setting, regulation and oiling of clocks, which operations require care, time and attention. Even with the best care, experience with winding clocks proves that it is impossible to keep them more than approximately correct or together.

The "Standard" system normally requires no attention, save the renewal of batteries and cleaning and oiling of Master Clock about once per year or eighteen months. All of its component timing elements must agree with each other since they agree with the Master Clock; and since this Master Clock is so made and located as to run with a high degree of precision, all of the Secondary apparatus will likewise be accurate.

INDUSTRIAL PRECISION WITH ELECTRIC TIME

THE "Standard" system of distributing time with Secondary Clocks located in departments, offices, rooms or buildings where time enters as a factor in the cost of human or machine work, makes possible exactness in the use of time, accurate data on the cost of production, and precision in the time of performing operations.

Time Cost. When a workman does a certain piece of work he notes from a Secondary Clock on his time card direct, or with a time stamp, the time of starting and stopping, from which the elapsed time or the time required for him to perform the work can be obtained. This data will form a basis from which to arrive at the standard time for that job; or, if this has already been established, the actual time used in any particular instance can be compared with the standard for the job. It is essential that this data be based upon the readings from clocks that are correct and agree with each other, or that the time stamps used are accurate and in synchronism.

Punctuality. There are operations which should be performed with precision, though not necessarily at the same time each day. Any variation from the definite time that would result from going by watches or clocks, even a little bit off, would cause inconvenience or loss. The time for starting and stopping engines, switching on or off electric power, are illustrations in point.

Concerted Action. The synchronous characteristics of "Standard" Secondary Clocks commend their use for indicating the same time at several different points. No matter how widely separated they are, the minute hand of each clock will move precisely on the minute through an angle of six degrees, or one-sixtieth of an hour. This movement is so conspicuous that it constitutes a definite signal which cannot be mistaken, and requires no judgment in its correct observation for use in setting watches or starting operations exactly together. Taking time from the observation of the impulse of the minute hand on a "Standard" Secondary Clock is similar to observing the fall of a time ball. Secondary Clocks can, furthermore, be placed at the most convenient points, and give their signals every minute rather than once a day.

Testing. In experimental and testing work it is often necessary that many readings be taken simultaneously. Audible signals may be used as described below, but frequently each operator depends on his own watch, which might not be exactly in unison with the watch of any other operator. Readings taken according to the time indicated by it would therefore not be coincident with the others, even if the operator did accurately read his watch. He cannot mistake the minute impulse of a "Standard" Clock, and every "Standard" Clock minute hand moves at the same instant, so that simultaneous action can be taken by any number of observers in widely separated places.

Disputes. Standard Electric Time removes one of the most fruitful causes of dispute, *i.e.*, the question of correct time. Discrepancies between clocks in this system do not occur, and the entire system is so accurate that employees have no basis for excuses. They cannot lay the blame for negligence, tardiness, or any other lack of precision, to the clocks being wrong, nor can any question of conflicting time indications arise between clocks in this system.

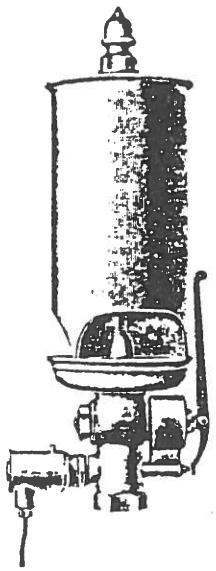
Economy. The moral effect of this precision in time measurements is to make people precise in the use of time. It is hard to resist the demoralization induced by starting work at "about seven" A.M., stopping "about" twelve for "about" one hour, which may be the conditions in a business run by time that is approximate and not exact. Employees are certainly not going to be more punctual than the business with which they are connected. On the contrary, some of them, at least, will eagerly seize upon any lack of precision to excuse their tardiness. This tardiness, not only in beginning work, but in the use of time throughout the day, affects, to some degree, directly or by example, every one else in the business, so that any method of tuning up a business with respect to its use of time will have both a direct and indirect economic value that cannot be ignored.

Since overhead expense, depreciation, productive capacity of machines, capacity of plants, and ability to fill orders are functions of the time of effective operation, *i.e.*, the time men are producing the products, it follows that all these factors are modified by the precision of employees in the use of time.

If, therefore, the direct saving effected by employees' precision is added to these far greater "indirect savings," it is not difficult to see that the investment covering the Standard Electric Time equipment is fruitful, even in small plants, in inducing systematic operations, increased production and making dividends.

PROGRAM CLOCKS FOR COMMERCIAL USE

IN an industrial plant the work is usually started or stopped by some audible signal, generally a whistle. To blow this whistle with unfailing precision requires an accurate timepiece, the forethought of some person, and that he should always be present long enough in advance to have his hand on the whistle valve ready to operate it when the proper time arrives.



This manual operation, therefore, requires the individual attention of a skilled and faithful operator, depends at best upon the accuracy of the clock and his observation of it, and is also subject to human failures.

With an electric whistle valve, operated by batteries and controlled by a "Standard" Program Clock, the system is automatic and is operated according to accurate time.

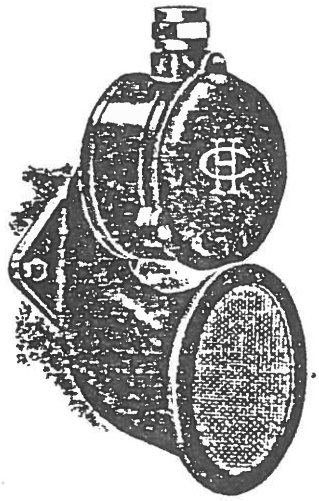
The Program Clock can be set to give a certain schedule of signals for every day, except Saturday and Sunday. For these two days the program will automatically change, if desired, to suit the working hours in force.

If the same whistle is ever needed to give signals for abnormal events, such as in case of fire, it can be operated manually, as in the old way, or direct from the Program Clock by means of a push button, without interfering in any way with the program mechanism.

There are many cases where a whistle is not used, as, for example, in stores, railroads, offices, etc. For signaling the time to begin, stop or change work, bells or gongs operated through the Program Clock are employed. This system of signals is very elastic, since it permits as many different schedules to be used in different departments, offices or buildings as may be desired.

For example, the factory and office of an industrial plant may run on different schedules of hours. A bell circuit will ring signals at any points in the one entirely independent of the bell circuit in the other.

These automatic signals throughout a plant insure concerted action of the employees, since, by means of posted notices, it should be well understood that they should not stop their work or machines to wash up, get on their wraps or depart until the bell signals are given for them to do so. They know that these signals are operated automatically and will sound at the proper time, so that they need not observe their watches or clocks at frequent intervals prior to departure for fear they will be a little late in leaving. The actual time they would lose by stopping too soon would amount to a considerable loss, but far greater would be the loss due to uneasiness and the distraction from work incident to the "watch-out" habit.



ELECTRIC HORNS

WHEN metallic sounds in factories or other noisy places would absorb the ordinary bell sound waves the electric horn operated through a Program Clock is a novel and effective device for signaling. The tone is powerful and of a peculiar quality, giving a signal which is not easily mistaken.

The horn is compact, is water-tight and can be relied upon.

It can be wound to work on direct-current pressures from 10 to 250 volts, and sparking at contacts is practically eliminated.

The instrument has been approved for emergency signaling by the United States Navy.

PROGRAM CLOCKS AND TESTING

IN engineering institutions, manufacturing plants, etc., where tests of boilers, engines, electric generators, motors and other machinery or apparatus are run, the need of audible signals at the time readings should be taken is an important one, provided, of course, a visual signal system, such as that secured through the use of "Standard" Secondary Clocks, is not employed.

The system operating through "Standard" Program Clocks consists of bells located near enough to the places where readings should be taken to insure their being heard by the observers. The Program Clock can be arranged to ring these bells one or two minutes before readings are to be taken as a warning. Precisely on the minute for taking readings bells will ring again, so that the observers in different parts of a building, plant or town can take simultaneous readings.

PROGRAM CLOCKS AND MACHINES

THE use of "Standard" Program Clocks that will appeal to engineers and manufacturers is for operating automatically certain machines, valves, doors, etc., that should start, be opened or closed, etc., according to a time schedule that can be planned in advance. The electric energy transmitted through the Program Clock may not in itself be sufficient to actuate directly the starting or stopping devices.

It is then the practice to have this energy actuate relays or valves, which transmit the energy necessary for doing the actual work of starting or stopping.

The principle, however, of making these operations automatic, rather than having them depend on human care and forethought, is sound and of broad economic scope. It is simply a case of designing the actuating mechanism which is best suited for being controlled by the Program Clock, and which will, in turn, conveniently control the apparatus in question.

SYNCHRONIZING TIME REGISTERS

ONE of the questions that arise in connection with the employees' time registers now on the market is to keep the clocks accurate and together, particularly if there is more than one register in use. It is manifestly unfair to record employees' time by registers that are the least bit off, and where these registers are used as a basis for cost-keeping records, the employer is obtaining unreliable data if the clocks are not correct.

Of course the clocks in all registers can be set once a day or oftener, but this is inexact, troublesome, and costly at best.

The "Standard" Electric Time System, therefore, finds a most useful field in setting the clocks in every register once a minute. Each register has to be wound as usual, but its escapement is controlled by the Master Clock of the system, so that it will maintain the same accuracy, and will agree with every other register controlled in like manner.

This synchronizing attachment in each register is a small device that can be applied to the clocks in registers of any make before or after they are installed. Through their use the method of taking time by time register is placed on a higher plane of precision.

The grounds for dispute, based upon the inaccuracy of registers, is removed, and reliable data, as to time-cost of work, obtained.

This special device of the "Standard" System should not fail to attract those who use one or more employees' time registers for pay-roll, time or cost-keeping service.

TIME STAMPS

THE uses of time stamps or chronographs are so numerous that they cannot all be mentioned, but in general they stand for precise business methods; minimize errors and delays; make disputes as to filing time impossible; check up employees and place responsibility where it belongs.

Hotels, clubs, bankers, brokers and merchants use time stamps to register the time of receipt of letters, telegrams, orders, the payment of bills, sending of messages or orders, the exact time of doing things, automatically kept; not unbusinesslike approximations which involve errors, disputes and financial loss.

Some of the applications to the industrial field as affecting plant economy will be touched upon below.

Attention is particularly drawn to the form of record which is the natural straight line read from left to right; the usual, easy, clear way to read a date—not a complicated puzzle where the chances of error are as great as those of truth.

Time stamps of the clock-containing type have been used with a measure of success, limited always by the inconveniences of winding and repairing them. The derangement of the clocks in this type was an inevitable result of the pounding to which they were subjected, since at each impression the works sustained a shock.

Evidently the way to make a reliable stamp was to remove the timing mechanism from the rough service inherent in stamping. This has been done by operating any number of stamps electrically from a "Standard" Master Clock, so that the accuracy of the time stamped is equal to that of the Master Clock. Only the simplest tool steel parts are necessary in the stamps themselves. Thus long life, accuracy and reliability under the roughest conditions are attained.

The stamp automatically sets itself to the proper day, hour, minute and meridian. It does not have to be wound and only the months have to be set by hand.

In this bulletin there are presented the makes of time stamps that are recognized as the most reliable on the market, so that users of "Standard" Time Systems are not confined to the adoption of any one make, although suggestions, based on experience with time stamps under different conditions may be useful.

Any "Standard" Master Clock will operate time stamps in conjunction with the other timing apparatus forming a part of the system, but for controlling a system of time stamps when other apparatus does not form an important element, the No. 18 Master Clock has proved popular. See page 33.

TIME STAMPS OR CHRONOGRAPHS

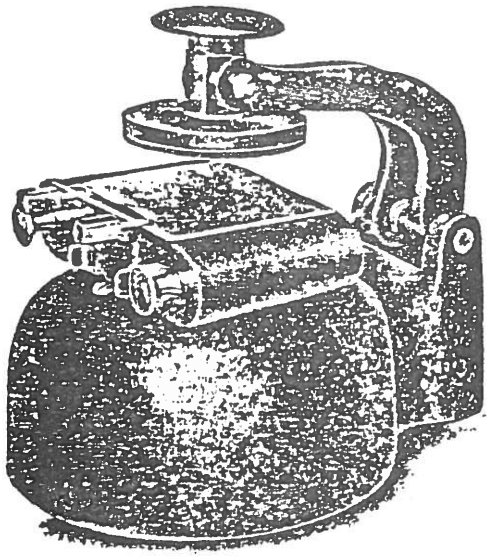


Fig. 472

MODEL AE TIME STAMP

Made by the Commercial Utilities Mfg. Co.

Fig. 473

FACSIMILE OF RECORD

In addition to the date, name and address, any wording suitable to the business, such as *Received, Sent, Paid*, etc., can be used by simply turning a knob so that the word desired will be in place for printing.

The action of this stamp is strong and positive. Its tool-steel parts are interchangeable, and the characters are engraved in steel so as to resist wear. It may be provided with gauge for adjusting cards to be stamped. The reliability of this stamp can be recommended.

Price, $55.00

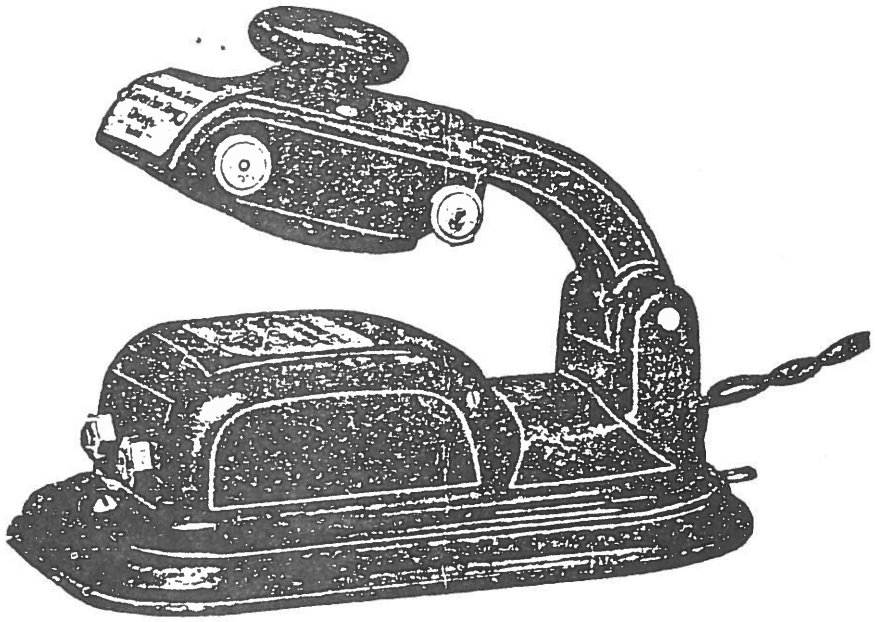


Fig. 482

"AMERICAN" TIME STAMP

These time stamps have been developed by the American Clock Co. after several years of experimental work. They can be wound for any D.C. voltage.

Price, $30.00

TIME STAMPS OR CHRONOGRAPHS

May be wound for any D.C. Voltage

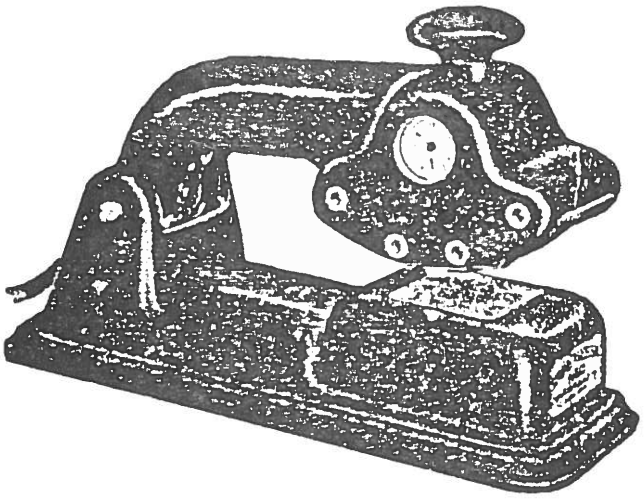


Fig. 474

STROMBERG CHRONOGRAPH

with Time Indicating Dial

Price, $50.00

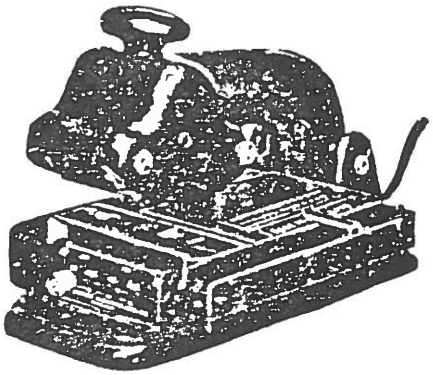


Fig. 475

STROMBERG CHRONOGRAPH

Equipped with Gauge for "In" and "Out" Record Cards. Price, $50.00

FACSIMILE CARD RECORDS

Made by Stromberg Chronograph

Figs. 476, 477 and 478 illustrate an application of time stamps to cost-keeping records. In no other way may the time be recorded more precisely on job cards, "in" and "out" cards, etc. Racks may be used to hold the workmen's cards in the most convenient way, and cards to suit any business used.

Job No. 3583 No. 74

Name William Lane

Day	MORNING Started	MORNING Stopped	AFTERNOON Started	AFTERNOON Stopped	Total
Mon					
Tue	8 25	12 04	12 58	6 03	8¾
Wed			1 35	6 01	4¼
Thu	6 58	10 48			3½
Fri					
Sat					
Sun					

Regular Time 17 00 Hrs. Rate .30 $ 5.10

Overtime ____ Hrs. Rate ____ $ ____

Total Time 17 00 Hrs. Total Wages $ 5.10

Wages $ ____

Material $ 18.63

Total Cost $ 23.73

Operation Turning Cylinders

Overtime on Other Side of Card

Fig. 476

Job No. 3752 No. 81

Name Ted Aston

STARTED	STOPPED	
FEB 1 AM 7 43	FEB 1 PM 1 27	5½
FEB 1 PM 1 32	FEB 1 PM 5 00	3½

Total Time 8¾ Hrs. Rate .30 $ 2.62½

Wages $ ____

Material $ 4.81

Total Cost $ 7.45

Operation Refacing Staff

Fig. 477

No. 148

Name Charlie Bates

Day	MORNING IN	MORNING OUT	AFTERNOON IN	AFTERNOON OUT	Total
Mon	6 55	12 03	1 05	6 10	9½
Tue	7 02	12 00	12 55	6 03	9½
Wed	6 49	12 06	12 47	6 05	10
Thu	6 57	12 02			5
Fri	7 10	12 13	12 59	6 15	9½
Sat	6 53	12 01	12 52	5 23	9
Sun					

Week Ending Feb. 20, 1909

Regular Time 52½ Hrs. Rate 30¢ $ 15.75

Overtime 2½ Hrs. Rate 40¢ $ 1.00

Total Time 55 Hrs. Total Wages $ 16.75

Note! This is reproduction of weekly card for Employees' In-and-Out Recording. Bi-weekly or monthly cards also may be used as preferred. The Chronograph is adaptable to all systems.

Overtime on Other Side of Card

Fig. 478

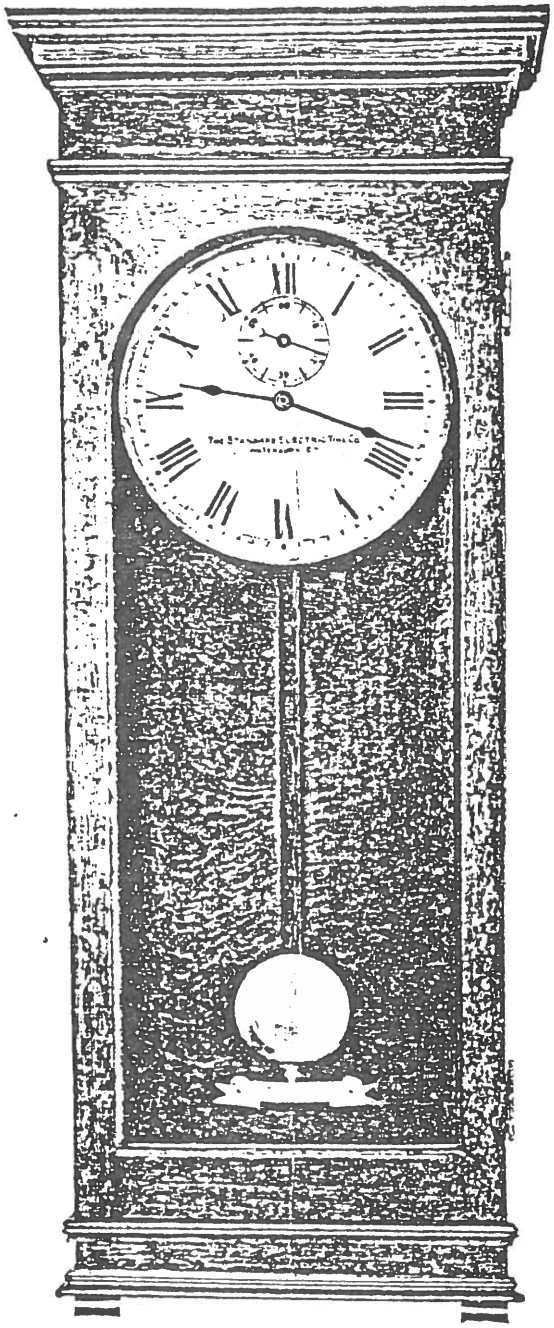


Fig. 481

No. 18 MASTER CLOCK OR REGULATOR

No. 1 Movement, Cut Steel Pinions, 72 Beat, Metal Compensating Pendulum. Case of Quartered Oak. 51 Inches High and 20 Inches Wide. Dial, 12 Inches.

Price, $95.00

This Master Clock has proved particularly useful for the control of time stamps, and if an equipment consists principally of them its use is recommended. It is a good timekeeper which should be the case for accurate time stamp work. Those who invest large sums in time stamp equipment should not hesitate about securing the best self-winding Electric Master Clock, since the value of the system will be nullified if the Master Clock is not absolutely reliable.

VOLTAGE, CURRENT AND RESISTANCE

IN a minute impulse electric time system the current is made and broken 1,440 times per day, and every day for years. It can readily be appreciated therefore that even with the contact mechanism used in the "Standard" Clocks, and the windings specially installed to prevent sparking, great care should be exercised in keeping the current and voltage at such values that the tendency to sparking will be reduced to a minimum.

"Standard" equipment is adjusted to operate through a certain range of voltage. The battery equipment should be capable of delivering the proper voltage to each element, and, furthermore, the battery should be watched so that renewals can be made before the e.m.f. has fallen below the value insuring good results. Excess voltage is likewise to be avoided, since it not only militates against good results but tends to produce sparking at contact.

Secondary Clocks are usually operated in series. It is, therefore, not well to wire more than twelve or fifteen on one circuit. If more Secondary Clocks are used they should be wired on two or more circuits which will receive their impetus from a relay operated by the Master Clock.

A switchboard, such as illustrated on page 37, is generally used when more than three circuits of Secondary Clocks are employed. On this board can be mounted the pilot dials for each circuit, battery gauge for testing the battery strength, circuit switch and relays.

The table below gives some average values of current, voltage and resistance used in "Standard" Clock equipment. Specific inquiries will meet with prompt attention, and if prospective users of "Standard" equipment will state fully the results that are desired both as to number and distribution of Secondary Clocks, as well as the other parts of a time system, it will often be possible to submit wiring diagrams and suggestions which will be of considerable service.

EQUIPMENT	RESISTANCE IN OHMS	CURRENT IN AMPS.	VOLTAGE
Master Clock, Winding Magnets	11	0.2	2.2
Secondary Clocks, No. 1 Movement, 12 inch Dials	10	0.1	1.0
" " " 1 " 14 to 18 inch Dials	20	0.1	2.0
" " " 2 " 18 " 24 " "	20	0.1	2.0
" " " 2 " 24 " 30 " "	30	0.1	3.0
" " " 3 " 30 inch and up	40	0.1	4.0
Tower Clocks, Time Magnets	50	0.1	5.0
Program Clocks, 2 Circuit	20	0.15	3.0
" " 4 "	30	0.15	4.5
" " 6 "	50	0.15	7.5
Time Recorders, "Bundy"	20	0.1	2.0
" " "Dey"	20	0.1	2.0
Watchman's Clocks; "Eco," etc.	20	0.1	2.0

WIRING DIAGRAMS

THE wiring diagram below is for a system comprising one circuit of Secondary Clocks and two independent signal bell circuits. The latter are controlled by a Program Clock in the Master Clock case. Blue prints of wiring diagrams are available for systems having any number of Secondary Clocks and clock circuits, bells, gongs, program circuits, time stamps, whistle valves, etc., also showing the connections when the Program Clock is mounted in a separate case rather than in the Master Clock case, as in Fig. 477.

Architects, engineers and owners are strongly advised to consider the ultimate use of electric time systems when planning new buildings, so that the wiring can be performed during construction just as it is for electric lights and telephone. Even if the advisability of distributing correct time throughout a building, like heat, light and water, should not appear necessary at first, the wiring should, nevertheless, be done so that clocks could be easily installed at any subsequent time.

Engineers and architects should not hesitate to write for wiring diagrams covering any system in which they feel an interest, or to call upon our engineering staff whenever they can be of assistance in the preparation of plans and specifications.

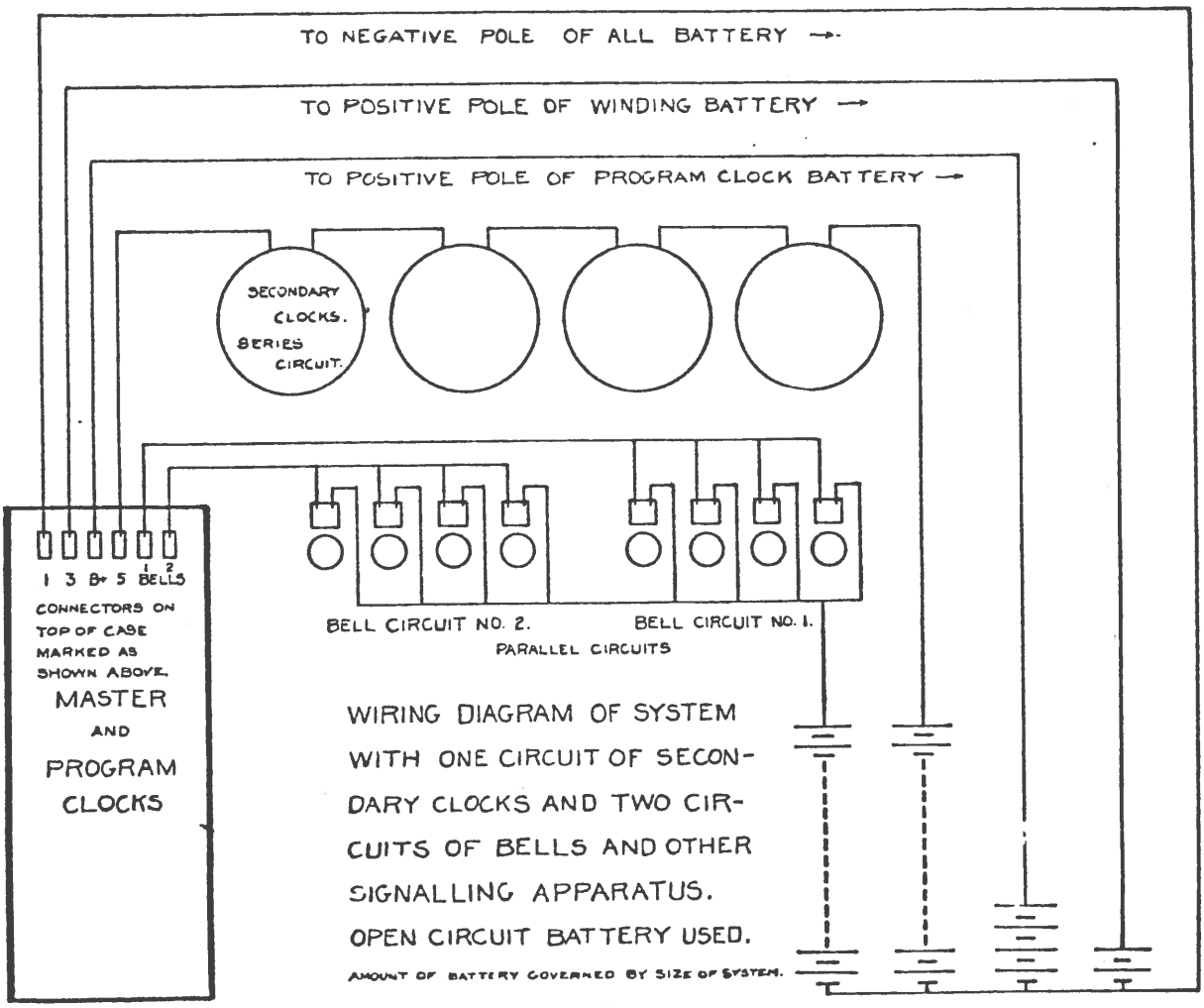


Fig. 477

SWITCHBOARDS

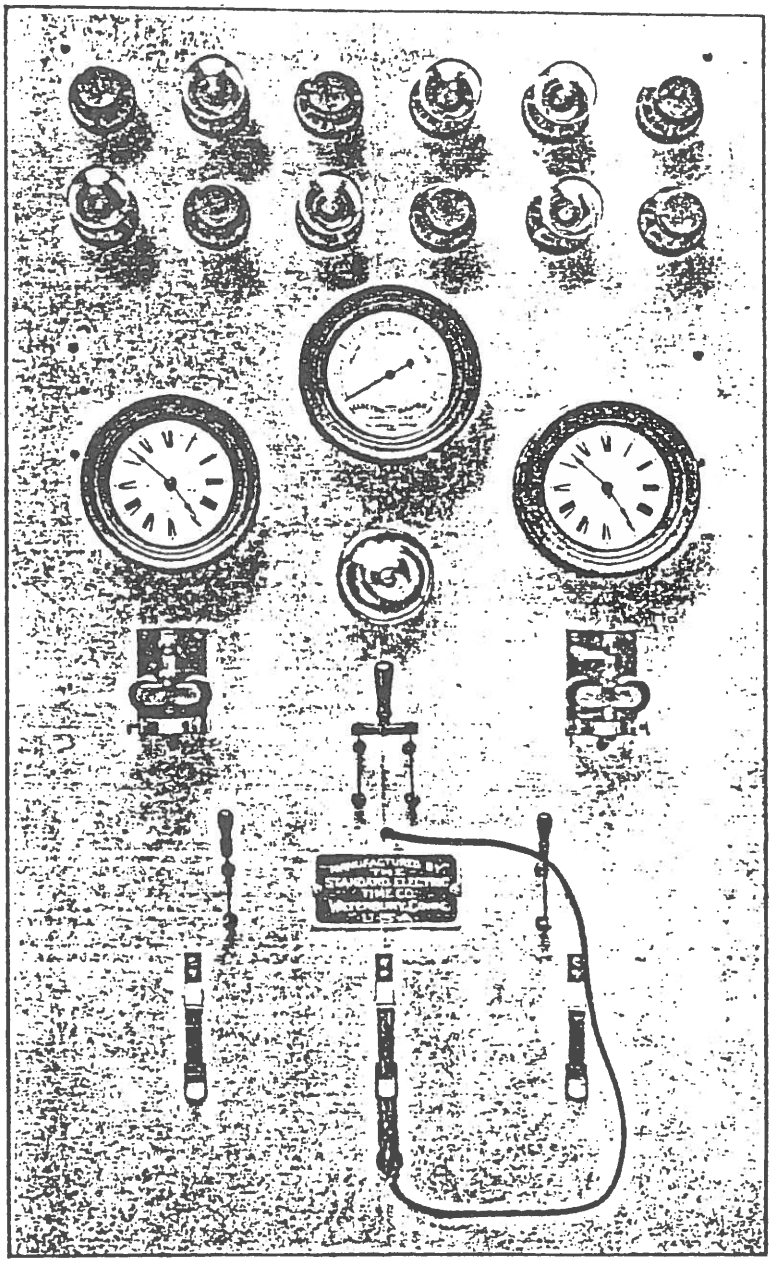


Fig. 444

Switchboard for a system of two clock circuits showing one pilot dial and one relay for each circuit. Also the resistance lamps, battery gauge and switches. The battery gauge may be used for testing the e.m.f. of either circuit by means of the cord and plug shown.

SWITCHBOARDS

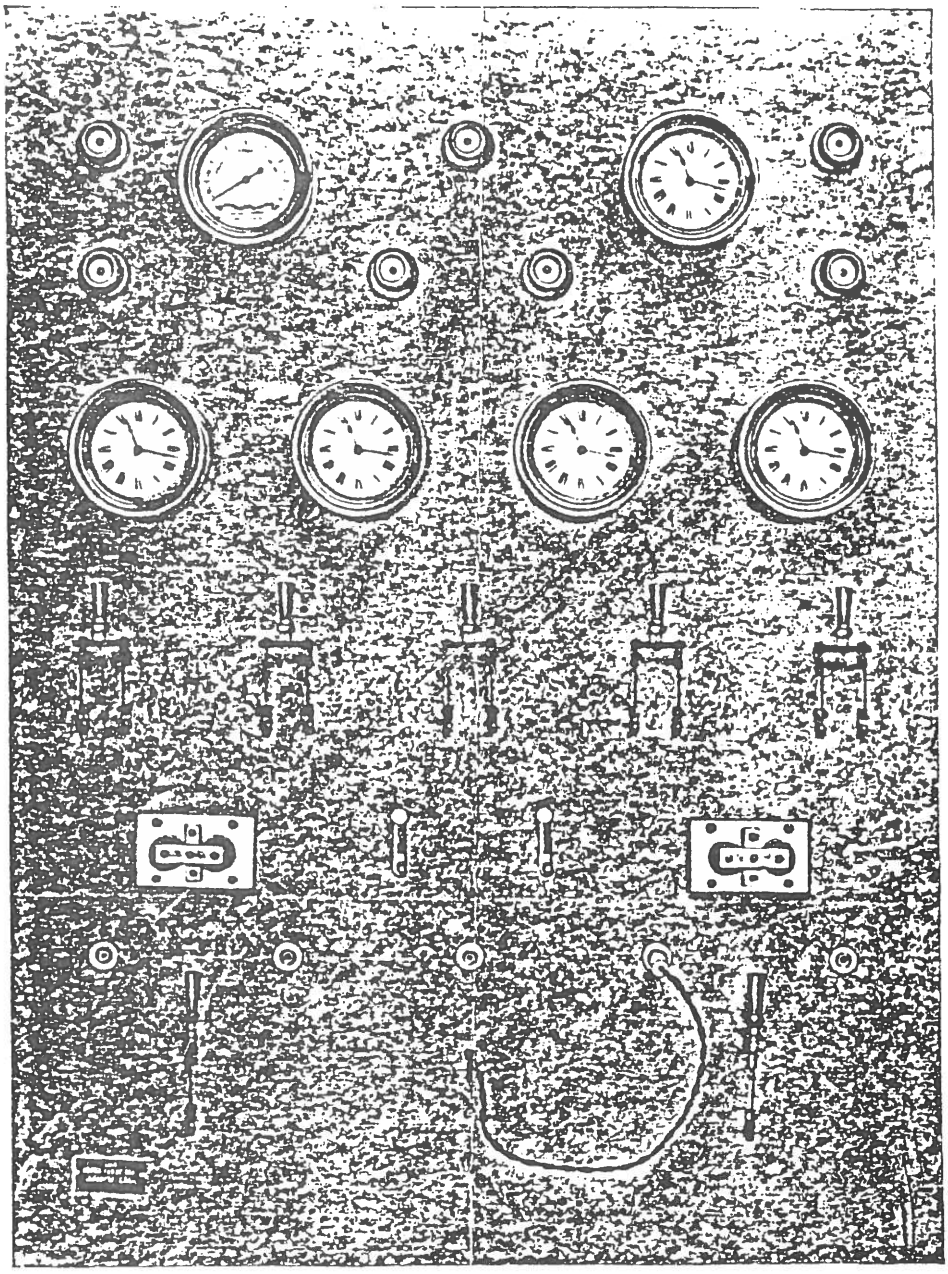


Fig. 41

Switchboard for the control of five Secondary Clock circuits. Its equipment consists of a pilot dial for each circuit, a battery gauge which may be plugged into each circuit, switches, relays, resistance lamps, etc.

A line of charging boards for systems of any magnitude have been designed. These are used when the system operates from storage batteries. The equipment of a charging board consists of a Weston voltmeter, automatic circuit breaker, switches, etc.

GENERAL WIRING REQUIREMENTS

ALL wires where passing over or through brick walls or any place where abrasion is likely to occur, where running near or across iron piping or ironwork of any kind, where running near or over electric light or power wires, must be adequately protected. In some cases circular loom or other equally good covering is sufficient; in other cases porcelain tubing or similar methods may be necessary. In brief, a thorough protection against leakage, grounds and "sneak" currents is required. Cheap wiring, or even good material and poor workmanship, should be avoided.

In factory wiring and general mill work it is not usually practical to conceal wiring, and if not run in conduit it should be fastened securely and protected against the various repairs and changes of the mill equipment. Where running down walls or near benches or machines, the wires should be either in conduit or moulding. No wire should be used smaller than No. 16 B. & S. gauge. Annunciator wire should not be used. The following wire is recommended: rubber covered for all damp places and locations where acids or other chemicals are used; weather-proof or an office wire equal to that made by American Electrical Works, for general purposes. All joints must be soldered and taped and all connections must be tight.

The wiring diagram shown in Fig. 477, page 35, as in blue prints of other wiring diagrams, are simplified for the sake of clearness in showing operation, and must not be taken literally when wiring. For instance, branch circuits must be tapped off where connections can be reached at any future time, these to be made at the top of the Master Clock or at the battery or some central point. For example, in wiring the system on page 35, Fig. 477, run five wires from the top of the Master Clock to the battery, run one pair of wires from the top of the Master Clock taking in Secondary Clocks in series, run two wires taking in all of No. 1 circuit of bells in multiple, run two wires for all of No. 2 circuit in multiple.

Not more than eight bells or gongs should be connected on one pair of wires. If more than this should be required on one schedule they should be divided in circuits and multipled at top of Master Clock.

If more than twelve or fifteen clocks are to be run from a one-circuit Master Clock, or if there are very large clocks on the system, they should be wired in two or more circuits and connected in series or run from a relay at the top of the Master Clock.

Full directions for installing, connecting and operating are sent with every clock.

INSTALLATION

FROM the perusal of this bulletin it is seen that the wiring for "Standard" Electric Time presents no problem either in a new or old building, before or after construction, that is not susceptible to the same treatment as any other low voltage, light current equipment, such as the telephone and telegraph.

Electricians who are familiar with good practice will, therefore, experience no trouble in wiring for "Standard" Systems when provided with diagrams and suggestions which may be had for the asking. Likewise the clocks and other elements in a complete system may be installed by the electrician or mechanic on the spot instead of necessitating the expense of sending a man from the factory to do the work.

1. The equipment for a system may, therefore, be bought f.o.b. factory, and the installation performed entirely by a local electrician.

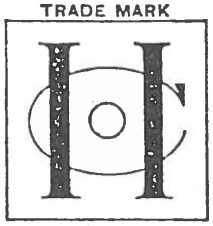
2. If this method is not agreeable, the wiring may be done by a local electrician, and a man sent from the factory to unpack and connect the clocks; or

3. A man may be sent to superintend the whole job of wiring and erecting; or

4. The factory will contract to supply all materials and labor for the installing of a system complete.

There is no mystery in the workings of an Electric Time System, but their use is not sufficiently general at the present time to have afforded many electricians experience in their erection. Any possible question, however, that may arise will be answered to the best of the ability of an Engineering Staff that has had much experience, so that no hesitancy should be felt in writing for such data.

TRADE MARK



WE want you to have our Engineering Bulletins on any of the following classes of instruments that you may ever require. A postal brings them.

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STANDARD REVOLUTION COUNTERS
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INSTRUCTIONS

FOR

Telechron Master Clock

Type A

Bulletin M-13

WARREN TELECHRON COMPANY
ASHLAND, MASS.

Installation and Operation of Type "A" Master Clock

It is recommended that only a man familiar with clock or meter movements be allowed to install, start and regulate this Master Clock.

Use care in unpacking the clock so as not to break the glass or to damage the case. Do not allow any packing material to get inside the case.

The following articles are packed as indicated and care should be taken so that all are properly unpacked and accounted for.

Inside of case

Pendulum

In top of case

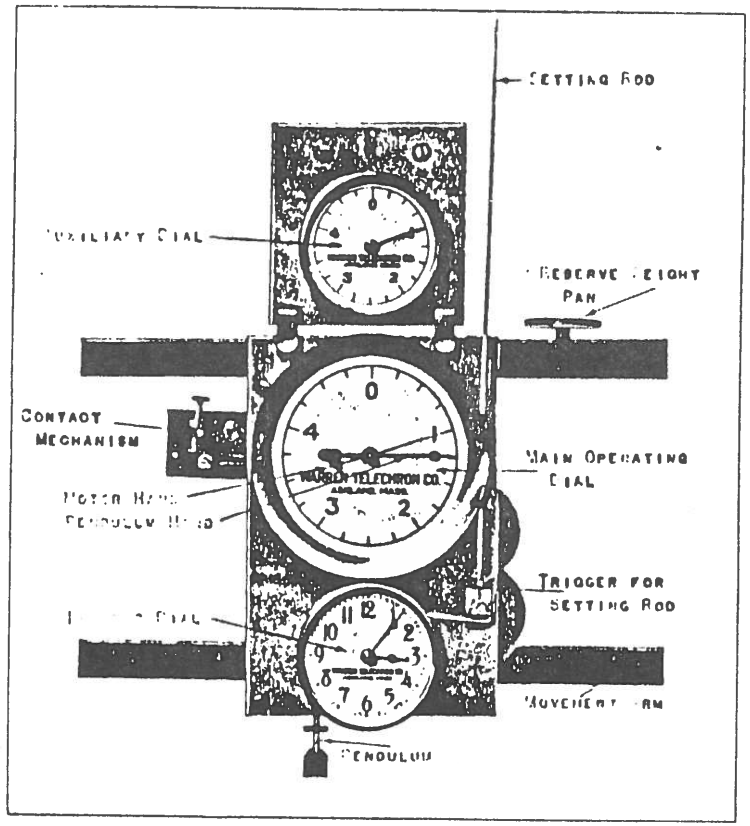
Setting Rod
Keys to case
Reserve weights
Regulating weights
Instruction book

In separate packages

Main movement with reserve weight pin
Auxiliary movement
Dry cells (2)
One Telechron clock for wall mounting

Location

Place the Master Clock in a location which is firm and free from vibration, and, in addition, where it may be readily observed by the switchboard operators or load dispatchers. It is recommended that the clock be mounted on a separate base, above the level of the floor, in order to lessen the vibration and to prevent undue handling. This base may consist of a heavy concrete or stone block which rests upon a felt or cork pad about one inch in thickness. By means of the three adjustable legs underneath, and the use of a plumb bob, the case should be leveled so that it is plumb in two directions, after which the legs should be locked in position with the locking rings.



Front view of Operating Dials

Installation of movement and pendulum

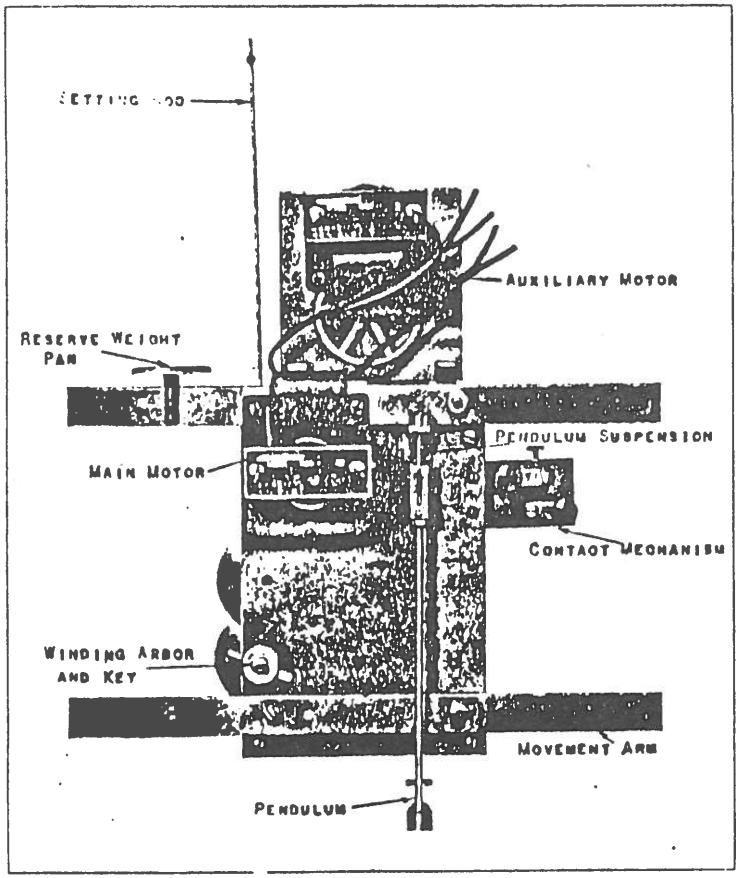
Place the horizontal brass bars, projecting from the main movement, in the groves of the cast frames which are attached to the inside of the case. The large five-minute dial should be on the top, facing the glass front of the clock. Be sure that the bars are resting on the leveling screws in the top lugs of the frame and not on the clamping screws in the bottom lugs. Level the movement, with a spirit level on the arms, by adjusting the small leveling screws and lightly clamp it in place with the clamping screws. Hook the pendulum on from the back, with the hook facing the front. Be sure that the pendulum rod passes through the fork of the verge rod. The distance between the bottom of the pendulum bob and the block should be $\frac{1}{32}$-inch. If this distance is not correct, adjust the leveling screws until the pendulum is in its proper position and relevel the movement. The small auxiliary five-minute dial should be clamped on the top of the front plate of the clock so as to be directly over the large five-minute dial.

Motor connections

Connect the wires, leading from the two motors, to the double pole single throw switches underneath the cover of the clock, keeping the switches open. Connect the line sides of these switches to a reliable source of regulated alternating current of the characteristics shown on the nameplate. It is recommended that each switch be supplied from a different primary circuit, if possible, so as to reduce the danger of a complete interruption. Each motor requires but four volt-amperes which will allow it to be connected to an instrument transformer circuit.

Adjustment of setting rod

Within the space under the top cover of the case, there will be found a slender steel rod with three small nuts on one end. This rod runs from the spring strap switch in the top of the case to the small brass block on the right hand side of the dial plate. The upper two nuts should be removed and the threaded end of the rod should be passed up through the holes in the



Back view of Movement

case and the strap switch. The large end of the rod should be placed in the hole in the brass block. Holding the rod with the left hand, so that the trigger prevents any further upward motion, replace the small hexagonal nut so that there is a nut on each side of the spring strap switch. Adjust both nuts so that the spring contact points make a good firm contact. Release the trigger and make sure that the contact points have opened. When the position of the spring strap has been adjusted, so that the contacts are open or closed respectively when the trigger is released or caught, replace the round lock nut on the rod and leave the switch in its open position.

Dry cells

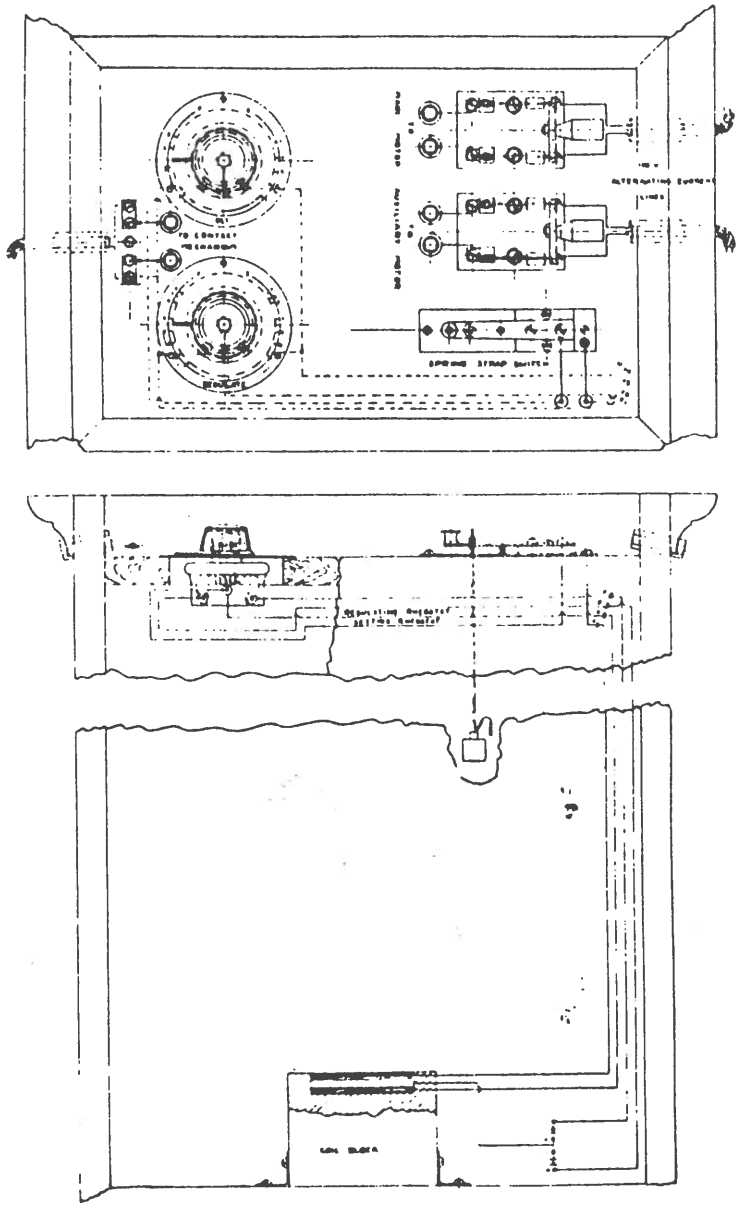
The two No. 6 dry cells should be placed in the bottom of the case against the right side wall in such a position that they will not interfere with the pendulum. The carbon (positive) of one cell connects with the wire marked "Carbon" and the zinc (negative) of the other cell connects with the wire marked "Zinc." The zinc of the first cell and carbon of the second cell should be connected together with the wire marked "Carbon-Zinc." These cells should be renewed every six months.

Regulating weights

Two small envelopes (marked "Regulating Weights" and "Reserve Weights") will be found in the top of the case. The regulating weights should be placed on the small circular pan secured to the pendulum rod. The reserve weights should be placed on the circular stand that can be easily attached to one of the movement arms. Each weight is marked with a numeral which designates the number of seconds per day which that particular weight will cause the clock to change its rate.

Starting the Master Clock

When the clock is ready for operation, the two switches in the top of the case should be closed,



Electrical Wiring of Telechron Type A Master Clock

thereby energizing the motors. The pendulum may now be started by moving it with the fingers. If the clock has not been injured in shipment and has been properly leveled and set up, the swings of the pendulum will give a balanced and even beat. The evenness of the beat can be readily ascertained by carefully listening to its sound which should be the same on each side of the swing.

Adjustment for even beats

The final adjustment for even beats can be made by the small leveling screws which support the horizontal bars projecting from the clock movement. When an even beat has been obtained, carefully tighten the lock nuts so that the leveling screws will not work loose.

Timing

The Master Clock, when tested at the factory, kept correct time when the weights in the envelope marked "Regulating Weights" were upon the pendulum pan. As mounted in its new location, the clock may require a different number of weights to give correct time but this can only be determined after it has run for several days.

The error in time of the black seconds hand should be determined each day by comparing its time with the radio time signals broadcast by the U. S Naval Observatory at Washington, D. C. or from some other reputable astronomical observatory. This error should be determined to the nearest second and a record kept of it, together with the corrections which were made. It will be useless to attempt to regulate the Master Clock except by comparing it with accurate time signals. If properly regulated, the clock is capable of running with an error of less than one second per day.

If the Master Clock shows by its record that it is LOSING, weights should be ADDED to the pendulum pan of the same value as the average number of seconds which the clock is losing in twenty-four hours.

If the Master Clock is GAINING, as shown by the daily record, weights should be REMOVED from the pendulum pan of the same value as the average number

of seconds per day which the clock is gaining in twenty-four hours.

The best method of changing the weights is by handling them with a pair of tweezers, moving the latter back and forth in time with the pendulum. In this manner, the period of swing of the pendulum will not be disturbed.

The accumulated error of the clock may be eliminated by carefully stopping the pendulum with the fingers, if the clock is fast, or, if the clock is slow, by vibrating the pendulum through its normal arc but at a more rapid rate than usual. In this manner, the clock may be easily set without touching the seconds hand at any time. The minute hand on the lower dial should read some multiple of five minutes when the black seconds hand is at zero. The former hand may be set manually.

The Master Clock can be very accurately regulated by means of weights being added to or subtracted from those in the pendulum pan. However, there are, in the top of the case, two additional methods of regulating the pendulum movement. This regulation is accomplished by the adjustment of the two small dial rheostats which control the intensity of the magnetic field set up by the coil block in the bottom of the case.

The setting dial, in the rear, is connected in series with the spring strap switch and is installed for the purpose of setting the clock. This rheostat should be set for the number of seconds which the clock must gain or lose in order to get back to correct time and the strap switch should be pushed down so that its contacts are closed. If the strap switch has been properly adjusted, the trigger on the front of the movement will catch the setting rod and hold it in position. The switch will remain closed for about ten hours, provided that this operation is completed shortly after noon-time, and, during this period, the clock should gain or lose the number of seconds for which the dial is set. At the end of the setting period, the strap switch will open automatically, break the setting circuit, and the pendulum movement will continue at its former rate.

For the purpose of correcting the rate of the pendulum movement, the regulating dial in the front of the

top should be used. This correction remains in effect at all times and acts in the same manner as the weights on the pendulum pan. If the pendulum movement has a rate of two seconds slow per day, the rheostat should be set to 2 on the fast side.

Radio time signals

Radio time signals are broadcast at noon and at 10:00 P.M., Eastern Standard Time, each day by the U. S. Naval Observatory at Washington, D. C. These signals, in the form of quarter second impulses, commence at five minutes before the hour and are sent in the following sequence, expressed in minutes and seconds. The one second dash at the end of the 10 second interval in the 59th minute is the signal for the hour.

55:00—55:28	55:30—55:50	55:52—55:55	
56:00—56:28	56:30—56:51	56:53—56:55	
57:00—57:28	57:30—57:52	57:54—57:55	
58:00—58:28	58:30—58:53	58:55	
59:00—59:28	59:30—59:50	60:00 (1 sec.)	

If the naval radio time signals are not available, they may be obtained by telephone or telegraph from a reputable astronomical observatory or from either of the national telegraph companies at NOON, Eastern Standard Time.

Setting hands

The gold seconds hand on the large dial is driven by a Telechron self-starting synchronous motor in the rear of the movement, and this same motor keeps the spring movement constantly wound. The gold hands on the two upper dials can be set by controlling the motor switches in the top of the clock. This can be easily done by closing the motor switch at the instant that the black hand passes beneath the gold hand. DO NOT SET EITHER THE BLACK OR THE GOLD SECONDS HANDS MANUALLY.

Auxiliary dial

The hand of the small auxiliary dial, at the top of the movement, is driven by an independent Telechron

motor and is provided for emergency operation. If, for any reason, the motor which drives the gold seconds hand on the large dial should stop, it will still be possible to maintain constant average frequency by comparing the black seconds hand of the large dial with the gold seconds hand of the small auxiliary dial. Both gold hands should always be set to indicate the same time so that if either one fails to operate, the other one will still be available.

This auxiliary dial can be used to regulate the frequency at any time if it is necessary to repair or replace the motor in the main movement. It is recommended that an additional Telechron Motor be held in reserve so that it can be used to replace either of the motors in the Master Clock.

Pendulum spring

The spring for the pendulum movement was wound before the Master Clock was shipped from the factory, and, unless it runs for more than a day while the motor is stationary, it will not require any additional winding. If the spring should run down, which it will do if the main motor is stopped and the clock continues to run for several days, it will be necessary to rewind it by means of the key on the winding arbor in the back of the movement. The spring should not be tightly wound. If it were, the motor might tend to overwind it. An easy way to avoid this danger is to allow the pendulum movement to run for at least twelve hours, after the spring has been wound fairly tight, before STARTING the main motor. In the meantime, the hand of the auxiliary dial may be used to obtain the correct frequency.

CAUTION: *Do not permit the main motor of the Master Clock to run for any considerable length of time if the pendulum is standing still. Such a condition may cause the motor to overwind and thus break the clock spring.*

Wall Clock

A Telechron wall clock with a sweep second hand is included with the Type A Master Clock and should be mounted near the latter where it can be readily observed by the switchboard operators. This Telechron clock will allow a check to be made on the system at all times, and, in an emergency while the Master Clock is out of service, will also permit accurate frequency regulation by comparing its sweep second hand with that of an accurate watch or clock. It will not be necessary to connect this Telechron clock directly to the Master Clock for it can be plugged into any regulated alternating current circuit of the proper voltage and frequency.

Operation of Master Clock

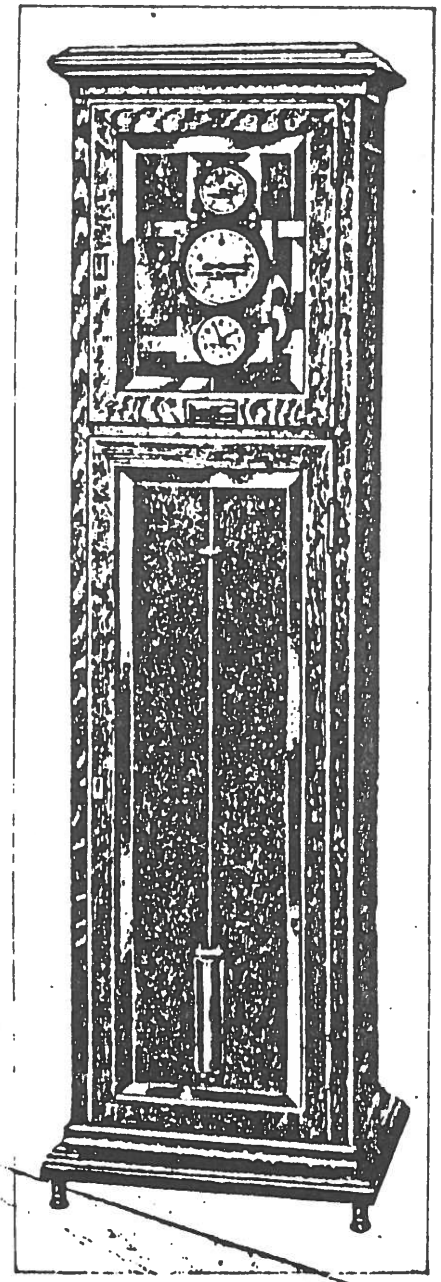
When the Master Clock has been accurately regulated by a number of successive timing tests, it is ready to be used in controlling the frequency. The switchboard operators should be instructed to keep the black and gold second hands together by adjusting the frequency from time to time whenever these two hands show any tendency to diverge. It should not be necessary to make any adjustments more often than three or four times an hour depending of course, upon load conditions, sensitivity of governors, etc. On a large system it will be the best practice to keep the two hands together at all times with a maximum error of not more than two or three seconds at any time.

Power interruptions

If the power supply to the Master Clock is interrupted for any reason, the gold hands will, of course, stop but the black hands will continue to operate. When the power is restored to the clock, the black and gold hands will no longer be together. The operator should not attempt, under these conditions, to change the normal frequency so as to bring the hands together but instead he should open the motor switches in the top of the clock and allow the black hand, on its next revolution, to catch up with the gold hand at which time the switches should be closed. Under no conditions should a divergence between the hands be overcome by manual resetting.

Recording Master Clock connections

On the left hand side of the top of the case is a small porcelain cleat which should be connected to the small



Type "A" Telechron Master Clock

contact mechanism on the left side of the main movement. These connections are to be used when a Telechron Recording Master Clock is installed in connection with the Type A Master Clock. The contact mechanism should be connected to the Recording Master Clock as shown in blueprints attached to the latter. It is sometimes advantageous to connect a low powered bell to this circuit so that the clock time may be checked over the telephone.

Overhaul

The Master Clock should be cleaned and overhauled every two years. At the same time, it is recommended that the two motor units be replaced. No difficulty will be encountered in changing the units and the only care necessary is to locate the new motor casing in the field in the same position as the old. When desirable, a similar master clock can be shipped as a temporary replacement while the original master clock is returned to the factory for overhaul and repairs. Such an over-haul results in practically a new movement at a very reasonable charge.

Any communications concerning the operation, construction, etc., of Telechron Master Clocks should be addressed to the Commercial Engineering Department.

WARREN TELECHRON COMPANY

Ashland, Mass., U. S. A.

Patents: October 29, 1918; March 14, 1922; July 22, 1924

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