

April, 1911.

Silent Electric

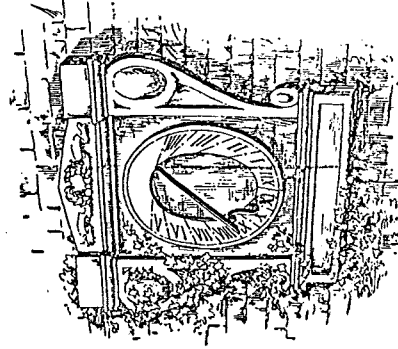
Impulse Clocks

and

Electric Turret Clocks

"The B.P. System."

BRITISH MANUFACTURE.



SILENT DIAL.

TANGENT

REGISTERED TRADE MARK

TERMS.

THIS LIST CANCELS all previous issues, and is subject to alteration without notice.

THE ILLUSTRATIONS show generally the appearance of the respective articles; but instruments may vary from the illustrations as improvements and alterations occur.

DELIVERY is made Free on Rails at Factory.

PACKING AND CASES are charged for, but full value is allowed for empties returned, if received in good condition, carriage paid and previously advised, within 14 days from delivery of goods. Packing Cases made specially, as for bulky articles, not returnable.

BREAKAGES or LOSS IN TRANSIT. All goods are most carefully packed, and no claim can be considered by us for damage, breakage, or loss in transit. Goods should be signed for after examination, or signed "Unexamined," so that purchaser can institute the necessary claim.

TIME OF DELIVERY is always reckoned from the date at which all particulars necessary are in our hands for executing the work. Promises are subject to the usual Strike and Accident Clauses.

GUARANTEE. All apparatus is carefully examined and tested before leaving the works, and is sent out in perfect order and condition. We, therefore, give the following Guarantee which takes the place of any Guarantee implied by Statute common law or otherwise:—

If within 12 months from date of despatch, any defect or fault is discovered in any instrument, due to faulty material, or bad workmanship, we undertake to make good the defect without charge, provided that notice is given to us immediately on the discovery of the defect, and the defective instruments or parts thereof, are forwarded to us carriage paid.

This guarantee does not apply to defects caused by ordinary wear and tear, misuse or neglect, or by circumstances over which we have no control.

Our responsibility in all cases is limited to the cost of making good any such defect.

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IMPORTANT NOTE!

YOU can Fix B.P. Clocks.

The goods described here are not delicate scientific instruments needing expert manipulation and attention, but strong, sturdy, substantial articles, designed to be dealt with by the Electrical Contractor, and can be maintained by the Works Engineer and handy man.

We are the Experts, and we have done all the Expert work. Most of the clocks are in closed cases and sealed to prevent tampering, and we are responsible while the seal remains unbroken and the article is undamaged.

The "Waiting Train" Turret Clocks are compact Mechanisms, easily fixed in position, and their action as easily understood by any intelligent workman, electrician, or clock maker.

In corroboration of this statement we would point out that in the list of installations given on the following page are many that have been fixed entirely by clock makers, electricians and works engineers.

The Contractor places the transmitter and dials in position, connects them in a simple circuit with an ordinary Leclanche battery, and finally adjusts the pendulum in position, when the system will keep time without any further attention to within a few seconds per week. In 12 or 18 months the battery may need a few minutes attention, and a Warning Bell is automatically sounded to announce this fact.

Some of the places where the B.P. Systems of Electric Clocks are in use.

New Central Criminal Court, Old Bailey. (For the Corporation of London).

Cardiff New General Post Office.

Mersey Dock and Harbour Board Offices, Liverpool.

Bradford City Tramway Offices.

Bradford Town Hall.

South Shields Town Hall.

The Merchant Venturers' Technical Institute, Bristol.

Bunley Corporation Technical School.

Leicester Corporation Technical School.

Secondary Schools, North Shields.

Ross Institute, Caithness.

Mullingar Station for the Midland Great Western Railway of Ireland.

Manors Station, Newcastle-on-Tyne, for the North Eastern Railway.

Riverside Station, Hull, for the North Eastern Railway.

Stoke-on-Trent Station. (For the North Staffordshire Railway.)

Nirvanian Observatory, Hyderabad.

Royal Alfred Observatory, Mauritius.

University Observatory, Oxford.

Marine Observatory, San Fernando, Cadiz.

The University, Leeds.

National Telephone Company's Exchanges at—

Paddington, East Ham, Gerrard, Walthamstow, Hop, Soho,

Hammersmith, Eastern, Dalston, Tottenham, Brixton,

Bromley, Beale, Great Yarmouth, Chester, Birmingham,

Altrincham, Liverpool, Manchester, Aberdeen, Cambridge,

Glasgow, &c.

Newport Borough Asylum, Caerleon.

Cardiff Mental Hospital.

Leicester and Rutland Counties Asylum, Narborough.

West Riding Asylum, Courties Hall.

Leicester Borough Asylum, Humberstone.

Ashlyns Hall, Berkhamsled, for Sir Richard Cooper, Bart.

Thornbridge Hall, near Bakewell, for G. J. Marples, Esq.

Laragh Bhan, Killybeg, Argylshire, for E. Campbell Muir, Esq.

Evington Hall, Leicestershire, for John Faire, Esq.

W. S. Cummings, Esq., Rothes, N.B.

A. Gray, Esq., Shortlands, Kent.

Louis Ames, Esq., Longhrosey.

V. G. Middleton, Esq., Broadway Chambers, Westminster.

Morgan Lewis, Esq., Leicester.

W. Tattersall, Esq., Hale, Manchester.

SOME PUBLIC TURRET AND CHURCH CLOCKS.

The "Times" Office, Queen Victoria Street, London. Two separate Clocks.

St. Luke's Church, Leicester.

The Fish Dock, Tynemouth.

St. Nicholas Church, Leicester.

Hordicks Malted Milk Factory, Slough.

Blackett Street, Newcastle-on-Tyne.

Westgate, Mansfield.

St. Ann's Square, Manchester.

St. George's Church, Leicester.

Public Baths, Bourneville, near Birmingham.

E. Merrill, Esq., Manor Heath, Bingley.
T. E. Hodgkin, Esq., Old Ridley, Stockfield.

Messrs. Cadbury Bros., Ltd., Bourneville, near Birmingham.
Messrs. F. and J. Smith, Tobacco Manufacturers, Glasgow.
The Premier Gas Engine Co., Ltd., Sandilace, near Nottingham.
The Bradford Gas Co., Bradford.

Messrs. Faire Bros. & Co., Ltd., Rutland Street, Leicester.

Messrs. The British Pioneers Co., Ltd., Wimpole Street, Leicester.

Messrs. W. J. & Lockhead, Ltd., Buchanan Street, Glasgow.

Oak Lea Mills, Long Eaton.

The Baddesley Colliery, near Atherstone.

Riley Engine Co., Castle Works, Coventry.

Messrs. S. Muggitt & Sons, Sutton-in-Ashfield.

Hickon Patents Syndicate, Long Eaton.

Eyre & Sons, Chesterfield.

Messrs. W. Wallis & Sons, Long Eaton.

Messrs. Hollins & Co., Pleasley, Mansfield.

Hordicks Malted Milk Factory, Slough.

Messrs. Rawson & Sons, Boot Manufacturers, Leicester.

Messrs. Cooper & Nephews, Chemical Works, Berkhamsled.

Messrs. John Brown & Co., Atlas Steel and Iron Works, Sheffield.

The New Lowca Eng. Works, Whitehaven.

Cardiff Channel Dry Dock and Pontoon Co., Ltd.

The "Times" Offices, Queen Victoria Street, London.

Messrs. Keen & Robinson, Mustard Manufacturers, London.

The Crown Agents for the Colonies.

Messrs. W. Tyler & Sons, Leicester.

Messrs. Boots, Ltd., Bath.

Messrs. Arnold & Lewis, Watchmakers and Jewellers, Manchester.

Messrs. Curtis & Horspool, Clockmakers, Leicester.

Mr. G. Feather, Watch and Clockmaker, Kighley.

Mr. Robert Milne, Manchester.

Messrs. Reid & Sons, Clock Manufacturers, Newcastle-on-Tyne.

Messrs. P. Orr & Sons, Clock Manufacturers, London.

Messrs. Hamilton & Inches, Jewellers, Princess Street, Edinburgh.

Mr. C. H. Cornish, Clockmaker, Plymouth.

Goldsmith's Alliance, Bristol.

The Edison & Swan U.E.I. Co., Ponders End, Middlesbrough.

Mr. Frank Harper, Jeweller, Norwich.

Messrs. Dobson Bros., Wheelwrights, Nottingham.

Messrs. Howard Bros., Paradise Street, Liverpool.

Messrs. Davis & Soper, 54 St. Mary Axe, London.

Messrs. W. J. Corse & Co., Union Street, Plymouth.

Messrs. Mackintosh & Co., London, E.C.

The British Westinghouse Electrical and Manufacturing Co.

Mr. J. Farr, Nottingham.

Evington Hall, near Leicester.

Port Elizabeth Public Granary.

Riverside Station, Hull.

Manors Station, Newcastle-on-Tyne.

St. George's Works, Leicester. Two separate Clocks.

Argyle Motor Works, Alexandria, Glasgow.

Thornbridge Hall, near Bakewell.

Rusdean Church, Gloucestershire.

Four 25 feet Dials for New Chief Offices of the Royal Liver Friendly Society, Liverpool. (The largest electrically Driven Clock in the World.)

General Description OF A Modern Impulse Clock System.

The Apparatus necessary for a complete system consists of:—

1. An Impulse Transmitter, which is an accurate time measuring mechanism, the function of which is to send the current generated by the battery to the impulse dials at half minute intervals; it also automatically controls the duration of the impulse to suit the exact requirement of the dials.
2. The Clocks or Impulse Dials, which are designed for all situations and requirements, wall dials, bracket dials, turret dials, illuminated turret dials. (Any number and any type of which can be impelled on the same circuit from the same transmitter).
3. The Battery, which supplies the power to the system, and which should consist of ordinary Leclanche cells or dry cells.
4. The Warning Bell, operated by the above battery which rings only when that battery needs attention.
5. The Wiring, which consists of copper wire insulated exactly as used for electric bell systems or electric light purposes, a single line only being used for connecting the dials, transmitter, battery, and alarm bell in a simple circuit.

N.B.—We would emphasize here that no expert knowledge of clocks is needed with the B.P. System, any works' engineer or electric contractor can fit with as much ease and assurance as he can carry out an electric bell or electric light installation.

ADVANTAGES OF THE SYSTEM.

Uniformity and accuracy. Every dial being absolutely governed by the Transmitter which has a compensated pendulum guaranteed to within a few seconds per week, uniform time and accurate time is maintained on every dial.

No winding. No weekly winding is required. No continual attention is needed, such as adjusting the hands, regulating the pendulums, repairing and cleaning.

Original Outlay no more. Where only a few dials are required the original outlay is not more than for spring driven clocks (where anything in the nature of a timekeeper of this class is under consideration) see estimates, page 42, and where a large number, say from ten dials upwards, is to be used the outlay is less, and as the number of dials increases the saving is more apparent.

Effectiveness. Effectiveness has been the aim in design—not cheapness. The B.P. System does not attempt to compete where price alone is considered. Comparison is invited between the clocks and prices with others.

Reliability and Independence of Battery. The B.P. System is designed to last, both transmitters and dials being fixed in cases of solid construction, and rendered air-tight, and the transmitters are substantial and wear resisting.

Variation. The design of the contact is such that it does not stop on closed circuit and so ruin the battery.

Warning Bell. The variation of the battery current does not affect the time-keeping, so weakening current does not affect the system.

Small Battery. When, in course of time, the battery needs attention, a warning bell is automatically operated by the weakening battery, until the necessary attention to the cells has been given. This ensures the system against stopping through the battery failing.

Can be extended indefinitely. The size of the battery required to drive a system is reduced to the absolute minimum and the duration of each impulse is reduced to so small a fraction of second that the battery lasts for years.

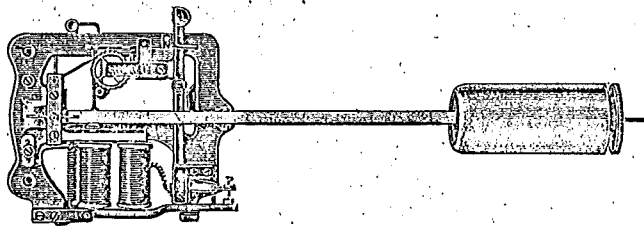
Workmen's Check Clocks. A system of Impulse Clocks can be extended indefinitely, both as regards number and size of dials. Turret Clocks of any size can be added, and existing Turret Clocks can have their pendulums so regulated by mechanism included in the circuit that they will keep absolute time with Impulse Clocks.

Workmen's Check Clocks of practically all sizes, makes and description can be adopted to the B.P. Impulse System, see page 25.

THE B.P. PATENT

"CENTOR" IMPULSE TRANSMITTER.

Hundred Beat Pendulum (approximate $\frac{1}{2}$ seconds). Rigid Cast Metal Base.



Centor Transmitter Movement showing details of rigid construction.

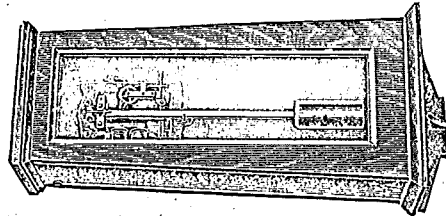


Fig. C 30.

In solid polished hardwood case, with glass panel, lock and key.

Price .. £4 0 0

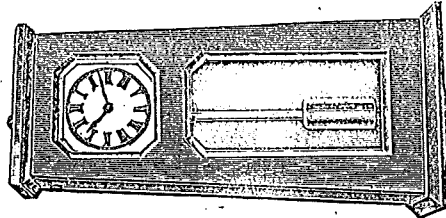


Fig. C 31.

In solid polished hardwood case, with time dial 6" diameter.

Price .. £5 5 0

The great advantage of the "Centor" Transmitter lies in its extremely low price and compact design. By utilising a smaller pendulum than before we have been enabled to assemble the whole movement in a much smaller case. In doing so, however, nothing has been sacrificed in efficiency or accuracy; which are as marked features in the "Centor" Transmitter as they are in the types illustrated on pages 12 and 14.

The "Centor" Transmitter automatically gives indication of failing battery, and further will ring our Patent Warning Bell (see page 16).

SPECIFICATION

OF THE B.P. PATENT

"CENTOR" TRANSMITTERS SHEWN ON OPPOSITE PAGE.

CASE.—Design as illustrated, in solid hardwood throughout, highly finished and French polished, framed door with glass panel, fitted with lock and key.

MOVEMENT.—Mounted on rigid cast iron bedplate, with strong electro magnet, improve quick break, sparkless half minute impulse contact. Inclined plane gravity impulse mechanism giving constant drive independent of battery strength and variation circuit. Hundred beat (approximately $\frac{1}{2}$ second) pendulum of special non-expanding nickel steel alloy fully compensated. Cast metal bob with toothed rating nut, capable of adjustment to approximately one second per day.

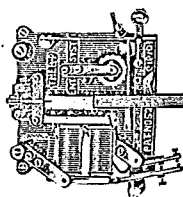
ADVANCE LEVER.—An advance lever with knob is fitted to the movement, for adjusting purposes by which all the clocks on the circuit can be advanced one impulse for ever vibration of the pendulum.

FITTINGS.—Substantial terminals and fixing plates for three screws are provided.

DIMENSIONS.—24" high x 11" wide x 5" deep ; weight without time dial 17 lbs.

THE B.P. PATENT "HOME" IMPULSE TRANSMITTER.

SECONDS PENDULUM, HEAVY CAST METAL BASE.



Home Transmitter
Movement.

Shows detail and the heavy construction of the Home Transmitter movement.

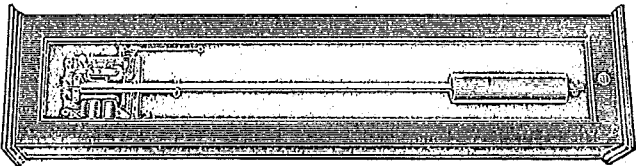


Fig. 66.

In air tight enamelled polished wood case with glass panel lock and key. Price .. \$6.

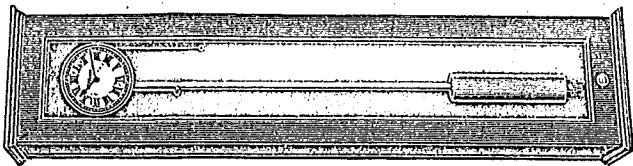


Fig. 67.

In air tight enamelled polished wood case, with time dial 7 inches diameter. Price .. \$7 15 0

The "Home" Transmitter automatically gives indication of a failing battery and further will ring our Patent Warning Bell, see page 16.

Some idea of the capabilities of the "Home" Transmitter may be formed by our stating it is in use in at least twenty-four National Telephone Exchanges, Cardiff Post Office, and is driving large Turret Clocks at Riverside Station, Hull, St. Nicholas Church, Leicester, Manors Station, Newcastle-on-Tyne, and many other clocks in all parts of the world.

For Full Specification, see opposite page.

INVAR STEEL PENDULUMS. The above transmitters are guaranteed capable of being regulated to keep time within seven seconds per week, but may be fitted with Invar Steel Pendulums at extra cost when they can be regulated to keep time within, say, two to three seconds per week. Read page 32.

Price extra for Invar Pendulums quoted on application.

SPECIAL CASES. Where desired, special cases can be made to architect's own designs, or to match existing furniture.

SPECIFICATION

OF THE B.P. PATENT

"HOME" TRANSMITTERS SHOWN OF OPPOSITE PAGE.

CASE, of design illustrated, in sound well seasoned wood, enamelled dark mahogany or rosewood, highly finished and French polished, door with full length glass panel, strong hinges, lock and key.

MOVEMENT.—Formed of rigid cast iron bed plate, with strong electro magnet, improved quick break sparkless half minute automatic adjusting impulse contact. Inclined plane gravity impulse mechanism giving constant drive independent of battery strength and variation of circuit, hard steel arbors working in hardened wrought brass bearings. **Seconds pendulum** with heavy cast metal cylindrical bob having toothed rating nut each tooth representing approximately one second per day. Platform for regulating weights, rod of non-expanding nickel steel alloy, fully compensated. The complete movement capable of being regulated to keep time within four or five seconds per week.

ADVANCE LEVER.—An advance lever with cord is fitted to the movement for adjusting purposes, by which all impulse clocks in the circuit can be advanced one impulse every two seconds.

FITTINGS.—Substantial terminals and fixing plates for three fixing Screws are provided.

DIMENSIONS.—Size overall 53" x 13" x 8", weight without time dial 44 lbs.

NOTE.

The two Transmitters shown opposite at Figs. C6 and C7, are identical except that one has an impulse movement and with its time dial fitted in the door of the cabinet. In this case the mechanism of the transmitter is fully visible on opening the door.

A separate time dial is sometimes more convenient and is not more expensive, while the absence of the time dial allows a free vision of the transmitter action through the glass and often allows the transmitter to be fixed in positions where its tick is unnoticed and where wall space is less valuable.

THE B.P. PATENT "THORNBRIDGE" IMPULSE TRANSMITTER. SECONDS PENDULUM, JEWELLED ESCAPEMENT.

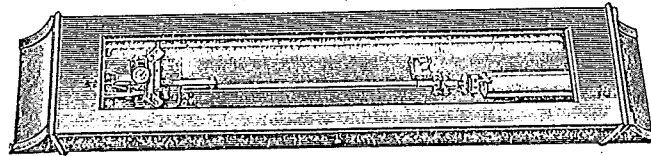


Fig. C2.

In solid hardwood cabinet.
Seconds hand dial 1 1/4 inches.
diameter.

Price .. \$16.

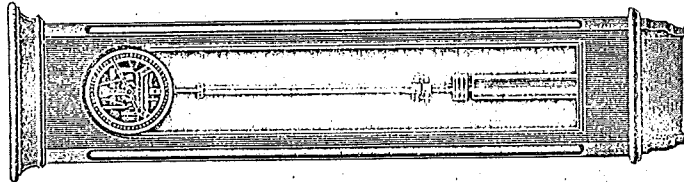


Fig. C3.

In solid hardwood cabinet.
With silvered centre seconds
ring dial 8 inches diameter.

Price .. \$20.

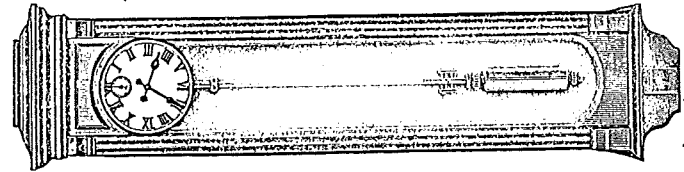


Fig. C4.

In solid hardwood cabinet.
With silvered time dial 8
inches diameter and sunk
seconds dial 2 inches diam.

Price .. \$25.

The "Thornbridge" Transmitter automatically gives indication of a failing battery and further will ring our Patent Warning Bell, see page 16.
INVAR STEEL PENDULUMS.—The above transmitters are guaranteed capable of being regulated to keep time within two seconds per week, but may be fitted with **Invar Steel Pendulums** at an extra cost when they become observatory instruments and can be regulated to keep time within say, 0.5 seconds per week. For further particulars see page 32.

Price extra for Invar Pendulums on application.

SPECIAL CASES.—Where desired, special cases can be made to architect's own designs, or to match existing furniture.

SPECIFICATION OF THE B.P. PATENT "THORNBRIDGE" TRANSMITTERS SHOWN ON OPPOSITE PAGE

CABINETS.—Solid hardwood throughout, highly finished and French polished, framed door with glass panel, strongly hinged, fitted with secure lever lock and key, joint rendered air and dust tight. Designs as illustrated.

MOVEMENT.—Strongly made movement, in heavy wrought brass, consisting of second pendulum, with teak rod compensated with zinc and steel, fitted with heavy cylindrical zinc-lead "bob" brass cased, and fitted with indicating micrometer adjustment for accurate regulation. Patent dead beat escapement jewelled in agates. Improve patent quick break "sparkless" half minute automatic adjusting impulse contact with large platinum surfaces. Patent gravity inclined-plane impulse to pendulum giving constant drive independent of current strength and variation of circuit. All parts accurately made and properly finished with silver steel arbors, ground and polished after hardening and tempering. The complete movement can be regulated when fixed in position to keep time within from one to two seconds per week, and is capable of impelling any number of dials of any size or type.

ADVANCE LEVER.—An advance lever with cord is fitted to the movement for adjusting purposes by which all the impulse clocks in the circuit can be advanced one impulse every two seconds.

FITTINGS.—Substantial terminals and a fixing plate are contained in the moulded ornamental top and an adjusting plate in the lower part of the case; available without opening the case proper.

THE PENDULUMS are fixed in position and it is only necessary on unpacking to hang on the cylindrical "bob" and release the rod.

DIMENSIONS.—Approximate size 60" x 14" x 8" overall; weight without time dial 59 lbs.

NOTE.

The choice of the most suitable of the three patterns for any particular installation, depend alone upon the position the Transmitter is to occupy, as the movements are all of the same type and finish.

No. C 2 is suitable when it is decided to fix the Transmitter in a position, where a time dial would be useless, such as in a pantry, lavatory, or passage, and such positions are often to be recommended.

No. C 3 are for those where circumstances or choice demand that the Transmitter be ornamental as in an entrance hall, lobby or main staircase.

No. C 4 shows a case of different pattern and this Transmitter is fixed where a time dial is desired.

A SPECIAL FEATURE of the B.P. System is the PATENT WEAK BATTERY WARNING BELL.

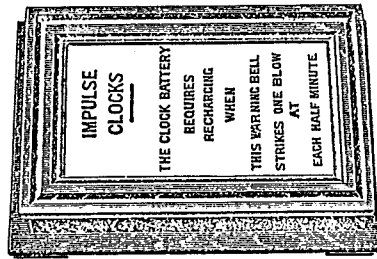


Fig. C8.

Fig. C8.—Warning Bell, with 2½" gong, substantial metal parts, all contained in polished wooden case. Size 12" x 8" x 4".

Price 20/- each.

By fitting this Warning Bell in the circuit of a system of Electric Impulse Clocks, all anxiety regarding the condition of the battery is removed, and no other testing apparatus or any periodical inspection is necessary. Immediately the battery begins to weaken the gong is struck at each half minute impulse until the battery has been given the necessary attention.

The Warning Bell requires no special battery to operate it, and can be fitted in any suitable position on the circuit, being simply connected exactly as an impulse dial.

While the bell is "warning" the lifting of the gravity lever of the Transmitter, i.e., the horizontal lever which drives the pendulum, is delayed until the pendulum returns to the right and assists the operation, hence the longer contact which gives the warning and which is capable of causing the above bell to ring. This longer contact is noticeable at all the dials which can be heard, as well as the transmitter, but a Warning Bell, as illustrated above, fixed in a definite position makes it somebody's duty to have the battery re-charged. A good plan is to have a stand-by battery to switch in while attending to the other one (see page 39, paragraph 9.)

B.P. IMPULSE CLOCKS. — OR — SECONDARY CLOCKS.

The infinite variety in design of clock cases in wood, marble, art metal and metal drums, in which it is possible to fit and in which are fitted the B.P. Impulse Clock Movements shown on page 18, cannot be adequately shown in this catalogue.

Some of the patterns most in demand are given in the following pages, but we are prepared to submit photographs and drawings on receipt of customers particular requirements, or to quote prices for the special designs of Architects and others.

To our Friends abroad and others wishing to fit Impulse Movements to their own cases, we would particularly call attention to the insertion clocks shown on page 21, which, being in flat hermetically sealed metal cases, are damp and vermin proof, and can be fitted bodily into existing panels or any type of wood or metal case.

B.P. PATENT MOVEMENTS FOR IMPULSE CLOCKS.

Impulse Clocks on the B.P. System can be made to any size and design. They are divided into three main classes, namely:—

1. Those in closed cases with simple locked movement.
2. Those subject to outside influences, such as wind (as in small Clocks with exposed hands) or other interferences, (as in workman's Check Clocks), in these a double locked movement is essentially necessary.
3. Large Turret and Church Clocks.

Movements for Classes 1 and 2 are shown below, but Turret Clocks (Class 3) are dealt with elsewhere.

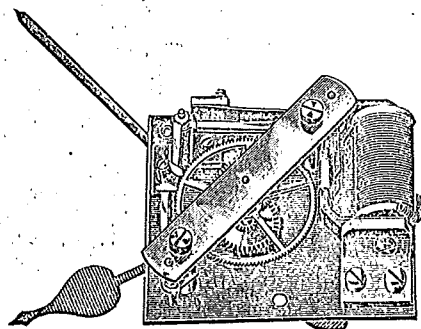


Fig. C 9.

SIMPLE LOCKED MOVEMENT

as fitted in wood case wall clocks and glazed out-door clocks.

Every movement consists of heavy hand wrought brass plate, machined, finished and lacquered, accurate machine cut ratchet wheel with 120 teeth, pawls of hardened and tempered steel, balanced aluminium hands running on bridged motion work, highly efficient electro-magnet. All the moving parts are designed to resist wear, and the design of the pawls and the stops is such that it is absolutely impossible for them to advance the ratchet wheel more than one tooth at each impulse. The armature of the impelling magnet is designed to operate with a contact of exceptionally short duration, and with a very weak current.

In the Double Locked Movement the hands are locked at each and every part of the cycle of action, and so cannot be moved forward or backward by any outside agency.

IMPULSE WALL CLOCKS, consisting of B.P. Impulse Movements in AIR-TIGHT WOODEN CASES.

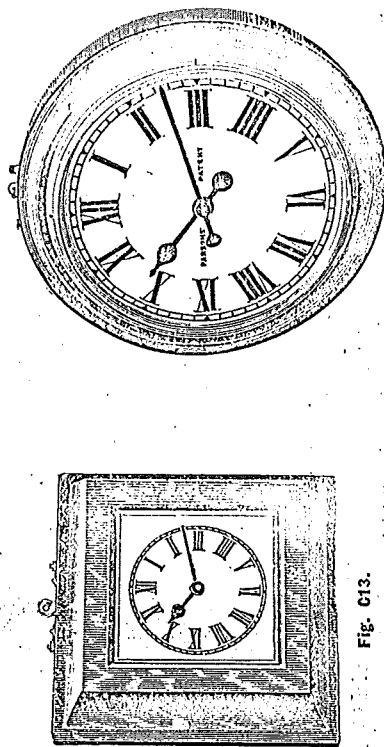


Fig. C 13.

Fig. C 10.

The above Clocks are of good design and being well finished are suitable for offices, schools, rooms, hospital wards, and domestic use wherever a wall clock is suitable, and, at the same time their strongly constructed and air-tight wooden cases render them equally suitable for work shop and engine room, and dirty and dusty situations.

Fig. C 10. These cases are of extra solid construction, have hardwood framed front: strong glazed bronzed bezels and enamelled metal faces.

Fig. C 13. Square pattern, is made in two sizes only with 6" and 9" dials. The cases are strongly made, and enamelled imitation walnut.

The Clocks are stocked in walnut but can be sent in other woods at short notice if so ordered.

The movements are B.P. standard pattern Patent, simple locked type, as illustrated on opposite page.

Substantial Terminals are provided available to fixer without opening the case, which is rendered airtight and sealed.

Fig. C 10. Diameter of Face ... 6" 9" 12" 16" 20" 24" 30"
Approx. Diameter of Case 9" 12" 15 1/2" 20 1/2" 25" 30" 36"
36/6 37/6 38/6 76/- 98/- 120/- 170/-

Fig. C 13. (Made in two sizes only) .. 36/6 37/6

The above prices are for "Quiet" Clocks, if absolutely "Silent" Clocks are necessary add 30/- each extra, see page 29.

IMPULSE

WALL CLOCKS,

Consisting of B.P. Impulse Movements in
AIRTIGHT WOODEN CASES.

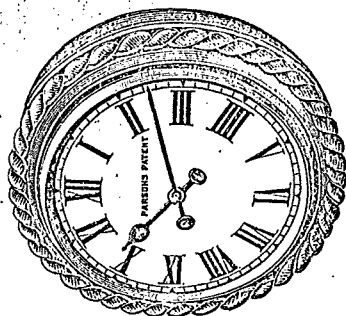


Fig. C 12.

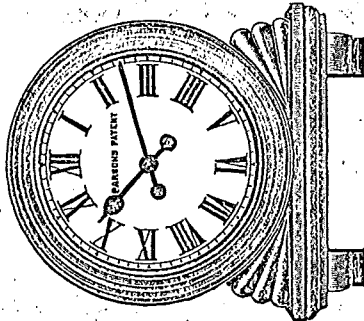


Fig. C 14.

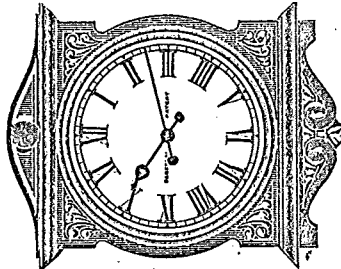


Fig. C 16.

The internal mechanism of these Clocks is identical with that listed on the previous page, but the cases are more elaborate and of the designs shown.

Fig. C 12.—Rope Pattern
case in solid oak, enamelled
face, solid brass bezel, with
bevelled plate glass front.

Diameter of Dial	9"	12"	15"
Approx. Diam. of Case	12"	15"	18"
Price	£2 10s.	£3 1s.	£4 1s.

Fig. C 14.—Bracket Pattern
case in solid walnut, enamelled
face, brass bezel, and strong
glass front.
Without feet this pattern
becomes eminently suitable for
mantel clocks.

6"	9"	12"	16"
11"x9"	13"x12"	20"x15"	27"x22"
£2 18 6	£3 2 0	£3 6 0	£4 16 0

Fig. C 16.—Fine Ornamental
case, in oak, enamelled face,
solid brass bezel, and strong
bevelled glass front.

9"	12"	16"	20"
15"x12"	24"x16"	32"x21"	40"x27"
£4 6 0	£5 0 0	£7 1 0	£10 10 0

The above prices are for "Quiet" Clocks, if absolutely "Silent" movements are necessary add 30/- each extra, see page 29.

IMPULSE MANTEL CLOCKS,
consisting of B.P. Impulse Movements in
CASES OF SPECIAL DESIGN.

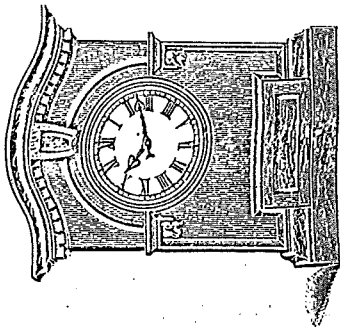


Fig. C 17.

Mantel Clocks can
be supplied in a
variety of Patterns.
Those illustrated at
Figs. C 17 and C 19,
show two
pleasing designs
recently made for
special positions.

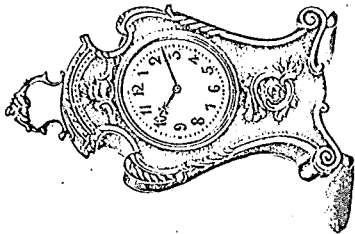


Fig. C 19.

Further designs and prices on application.

IMPULSE INSERTION CLOCKS,

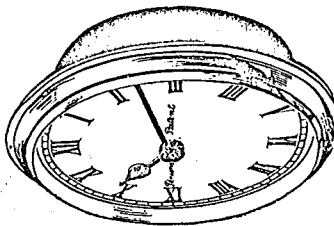


Fig. C 11.

Consisting of B.P.
Impulse Movements
in Air-tight and
Damp Proof
Metallic Dish Cases.



Fig. C 11.—Side View.

In this pattern, the movement is sunk into a shallow metal dish which, with the solid cast brass bezel and its crystal glass, forms an hermetic receptacle designed to fit bodily into existing wood cases, carved over-mantels, switch boards, or into ornamental or other metal-work. The insertion pattern clock was originally designed for Rangoon, where the humidity of the rainy seasons and the ravages of the termite ant together make wood of any kind unreliable for forming cases permanently air-tight.

The pattern, however, has been largely adopted in this country owing to its general adaptability.

Diameter of dial in inches	6"	8"	9"	10"	12"
Approximate overall size	6 3/8"	8 1/2"	9 3/8"	10 3/4"	12 3/4" x 3" deep behind rim.
Price, each	50/-	51/-	53/-	57/-	60/-

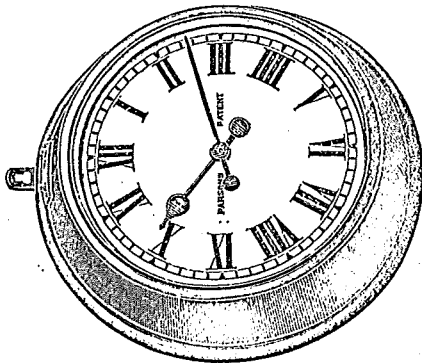
We commend the adaptability and general utility of this model to our friends.

IMPULSE

WALL (& DRUM) PLATFORM CLOCKS

consisting of B.P. Impulse Movements in
AIRTIGHT METAL CASES.

AS SUPPLIED TO
THE MIDLAND
GREAT WESTERN
RAILWAY
OF IRELAND.



AND THE
NORTH EASTERN
RAILWAY Co.

Fig. C15.

METAL CASED WALL CLOCK.

There are many situations where metal is preferable to wood for clock cases, such as Railway Stations, Covered Yards, Foundries, etc., and there are situations where, although not fixed in the open, the clocks are exposed to fog, damp and fumes, and for such positions the above clocks are specially designed.

Drum Cylindrical cases are supplied at the same prices as the bevelled pattern illustrated above. Two such clocks placed back to back form an effective two-faced drum clock for railway platforms and similar situations.

The movement, our Patent Standard pattern simple locked type, is as described on page 18.

The cases are of tinned or galvanized iron suitably painted and relieved.

The faces are of metal enamelled white, protected by strong glass fronts.

Diameter of dial	12"	16"	24"	30"	36"	42"	48"
Approx. diam. of Fig. C15 case	16"	21"	29"	35"	42"	48"	54"
Approx. diam. if drum pattern	14½"	19"	27"	33"	40"	46"	52"
Price per dial	£2 15 0	£4 12 6	£6 10 0	£8 10 0	£12 0 0	£15 10 0	£20 0 0

Larger sizes, prices on application.

IMPULSE

WALL CLOCKS,

consisting of B.P. Impulse Movements in
HEAVY METAL CASES,
Hermetically sealed for fixing in the open.

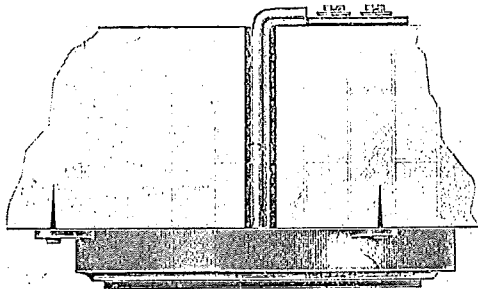


Fig. C 20.

Sectional View Showing Terminals led indoors.

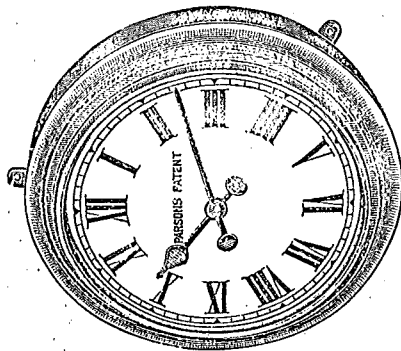


Fig. C 22.

Outside Wall Dial.

These Clocks are designed for fixing **directly in the open**, and will stand wet and weather without any shelter being necessary.

They are in heavy galvanised iron cases suitably painted and finished with strong glass fronts all hermetically sealed.

The Terminals for connecting are carried by a projecting flexible metallic tube which passes through the wall on which the dial is fixed, so that the actual electric connection is made indoors.

All moisture is removed from the air inside the case, which prevents sweating or steaming of the inside of the glass, so that the dial and hands are not hidden from view by mist during rapid changes of temperature.

The movements are standard pattern Parsons' Patent, as illustrated on page 18, and being in airtight cases are guaranteed, see page 6.

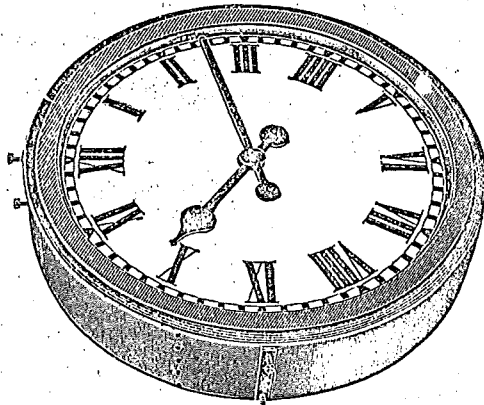
When fixed on the face of Towers or set in the brickwork these clocks form efficient, well-designed turret and church clocks.

Diameter of Face	18"	24"	36"	42"	48"
Approx. Diameter of Case	23"	30"	42"	48"	56"
Price	£7 10 0	£11 10 0	£19 12 0	£28 0 0	£36 0 0

Fig. C 20

TWO FACE DRUM CLOCKS,

IMPULSE
consisting of B.P. Impulse Movements in
HEAVY METAL CASES,
Hermetically sealed, for fixing to Ornamental Ironwork
in the open.



AS FIXED IN
MANORS STATION,
N.E.R.,
NEWCASTLE-ON-TYNE.

AS FIXED IN
ST. ANNES SQUARE,
MANCHESTER,
AS A PUBLIC CLOCK.

Fig. C 25.—Two-Faced Drum Clock.

The two-faced Drum Clock, as illustrated above, consist of heavy galvanised iron drum case painted and fitted with heavy plate-glass fronts, all hermetically sealed for fixing to ornamental ironwork of various descriptions in the open air.

All moisture is removed from the air inside the case, which prevents sweating or steaming of the inside of the glass, so that the dial and hands are not hidden from view by mist during rapid changes of temperature.

The movements are Standard Pattern Parsons' Patent with balanced aluminium hands, as shown on page 18.

The faces are of metal, enamelled white, but can be supplied in opal for illumination where desired at extra cost.

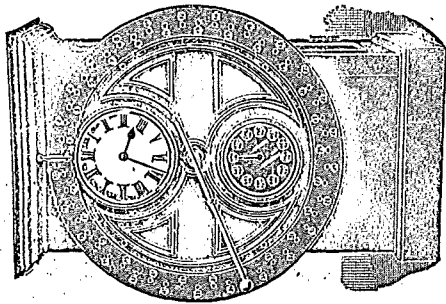
Tapped holes and bolts for same are provided at three positions for supporting the drum in any ornamental ironwork that may be designed or supplied for the situation.

Fig. C 25.

Diameter of face	..	..	..	42"	48"	54"	60"	66"	72"
Approximate diameter of case	..	..	..	48"	54"	60"	66"	72"	78"
Price	..	..	..	£49	£54	£60	£68	£80	£90

WORKMAN'S CHECK CLOCKS AND WATCHMAN'S TELL-TALE CLOCKS.

New and existing Clocks arranged for IMPULSE CIRCUITS.



Gent's Patent "Tell-Tale" Clock.

We have fitted all the well-known makes of Workman's Check Clocks such as the "Dey" "Bundy," "Rochester," so as to operate by our Home or Thornbridge Transmitters.

The importance of uniform time on two or more workman's clocks, and the saving of irritating disputes amongst the workpeople, need not be emphasized here.

This class of clock is dealt with by us in two ways, either the existing movement is removed and an impulse movement fitted to the dial or mechanism or the existing movement is electrically "escaped."

In the former case an impulse movement is necessary which is locked at every movement of its action so that the operations of the workmen when "checking in" cannot interfere with or accelerate the hands of the dial, see Fig. C 23, page 18.

When electrically "escaping" the existing movement, the pendulum, or balance wheel, is removed, and at each half minute impulse, the train is allowed to escape or run forward an amount equal to half a minute on the dial. With this arrangement the clock is wound as usual and it has the advantage that the pendulum can be re-installed at any time if the clock is removed to a situation where no impulse circuit exists. See also remarks on page 29.

Gent's Patent Watchman's "Tell-Tales" for checking the movements of nurses and attendants in hospitals, workhouses and asylums, and night watchmen in Works, Factories and large buildings, are now in common use, and where impulse circuits are employed, it is advantageous both as regards convenience and accuracy to have such watchman's clocks driven on the circuit.

PRICES.

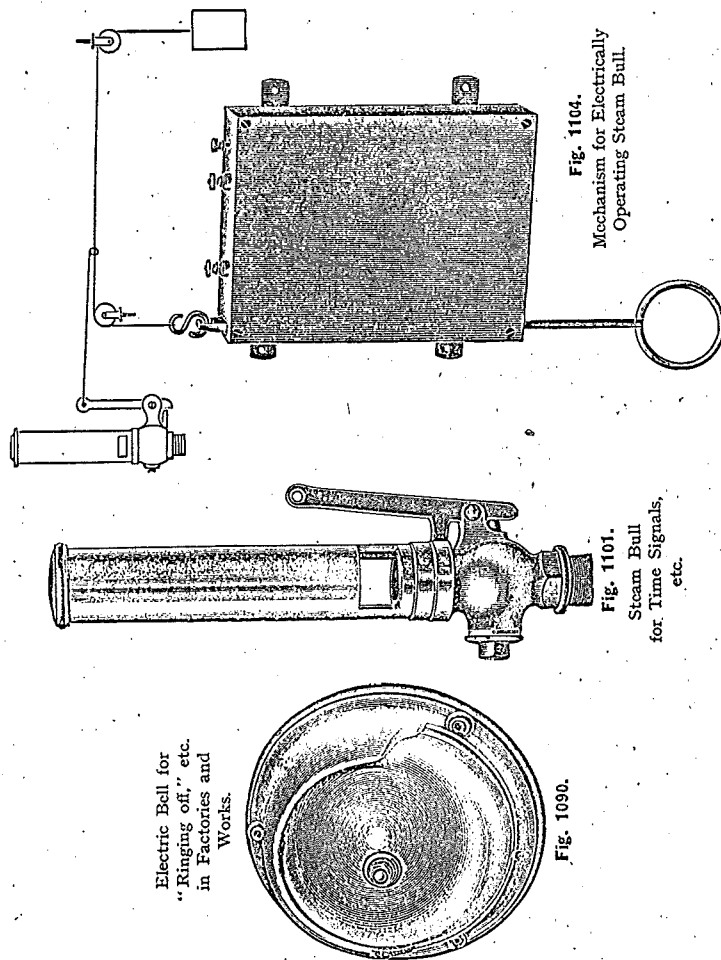
The price of the powerful double locked movement shewn on page 16, Fig. C 23, Size B, without hands is 60/-.

Fitting to existing dial or mechanism, extra according to work entailed.

The cost of "scaping" varies with each type and make, for estimating purposes 50/- each may be taken as an average cost.

Exact quotations will be furnished for either impulsing or scaping on receipt of particulars as to the make, type and number of clocks to be dealt with.

SOUND SIGNALS for STARTING WORK AND TIME CONTACTS ON IMPULSE CLOCK CIRCUITS.



Obviously only in those institutions and factories where uniform time on various dials is maintained, is it possible to employ sound signals for ringing on and off, starting and stopping work, etc., as with variation in clocks, dissatisfaction and confusion would be sure to arise.

With Impulse Clocks, and especially in those installations where workmen's Check Clocks are driven on the time circuit, the additions of sound signals is a most important feature in factory equipment, and one which is demanding more attention day by day by works' managers, as by the combination the now somewhat old-fashioned method of giving "five minutes' grace for variation of clocks" is not necessary.

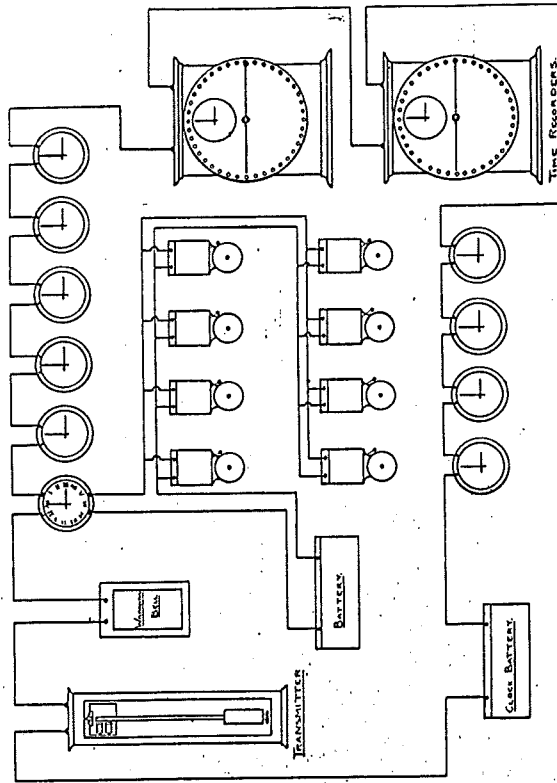
Five minutes' grace on coming in three times a day with 100 men means 150 hours per week, which at 6d. per hour shows £7 10s. od. per week. Impulse Clocks will save this amount. We commend the subject to the careful consideration of the reader.

Sound signals may consist of electric bells, electric syrens, or the usual steam bull, according to the particular requirements of the situation.

Any of the clocks of a system may be fitted with contacts to operate at various times, as all clocks are alike and the clock in the timekeeper's or any other office need not be chosen for the work, but any convenient clock in the system may be employed.

SOUND SIGNALS FOR STARTING WORK—continued.

A momentary or passing contact serves in the case of a steam bull, which is operated by the mechanism illustrated at Fig. 1104, and which is replaced by hand; but a current of 30 seconds duration is the simplest and cheapest arrangement for ringing electric bells as the clock to which the contact is fitted works at 30 second intervals and the contact remains on for this interval or any number of such intervals. Signals of shorter duration can, however, be arranged by the device described on the following page 28.



Practical experience has proved that generally it is better to have a number of electric bells in say a large noisy workshop than one large one, and the above diagram shows an impulse clock, or time circuit, in which is fitted besides a number of ordinary impulse clocks two workmen's registers and an impulse clock fitted with time contacts so connected as to ring eight electric bells which might be fixed in as many different departments in a large factory or works.

The programme of ringing varies in every installation and in large works different programmes are often required by various departments.

In this latter case with impulse clocks it is a simple matter to work the signals peculiar to the departments from an impulse clock in that department, and where a complicated programme universal to all departments is required in a works, it is sometimes useful to divide the duty of contact making between two or even three of the impulse clocks of a system.

An example of a simple programme is given below, the time signals in this particular instance, where a number of 6-in. electric bells are employed, are arranged to ring for an interval of 30 seconds.

Monday, Tuesday, Wednesday and Thursday.

A—6-25	until 6-25½ a.m.	E—I-0	until 1-0½ p.m.
B—6-29½	" 6-30 "	F—I-55	" 1-55½ "
C—8-0	" 8-0½ "	G—I-59½	" 2-0 "
D—8-29½	" 8-30 "	H—5-30	" 5-30½ "

Friday signal H rings at 6 p.m. until 6-0½ p.m.

Saturday signal E rings at 12-30 to 12-30½ p.m., and Signals F, G, H do not sound.
Sunday all signals silent.

SOUND SIGNALS FOR STARTING WORK—*continued.*

In this installation the signals are automatically cut off during the night, but the changes of programme from Thursday to Friday, Friday to Saturday, and Saturday to Sunday's silence, are accomplished by a switch in the time office operated by the timekeeper, but could, if desired, be operated automatically at increased expense.

The cost of fixing contacts to a 12" Fig. C 10 Impulse Wall Clock is 25/6 for the first contact and 3/9 for each additional contact of the programme.

If it is desired to automatically cut out the signals at week ends, a seven day wheel must be added to the movement with its contact, costing £1 17s. 6d. extra.

As there is a limit to the number of contacts possible on one clock, and as this limit depends to some extent upon the time of the contact, long or intricate programmes should be submitted and a special quotation obtained from us. Such programme sometimes necessitates the employment of two impulse clocks.

Prices of Signal Bells, Steam Bells and operating mechanism on application or see our other catalogues.

The B.P. Patent Duration Contact.

AS FIXED IN THE
MERCHANT VENTURERS'
TECHNICAL COLLEGE,
BRISTOL,

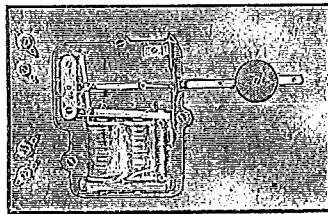


Fig. C 60.

THE
CAPE HILL BREWERY,
BIRMINGHAM,
and
THE GILLETTE SAFETY
RAZOR WORKS,
LEICESTER.

In those instances where the signal of 30 seconds' duration, described on the previous page, is considered too long, signals of shorter duration can be arranged for by employing the Duration Contact, shown above at Fig. C.60. This consists of a pendulum electrically operated by a momentary current supplied through contacts operated by the impulse clock, which pendulum by a simple arrangement closes the electric bell circuit so long as, and **only so long as the pendulum maintains a certain amplitude of swing.** The pendulum bob is adjustable so that the duration of the sound signal can be varied from five seconds up to fifteen seconds as required.

The Duration Contact is strongly made on solid cast metal base with heavy platinum contacts and all contained in suitable wooden case, for screwing to the wall.

Price £3 10s. 0d. each. Delivery from stock.

The Duration Contact is useful for purposes other than that described above, a momentary contact by an ordinary push or door contact can operate an electric bell so as to ensure a prolonged ring.

THE IMPULSING OF EXISTING MECHANICAL CLOCKS.

Existing Turret Clocks, Workmen's Check Clocks, Chime Quarter Bracket and Chiming Grandfather Clocks may with advantage be fitted with half minute escapements and so keep time by the transmitter and with other clocks on the time circuit.

Where this arrangement is required the pendulum or balance is removed from the train and a half minute electrical escapement is added, consisting of an armature and magnet mounted in a suitable bed plate or fixed to the metal framing of the clock movement.

The half minute impulse from the transmitter then releases a pin fitted to the escape wheel, allowing the latter to make a revolution and advance the 'train' and consequently the hands half a minute at each impulse.

A clock so fitted will require to be wound as usual, but will be compelled to keep uniform time with the transmitter and impulse clocks in the circuit.

Such electrical escapements when fitted to turret clocks of large diameter with heavy hands are provided with a pressure reducing device to reduce the pressure from the 'train' on the escapement and ensure smooth working.

Notable instances of turret clocks so fitted by us are the two large public clocks of "The Times" newspaper offices, Queen Victoria Street, London.

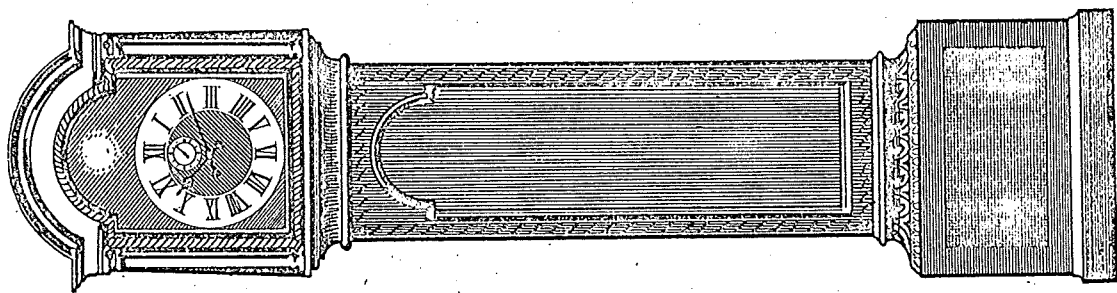
Prices for fitting with photos and drawings will be forwarded on receipt of particular requirements.

SILENCE IN IMPULSE CLOCKS.

THE B.P. SYSTEM.

It is impossible to truthfully state regarding any clock movement that it is "absolutely silent," as no mechanical movement can be scientifically and absolutely silent in action. In a small room in the stillness of the night a pin dropping on a soft carpet produces a distinctly audible sound.

With the ordinary indoor or quiet dial here listed no sound is noticeable under ordinary conditions of every day life; the sound of the impulse when it occurs every half minute is less loud and far less noticeable of course than the tick of an ordinary clock; while with the "Silent" dials the stillness of a room even in the night is not disturbed, if any sound can be detected it will be found less than that created by the tick of a watch. This is a most important consideration in hotel bedrooms, libraries, hospitals, dormitories, etc.



Existing Grandfather Clocks with their striking and chiming can be electrically impulsed.

IMPULSE CLOCKS FOR SHIPS.

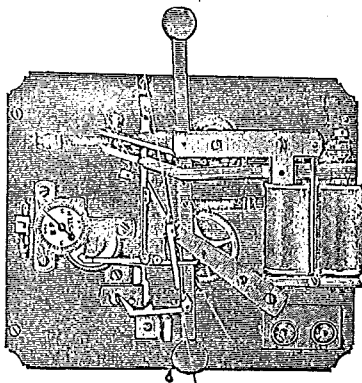


Fig. C 90.
Mechanism of B.P. Impulse Marine Transmitter.

For ships and other positions where a pendulum is impossible, the B.P. Transmitter is fitted with a jewelled lever escapement and chronometer balance in place of a pendulum, in which case the movement has the appearance illustrated at Fig. C 90, while the construction details and finish are all on the lines of the transmitters detailed on pages 10 to 14.

The movements are fitted into framed teak cases of solid construction suitable for the position to be occupied.

ADVANCE AND RETARD ADJUSTMENT.

An important addition to this "Marine" B.P. Transmitter is an advancing and retarding device for effecting the daily corrections for longitude in the secondary or impulse clocks of the ship.

When sailing eastwards it is only necessary to set a pointer to the number of minutes it is desired to advance the Clock, and the whole of the ship's clocks are automatically advanced, and when sailing westwards the pointer is set to the number of minutes it is desired to retard the Clocks, and the Clocks are thereby automatically retarded.

This longitude adjusting device, when added, is fixed in the transmitter case and becomes available by opening a door separate from that of the transmitter proper.

B.P. Marine Transmitters are held in stock ready for fitting into special wood work and immediate delivery. Prices on application.

IMPULSE CLOCKS FOR SHIPS.

As the Impulse Clock movements, shown on page 18, are unaffected by ordinary vibration or wave motion any of the clocks catalogued are equally suitable for use at sea as on land; but the Insertion Clock, shown on page 21, is particularly suitable for ship work, being unaffected by sea atmosphere, dust when coaling, and fitting directly into the wood panelling or metal work of the ship.

ACCURACY IN IMPULSE TRANSMITTERS.

The compensated pendulum supplied in our standard pattern Transmitter here listed, will, as before stated, keep time within two to three seconds per week, which is, as will be admitted far in advance of that needed to meet the most stringent commercial requirements.

The reason of such accuracy being obtained (even with commercial articles) is that the Pendulum is impelled and the vibrations maintained solely by gravity, which is a uniform and unvarying force.

The Gravity Principle employed establishes a new type of escapement, or rather propellment, differing widely from gravity escapements hitherto employed. In the older types of gravity escapements, the pendulum was obliged to lift its own diving force at each swing in order to unlock the escapement. It had in fact, to perform a re-coil action. This work also was imposed on the pendulum at a time when it should be left really alone, that is to say, when its Kinetic Energy was at its lowest value.

With the B.P. gravity principle, the pendulum is entirely free at the end of each swing, and the work of unlocking the gravity lever and also the application of the impulse, takes place when the Kinetic Energy of the pendulum is considerable. On the completion of the Gravity Impulse, a rigid stop in the path of the gravity lever, terminates the impulse at a definite point, and the electrical contact is then made by the full pressure of the gravity lever and an electro-magnet restores it to its potential position.

A special feature of the gravity impulse, is that the roller and pallet method adopted, allows the gravity lever to be at all times very close to its work, and to be applied at the most advantageous moment. It will also be noted that the function of the Electric Current is to replace the gravity lever at each half minute after it has imparted by the unvarying force of gravity a definite impulse to the pendulum, and consequently, the variations of strength of the electric current, cannot affect the time-keeping abilities of the pendulum.

"GREENWICH TIME" CONTROL.

In some instances where, for special reasons, it is necessary that any regulation shall be accomplished by the Observatory Time Signal, a Chronographic Attachment can be fitted to the Impulse Transmitters, so that every morning at 10 a.m., by the signal sent daily to all Telegraph Offices, the Transmitter is corrected instantly of the error that it may have acquired, if any, during the past 24 hours.

A connection to the nearest Telegraph Office is of course necessary, for which a small annual charge is made by the Authorities, such charge including the necessary wiring from the Telegraph Office to the subscriber.

In the best previous practice of automatic regulation from an Observatory it has been customary to set the system to lose or gain up its error during the day, or, in accordance with another method, to stop a gaining system at 10 a.m., leaving it entirely dependent on the arrival of the Observatory Signal to restart it.

In our improved method of automatic regulation from the Observatory, the "Impulse" is set forward if slow, and backwards if fast, and it will at once be recognised that this method is far in advance of previous practice, the method being one of immediate correction.

With an alternative method which we have introduced, the pendulum of the Impulse Transmitter is automatically regulated by the Observatory Signal, the advantage being that the temporary removal of the control does not affect the timekeeping of the Transmitter.

The B.P. Patent Impulse Clocks for

Astronomical Observatory Timekeeping

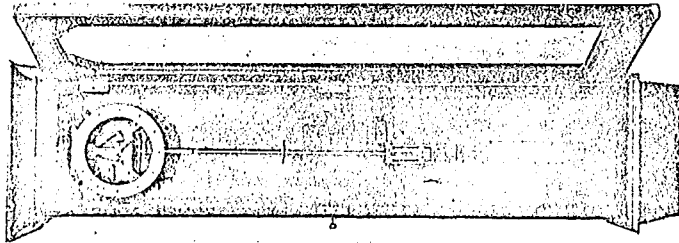


Fig. C 71.

Observatory Transmitter, as supplied to the British Government for Mauritius Observatory.

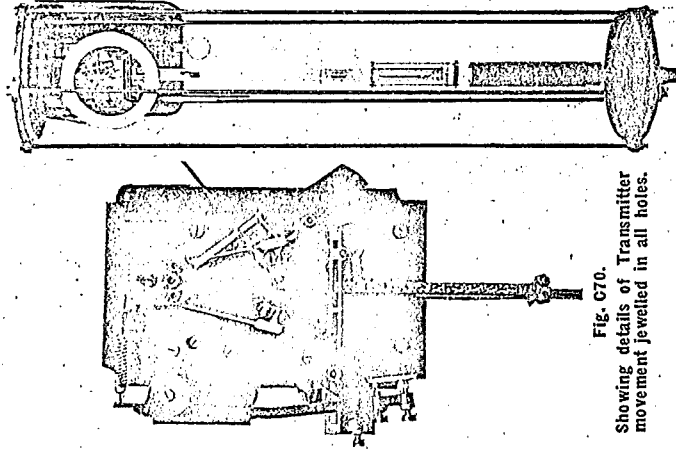


Fig. C 70.

Showing details of Transmitter movement jewelled in all holes.

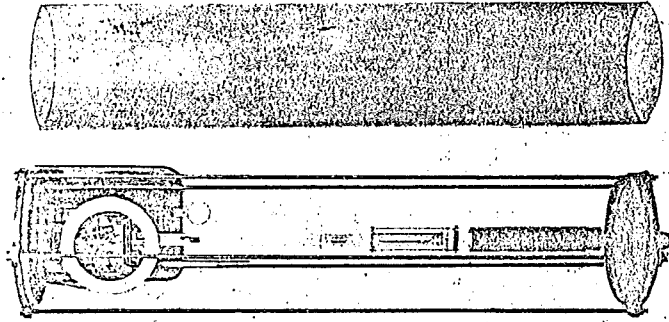


Fig. C 72 1/2

Observatory Transmitter, as supplied to the Nizamian Observatory, India.

With a transmitter such as described on preceding page, where accuracy within two seconds per week can be obtained in what we call a commercial way, it will be seen that with a few further refinements, scientific accuracy can be, and in fact is obtained by our Transmitters.

In observatories and other installations where this is required, our Thornbridge pattern centre seconds Fig. C 3 Transmitter is recommended with the addition that jewels be fitted to all points and actions as well as the escapement (which is already jewelled) and that a pendulum of special construction be employed. Such a jewelled movement is shown in the half tone, Fig. C 70.

The pendulum we recommend is of Invar constructed with a special copper compensation in which the contingency of the change of the co-efficient of the expansion, as is believed by some to take place in Invar is provided for.

This type of Pendulum is shown in the above half tones.

With these refinements, we are prepared to guarantee time-keeping equal to and even better than the best observatory practice of to-day.

The transmitter shown on the right is so designed that the metal work is bolted directly to the stone work of the observatory building, and the working parts and pendulum are covered by a glass cylinder (shown removed) so that the pendulum swings in constant pressure or partial vacuum and the barometric error is eliminated.

Prices of these transmitters fitted with these refinements will be given on receipt of requirements.

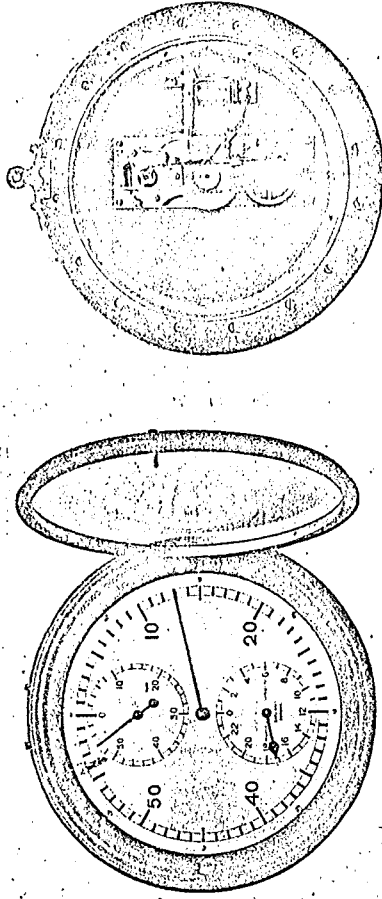
OBSERVATORY WALL CLOCKS,
IN AIR-TIGHT WOODEN CASES.

Fig. C 84.—Astronomical Impulse Clock, as supplied to the Government Observatories.

Back view of Astronomical Clock, showing internal mechanism.

The Observatory Transmitters shown on the opposite page, transmit the usual half minute impulses to ordinary impulse dials. Sometimes, however, a more frequent impulse is chosen such as 20 seconds or 2 seconds, when the impulse clock mechanism has to be fitted with a main wheel of suitable pitch. But for astronomical work extra and independent contacts may be fitted to the transmitter which "make" every second.

Fig. C 84 shows the movement of an Impulse Dial specially manufactured by us for such Observatory work. It beats audible seconds and indicates 24 hours, 60 minutes and 60 seconds on three separate circles on the dial.

The actual movement here depicted is also fitted with hourly contacts for releasing a time ball precisely at the 60th second of the hour and is also fitted with additional contacts for other Observatory purposes.

Price, full particulars, photos and drawings on application.

TURRET CLOCKS.

THE B.P. PATENT WAITING TRAIN MOVEMENT.

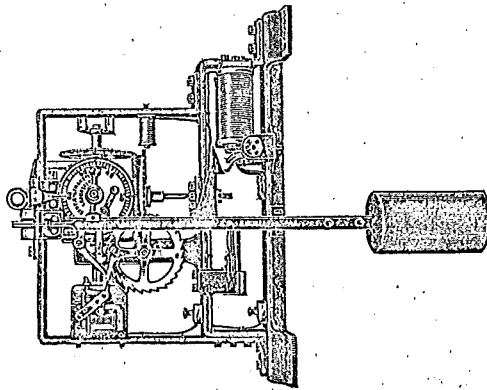
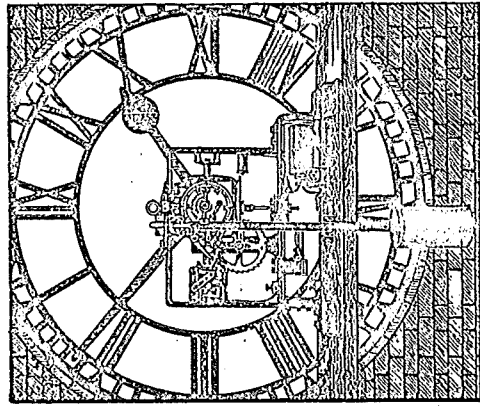


Fig. C 40.



"Waiting Train" Movement, shown in position behind dial.

Double locked impulse movements, as shewn on page 18, are suitable for small turret clocks, and single locked movements are made in dials up to 6 feet in diameter where it is necessary that the cases shall be hermetically sealed, but for ordinary and large turret clocks the "waiting train" movement should be employed. It is connected in the time circuit as an ordinary impulse clock and is so controlled by any B.P. Transmitter, but the actual power for driving the hands is provided by a leclanche battery connected in a local circuit for that purpose.

The fact that the hands of large four faced turret clocks, such as that shewn on pages 36 and 37, can be driven by a practically irresistible force with energy obtained from a few leclanche cells and can be controlled by a transmitter of scientific accuracy is alone sufficient to put the "waiting train" in front of mechanical clocks, the most powerful of which are affected by the weather and can be actually stopped by snow and sleet, but the "waiting train" electric turret clock has many other advantages over the older form of mechanical clocks, such as the entire absence of ponderous weights, pulleys and cords, which are liable to fall and do great damage as well as occupying space required for bells. The time keeping of the "waiting train" is not affected by vibration of the bells in a tower, etc., etc.

The Waiting Train Movement consists of a reciprocating inertia motor in the form of a heavy pendulum, the function of which is not to keep time but to haul round by means of a pawl tooth by tooth the large ratchet wheel of the movement. This heavy motor pendulum is electrically driven, and on the vibration falling below a predetermined value an electric circuit is completed and the pendulum is re-energized by means of a powerful magnet.

TURRET CLOCKS—continued.

Under normal working conditions re-energisation takes place about once per minute, but on heavy work being thrown on to the movement due to resistance and wind pressure on the hands, the pendulum becomes energised more often; each complete vibration if necessary. On being energised at each complete vibration, the motor then develops 50 times its normal power, and it is impossible to stop the movement by hand, even when exerting ones full power on to the worm wheel.

The reciprocating motor, by means of worm and wheel, and the usual crown work, drives one, two, three, or four sets of hands as may be necessary, and is set at such a speed that the long hand is driven through a half minute space on the dial in 27 to 29 seconds. The pawl is then automatically lifted so that although the motor still maintains its speed the hands remain stationary for two or three seconds, locked by the worm gear until a current from the transmitter, dead on the half minute, releases the pawl and the hands are driven forward for another half minute on the dial. As a rest of two to three seconds is inappreciable, the hands appear to move with absolutely regular progression and not in half minute jumps as is the case in impulse movements.

"Waiting Train" Turret movements are made in four standard sizes as follows:—

- C40 A. for driving four dials up to 3 feet in diameter or two dials up to 4 feet 6 inches in diameter.
- C40 B. for driving four dials up to 5 feet in diameter, or two dials up to 7 feet in diameter.
- C40 C. for driving four dials up to 10 feet in diameter, or two dials up to 14 feet in diameter.
- C40 D. for four dials up to 20 feet in diameter, or two dials up to 25 feet in diameter.

Owing to the extreme flexibility of the driving power of these movements, these sizes are not strictly binding as the different sizes of movements would be capable of driving larger dials than stipulated.

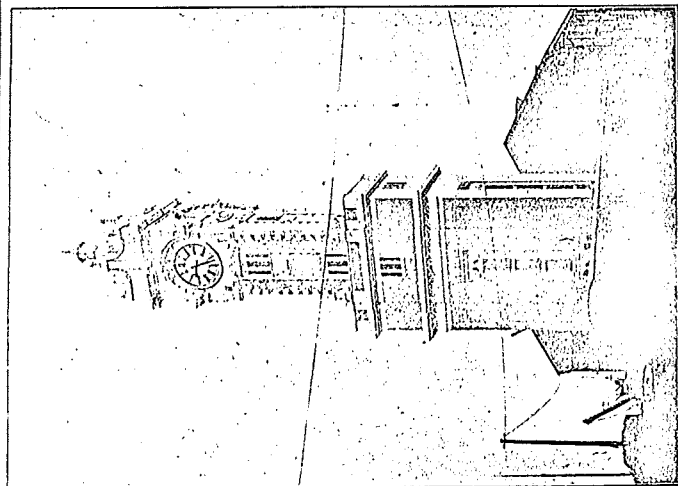
There is practically no limit to the size to which these movements can be made. These movements are also in use driving batches of recording instruments, advertising devices and the like, and are applicable to any slowly revolving power apparatus.

Prices, Drawing, Photos, and full details will be forwarded on receipt of particulars of requirements.

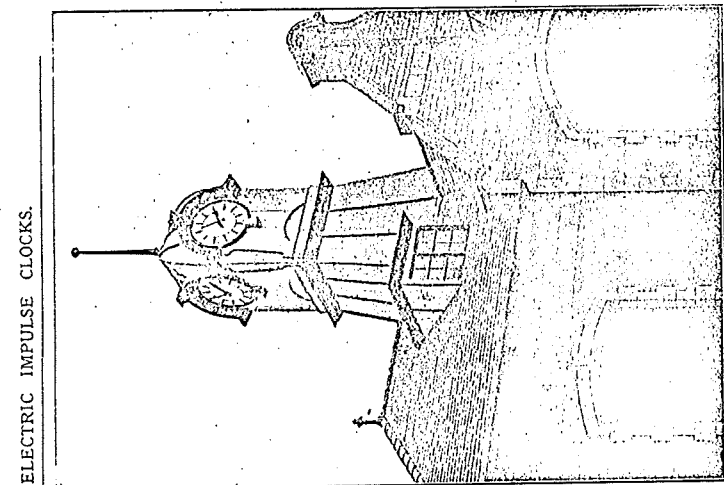
GENERAL SPECIFICATION.

The general construction of the "Waiting-Train" movement is, as far as is applicable, in accordance with the latest mechanical turret clock practice and is of equally durable construction in every respect.

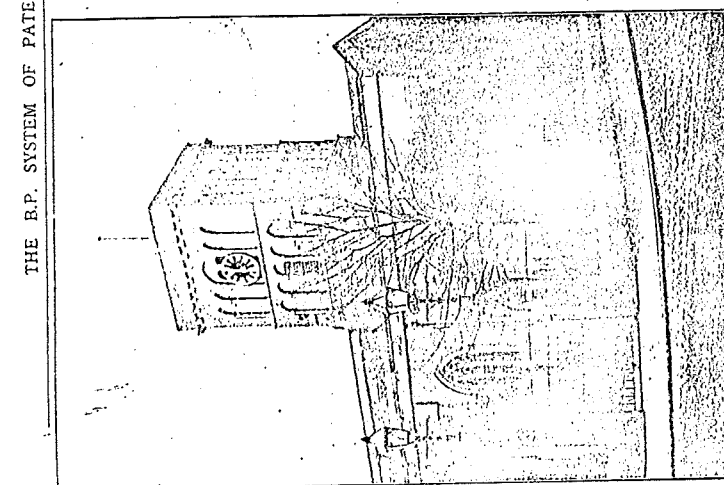
The movement itself is built up on a substantial iron base with arbors or spindles of toughened steel running in gun-metal bushes which are detachable to enable parts to be removed for cleaning, etc., without disturbing the remainder. The crown work is mounted directly on to the equivalent of the centre wheel of the movement with the advantage that all back lash and consequent uncertainty in the pointing of the hands is avoided. The powerful worm-gear



10 ft. Electric Clock with four faces, fixed at Riverside Station, Hull, for the North Eastern Railway Co. The dials are illuminated with gas, automatically turned on and off at dusk and dawn. The mechanism automatically adjusting itself to the seasons.



42 ft. Electric Clock with four faces, fixed for the North Eastern Ry. at New Manor Station, Newcastle-on-Tyne. The dials are electrically illuminated, the current being automatically switched on and off at dusk and dawn. The Platform and Office Clocks are driven from same circuit.



6 ft. Electric Striking Clock, fixed at St. Nicholas' Church, Leicester. An Electric Hammer operated by Ledanche Battery strikes the full hours on the Tenor Bell, weighing 6 cwt. A small Clock in the vestry is also driven of the same circuit.

The Dials of these Clocks are NOT covered by glass, which is objectionable and unnecessary.

by which the movement is driven prevents all interference from wind pressure. The few wheels present in the movement are of hammered gun-metal accurately machine cut. The contacts of the motor pendulum are of heavy platinum and are shunted by a correctly proportioned shunt to prevent sparking.

The motion-work and hands are made in accordance with the latest mechanical turret clock practice and the hand spindles are constructed with gun-metal bearings in lieu of steel which entirely prevents the rusting up of the spindles as is often found to happen with mechanical turret clocks.

To give some idea of the solidity of the movement, we may say, that the weight of the B. size turret movement is 150 lbs. and the weight of the smallest wheel of the movement together with its arbor to which it is screwed is 1 3/4 lbs.

Dials are made of wrought copper or skeleton cast iron, filled in with opal or in the smaller sizes of opal discs, where internal illumination is required, or of solid cast iron with raised gilded letters where illumination is not required.

Electric striking and chiming can be fitted to new or existing bells of any size, see page 38.

Existing Mechanical Turret Clocks can be electrically controlled on a time circuit or by our B.P. Transmitters, see page 29.

Non-striking Clocks, either mechanical or electric, can be fitted with electric striking mechanism.

Prices, photos and full particulars on application.

Automatic Illumination of Public Clocks

In Electric Clocks that require no winding and consequently have no regular attendant, automatic turning on and off of the illuminant is essential.

The changes of the seasons necessitate that the time of lighting and turning off shall vary and to this end we manufacture two types of automatic device suitable either for electric switching or turning gas cocks, which are provided with means for setting the times by hand, weekly or as often as may be desired, one of these is driven by a small clock movement requiring weekly winding, and the other is driven by an Impulse movement, off the Impulse Circuit, and requires no winding.

Fig. C64 shows the latter type arranged for electrical switching.

We also make a type of switch to work in conjunction with our Waiting-Train Movement and which automatically changes the times of switching on and off to suit the gradual change of the seasons. This result is effected by a cam which is cut to a curve representing the gradual change of the seasons, and which, by means of worm-reducing gear, revolves once only in two years. With this arrangement the alteration due to leap years is so nearly corrected that the accumulating error is only 10 minutes in 30 years. One minute only is then required to re-set the apparatus for a subsequent 30 years.

One of these Automatic Mechanisms is operating a large gas valve in the four faced turret clock illustrated above, and fixed at Riverside Station, Hull.

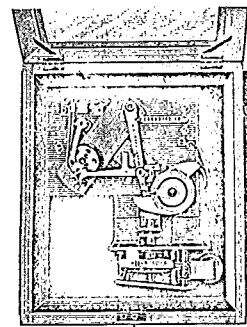


Fig. C64.

Prices, particulars, photos and drawing on application.

THE B.P. PATENT

Electric Striking & Chiming Mechanism.

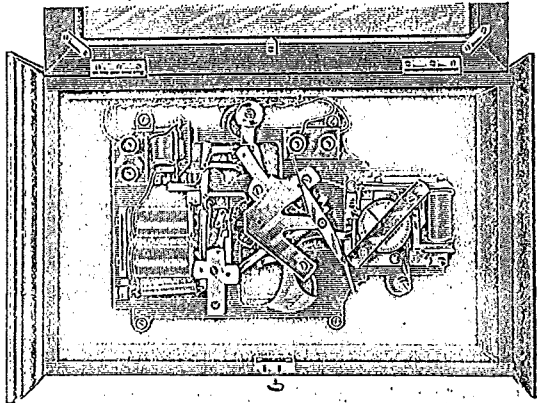


Fig. C50.

Striking Relay Transmitter.

In conjunction with any B.P. Impulse Clock, large, small or turret pattern, electric striking mechanism can be used with or without quarter chiming gear for Westminster Ting-Tang or other chimes.

The power for striking bells weighing from a few ounces to many hundredweights can be obtained effectively and efficiently from ordinary leclanche cells by means of the patent interlocking striking relay transmitter and hammer gear illustrated above, but where "direct" current can be obtained from power mains there is no objection to taking power from such source for this purpose.

The Striking Relay Transmitter is made in one size only, which is suitable for small gongs, wire gongs, tubular bells and church bells up to a weight of two tons or more. It consists of the necessary mechanism, firmly fixed on a heavy cast iron base, all contained in a case of solid hardwood with glazed front, with lock and key.

The relay coils of the apparatus are connected any where in the time circuit in a similar manner to an impulse clock when it will count out the hours on a local circuit containing a hammer mechanism suitable to the size of the bell to be struck.

Price of Standard Pattern Striking Relay Transmitter, Fig. C50, £12.

The Electric Clock Hammer, Fig. C51, consists of heavy electro magnet, armature, with spindle in gun-metal bearings, controlling spring, adjustable stop and patent interlocking mechanism to operate in conjunction with Striking Relay Transmitter.

Price of Standard Pattern Hammers varies according to the size of Bells, and will be quoted on receipt of particulars.

By the Patent Interlocking Contacts provided in the hammer and transmitter, it is arranged that the current is cut off at each blow, the instant that the bell is struck, hence it is that an ordinary leclanche battery can be successfully employed.

Westminster Ting Tang and other Chimes quoted on application.

FIXING INSTRUCTIONS.

Fix the Transmitter securely to the wall by means of all three fixing plates provided, and see that the screw heads, or nuts, if lewis bolts are employed, are actually home and clamp the fixing plates. This is an important point, as if the head of the Transmitter case is not firmly fixed to the wall, indifferent time-keeping will result, or complete stoppage may occur. You are dealing with an oscillating pendulum bob weighing 10 lbs., and the slightest instability of the case must be corrected and the fixing made quite firm.

A deal fixing board 2 inches or 3 inches longer and wider than the Transmitter, to keep it off the actual brick and to provide a level backing, is desirable.

Two small brass studs with notches, will be seen on the front of the Transmitter case, and these must register vertical with the line of a plumb bob.

See also that the wall or fixing board to which the Transmitter is secured, is itself vertical.

THE DIALS.—No special instruction is necessary for fixing the impulse clocks. The Dials are hung upon a nail or screw by the plate provided.

THE BATTERY.—The necessary number of three pint or two pint Leclanche Cells should be contained in a sound wooden battery box, with substantial terminals and with a tight fitting lid, making the case air-tight and thereby preventing evaporation.

POSITION OF BATTERY.—The position chosen for battery must be cool and not excessively damp; a shelf in a cellar is often an ideal situation. On no account fix a battery in a hot or dry situation, or frequent attention will be needed, not for any electrical fault, but because it will become necessary to refill the cells to make up the water lost by evaporation.

DRY CELLS.—Dry Cells may be used with advantage in many instances, provided a make of cell is employed that does not "dry up," either when in use or "standing by." The make employed should have a "long" capacity. A cell 8" x 3" diameter is a suitable size to employ.

DUPLICATE BATTERIES.—A practice to be recommended is that of having duplicate batteries connected to the system by means of a two-way Switch, so that either may be brought into use as desired, and the second battery is always "resting." A further advantage of this practice is that, when in course of time battery cleaning is required, the time keeping of the system is unaffected or uninterrupted. A cheaper arrangement in lieu of a duplicate battery is a box containing half a dozen cells which may be employed to take the place of batches of six cells while these are being re-charged.

SMALL CURRENT REQUIRED.—No clock system works with so little current as that listed here; the only reason large size cells and duplicate batteries are recommended is to avoid anything like frequent attention to batteries being required.

To give some idea of the small amount of current taken from the battery, we may state that we have had a battery of dry cells operating a clock circuit for between two-and-a-half and three years without requiring any attention. Leclanche cell last equally long but require water being added from time to time to make good the lost by evaporation.

FIXING INSTRUCTIONS—continued.

ESTIMATING BATTERY POWER.—The number of cells required for driving turret clocks and dials varies in accordance with the size of the dials, and full details will be given on receipt of enquiries.

To find the necessary number of cells for an installation with 12" dials or smaller, the following rules should be observed :—

Allow three cells for the transmitter, add one cell for every two dials in the circuit, and two or three extra for line resistance according to the length of the circuit.

Thus an installation of 18 12" dials requires :—

For Transmitter	3 Cells
For overcoming resistance of lines, say ..	4 Cells
1 Cell for every two clocks	9 Cells
Total	16 Cells

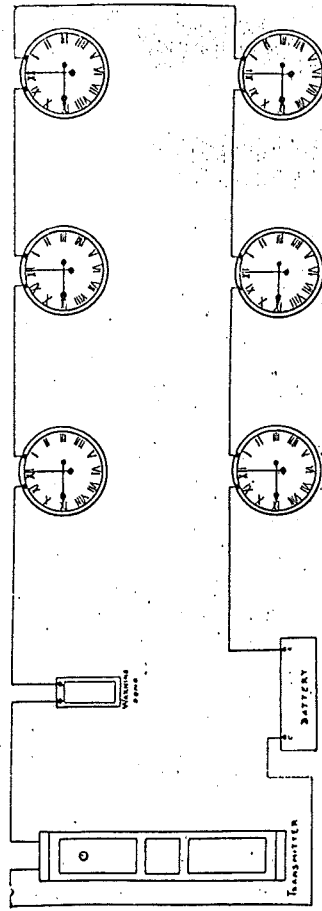
After charging up the estimated number of cells and starting the system, reduce the current strength by taking off one cell at a time until the warning bell just commences to ring. This will enable the fixer to see the exact margin of battery power the system is supplied with, and he should then see that there is a margin of at least 25% above that number of cells which causes the warning bell to ring. This test should also be made after re-charging the cells at any time.

LINE WIRES.—An ordinary 18 or 20 gauge electric bell wire, insulated with india rubber and double cotton covered will suffice for the work, but by reason of the extra mechanical strength which can be afforded without materially increasing the cost of an installation we recommend, say, an 18 or 16 gauge 300 or 600 Megohm electric light wire being used. If the wire is not cased or drawn into a tube, no matter whatever type of insulated wire be employed, use insulated saddle staples, as with these the lines can be stapled without fear of abrasion, and the cotton braiding is not damaged by iron rust in the course of time.

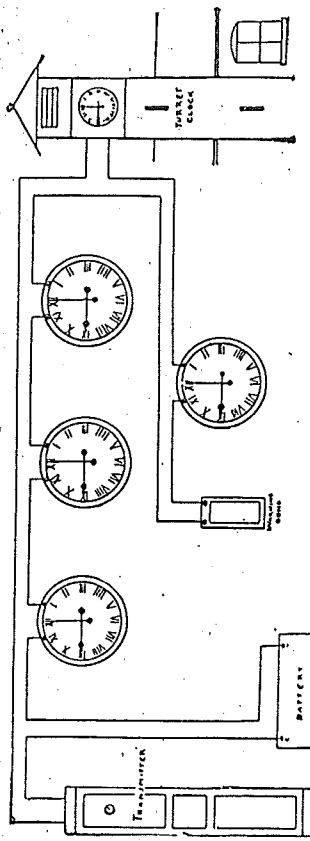
JOINTS and TERMINALS.—All joints in line wires must be soldered as well as the connection to the zinc pole of battery. This latter precaution is often not taken by otherwise careful workmen. After an installation is complete it is desirable for the foreman to personally assure himself that all joints have been soldered and go over the terminals of transmitter, clocks, battery and warning bell himself to insure all are tight, as a faulty joint will upset the most perfect system and may make some dials lose and other dials gain.

FIXING INSTRUCTIONS—continued.

ARRANGEMENT OF CIRCUIT.—The Transmitter, the Dials, and the Battery are connected together "in series," that is, a single line is run from one terminal of the transmitter to the battery, from the battery to the nearest dial, then from dial to dial, and on from the last dial to the second terminal of the transmitter.



The above diagram illustrates this principle of "series wiring" and shows clearly the circuit of wire and the dials, etc., included therein, but in many places, the plan of the building will not permit of the dials being arranged in a complete ring as shown above. The principle of series wiring must however be still followed, and it is then often advantageous to run the return wire from the last dial back to the transmitter, alongside the wire connecting the dials, as shown in diagram below where the turret clock is the "last" dial.



ADJUSTMENT OF DIALS.—In order to get all dials to the same time when starting the system, if a dial is slow advance the hands by making repeated contact at its terminals with one dry cell, and if fast, short circuit the terminals by connecting them together with any piece of clean metal (piece of wire or knife blade) while the system is going, so long as necessary.

REMOVING DIALS.—When it is desired to remove a dial to a different position, or for any other purpose, be sure to rejoin the wires so that they are in good connection with each other. A binding screw is best for a temporary connection, and a soldered joint is necessary if the connection is to be permanent.

It is necessary to disconnect a dial immediately after an impulse is made, and to quickly reconnect before the next impulse is due, otherwise the clocks in the system will become slow. This rule also applies to reconnecting dials.

FIXING INSTRUCTIONS—continued.

REGULATING THE SYSTEM.—It is necessary that the final regulation of the pendulum of Transmitter be accomplished when it is permanently fixed in position. If the system gains time, correct the dials by stopping the pendulum so long as necessary, and regulate the pendulum by turning the graduated rating nut of the "bob" to the left.

If the system loses time, advance the dials by means of the advancing cord or knob, which in all types of Transmitters will be found inside the transmitter case. This, when gently held down, causes the dials to advance half-a-minute at each vibration of the pendulum as long as the knob is kept down, instead of at the normal half minute intervals. Regulate the pendulum to go faster by turning the graduated rating nut to the right.

The rating nut is clearly marked with degrees, each of which is approximately equal to one second per day or one-and-a-half turns of the nut to one minute per day.

The top of the pendulum in the Home pattern "bob" will be found to be dished to receive small shot or other weights by which most minute regulation can be effected if desired.

ESTIMATES.

In order to show at a glance the approximate cost of various sized installations, the following estimates are detailed.

It will be observed that the wiring allowed for is approximately 33-ft. per clock; more or less wire may be required according to situations.

The cost of fixing must be added in each instance.

	£	s.	d.
For an installation of 10 Clocks.			
1—Home Transmitter	6	0	0
10—Fig. C10 12" Impulse Clocks, at 38/6 each	19	5	0
1—Warning Bell, Fig. C8	1	0	0
11—3 pint size Leclanche Cells	1	2	0
110 yards Electric Light Wire	1	3	0
	£28	10	0
For an installation of 20 Clocks.			
1—Home Transmitter	6	0	0
20—Fig. C10 12" Impulse Clocks, at 38/6 each	38	10	0
1—Warning Bell, Fig. C8	1	0	0
17—3 pint size Leclanche Cells	1	14	0
220 yards Electric Light Wire	2	6	0
	£49	10	0
For an installation of 40 Clocks.			
1—Home Transmitter	6	0	0
40—Fig. C10 12" Impulse Clocks, at 38/6 each	77	0	0
1—Warning Bell, Fig. C8	1	0	0
28—3 pint size Leclanche Cells	2	16	0
440 yards Electric Light Wire	4	12	0
	£91	8	0
For an installation of 80 Clocks.			
1—Home Transmitter	6	0	0
80—Fig. C10 12" Impulse Clocks, at 38/6 each	154	0	0
1—Warning Bell, Fig. C8	1	0	0
50—3 pint size Leclanche Cells	5	0	0
880 yards of Electric Light Wire	9	4	0
	£175	4	0