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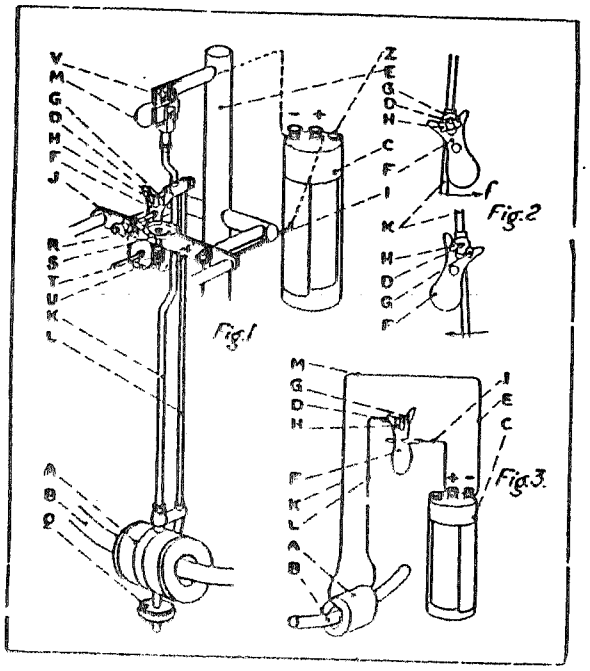
ALL YOU OUGHT
TO KNOW ABOUT
THE

BULLE CLOCK

THE
MOST WONDERFUL
CLOCK IN THE WORLD

THE BULLE CLOCK



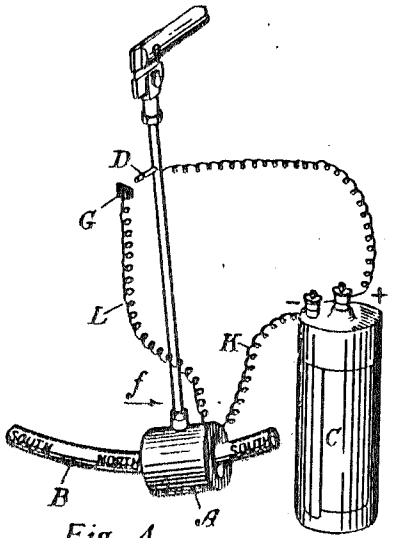


Fig. 4

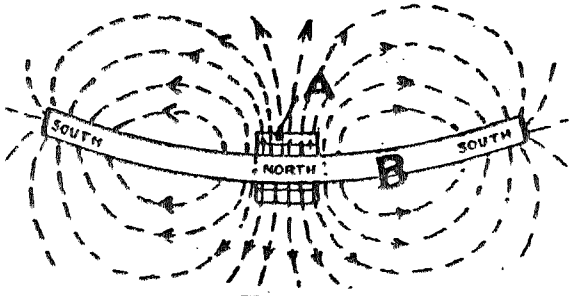
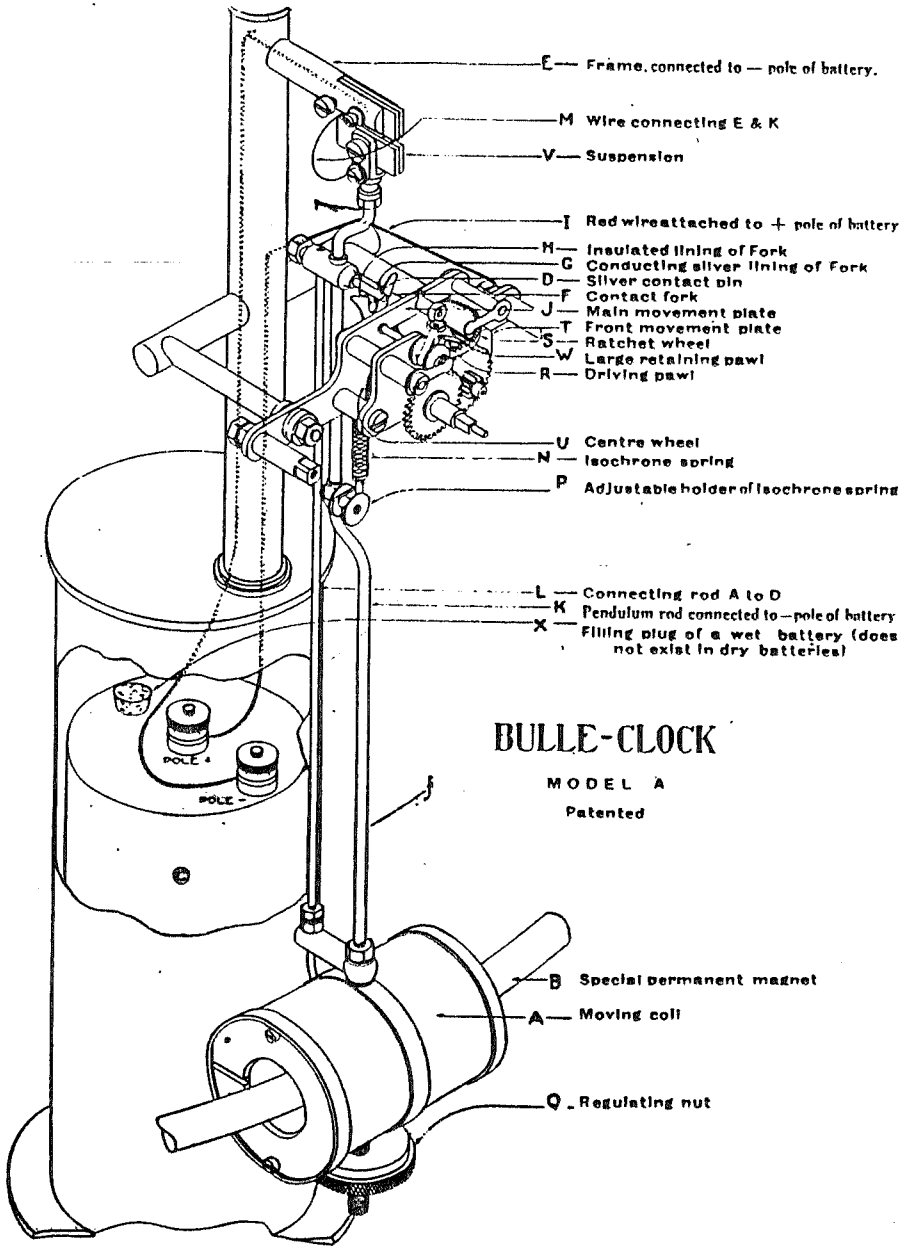


Fig. 5

Lines of force of the special consequent pole magnet of a Bulle Clock.



THE BULLE CLOCK.

General principle.

Before entering into details of the construction of the Bulle Clock and describing its working we think it well briefly to touch on a few properties of electric energy to enable the reader readily to appreciate why electricity which has already revolutionised so many industries should have been chosen by the inventors of the Bulle Clock as the ideal motive power for a clock destined to also revolutionise the clock making industry.

Let us consider an ordinary electric battery such as are commonly sold for use in connection with electric bell installations and which have a capacity of approximately 50 watt hours. Were it possible to entirely eliminate friction and all other sources of resistance and avoid any loss of electricity whatever, and under these ideal conditions were we to base a small calculation on the accepted electric law that one watt hour is equal to 3,600 joules and that one joule is equal to 1/98 kilogrammetres, we would find that the power of one of those batteries referred to is so considerable that in converting into mechanical energy the electric energy which it actually contains we would have 18,300 kilogrammetres. In other words we would have enough mechanical energy to raise a weight of 1 kilogramme (about 2.2 lbs) to a height of 1 8, 000 metres (about 60,000 feet).

The energy is more than 150,000 times greater than that which is transferred to the works of your watch as the sqring unwinds.

These figures alone give ample proof of the advantage to be gained in employing an electric battery with its great store of energy instead of an ordinary coiled spring when the object aimed at is to produce a Clock that will go continuously year in year out without augmentation or replenishing of its motive force in any way.

So far so good, but it remains to find a method of harnessing the battery which will assure the minimum loss of energy taking place.

The harness, or in other words, the mechanical means of transmitting the force contained in the battery to the work of turning the clock hands, should be as light as possible, yet not susceptible to derangement by shocks, and it should be free from all complicated

parts which necessarily entail loss of force by friction, and tend to interrupt the smooth working of the whole.

With a full realisation of all these conditions, we establish what is now so widely known as the Bulle Clock, and we believe that the reader, after a careful perusal of the following details concerning the construction and working of this invention, will be assured that nothing has been left to chance and that in its minutest details the Bulle Clock is as perfect, mechanically and electrically, as is humanly possible to-day.

The harnessing of the battery is so ingeniously conceived that its force is utilised to the fullest degree, to such an extent, in fact that its useful life when driving a Bulle Clock would be little short of its duration if unharnessed and allowed merely to expend itself naturally into the air.

2. Principles on which the Bulle Clock is based. --

The driving motor of a Bulle Clock is based on the well known combination of an electrically agitated coil and a permanent magnet and is diagramatically illustrated on Fig. 4. What is usually termed the 'weight' of the pendulum in an ordinary clock takes the form of an electric coil 'A' in a Bulle Clock and passing through the hollow centre of the coil we have a permanent magnet B. the curve of which is concentric with the swing of the pendulum. The magnet B. is fixed, whereas the spool A. is free to swing without touching the magnet.

The magnet B. has a peculiar property. Instead of having a North Pole at one end and a South Pole at the other end of its length, the aid of a compass demonstrates that a South Pole is found at either end and a North Pole in the middle of its length.

The special preparation of the magnet has a remarkable effect on the coil A. for we will find if we connect the two ends of the wire forming the latter to the terminals of a battery, the spool will be compelled, by the action of the electric current on the magnet, to travel in the direction indicated by the arrow f (fig. 4).

Knowing this fact we have all the knowledge of electricity required to understand the working of the Bulle clock.

The following little experiment will demonstrate the manner in which the inventors have taken advantage of the above mentioned peculiarity and how the regular swing of the coil A. - or pendulum, as it really is - is maintained. Let us take the two ends of the wire forming the coil leaving these long enough to allow for a free swing. Connect these two wires, one to the North Pole and one to the South Pole of an electric battery introducing a make and break contact switch

(D. G. fig.4) in the length of one of the wires between the battery and the spool. Now while the coil is swinging let us make contact each time it moves in the direction indicated by arrow f (fig 4) and we will find that the coil will be compelled to keep on swinging regularly because we are employing the action of the electric current passing through the coil on our special magnet and producing the peculiar effect already mentioned, we are giving an impulsion in one direction of the swing of the pendulum each time contact is made. Just as with a child's swing, if we give a push each time the swing passes us in one direction, we assure a continuation of the 'swinging'

In the Bulle Clock the sequence of operations passes exactly as described in the above experiment but the make and break of the contact is carried out automatically by the pendulum itself and in addition the exact instant when contact is made or broken and the value of the impulsions given are regulated so as to obtain correct timekeeping. The swing of the pendulum is also utilised to operate the mechanism which turns the hands of the clock - a mechanism more simple by far and more certain in its operation than any known in clock-work up to the present day.

3. Description of the working of the Bulle Clock.--

Fig. 2, 3 and 4 represent diagramatically the main working parts of the Bulle Clocks consisting of the coil A. with its supporting stem forming the pendulum. The magnet B. passing through the hollow centre of the coil. The automatic make and break contact formed by the small pin D. (connected electrically to one end of the wire forming the coil by a spindle parallel with the stem of the latter) touching alternatively the conducting side and the isolated side of a pivoting fork piece F (see fig. 2).

The electric circuit between the battery and the pendulum spool is closed only when the pin D. touches the conducting side of the pivoting fork F, that is when the pendulum, on the stem of which the pin D. is fixed, moves from left to right and the circuit is made in the following manner.

The central terminal of the battery (positive pole) is wired to one of the plates forming the frame of the movement, this plate being in contact with the pivoting fork F. but isolated from all other parts of the clock. The fork F is thus connected electrically, to the pole of the battery. The other terminal of the battery (negative pole) is wired to the metal body of the clock from which a small flexible wire passes to the stem of the pendulum, the latter forming in itself a conductor to the coil of the pendulum. In this way the coil of the pendulum is constantly connected electrically with the negative pole - of

the battery. A false stem running parallel with the real stem of the pendulum and isolated from the latter, forms a conductor between the pin D and the coil of the pendulum.

Thus when the pin D touches the conducting side of the fork a connection is formed between the coil and the positive pole of the battery and the circuit completed.

The pivoting fork F is mounted on the same spindle as a small rocking lever carrying a ratchet pawl. The latter engages with and operates a horizontal ratchet wheel mounted on the same spindle as a worm in gear with a worm-wheel turning parallel with the movement of the hands.

Between the worm-wheel spindle and the spindle carrying the hands the usual pair of demultiplying wheels are found.

One great advantage of the system is to be found in the high electric efficiency obtained and the certainty with which the simple mechanism operates the make and break contact just at the precise instant.

4. High efficiency of driving motor.--

It will be appreciated from the foregoing that the electrical combination in a Bulle Clock constitutes a veritable electro-magnetic motor, converting the energy of the battery into mechanical energy, transmitted to the pendulum. In present day electric motors we find an efficiency as high as 75 o/o or even 80 o/o. With the more favourable conditions obtaining with the Bulle Clock system where the loss of energy is reduced to a strict minimum the efficiency is little short of 100 o/o.

Mechanically, the loss of energy due to friction etc., is insignificant. The weight bearing on the various pivots of the movement does not in fact exceed several grammes and all other rubbing parts are equally well provided for with the idea of obtaining the highest possible percentage of efficiency.

5. Low consumption of current.-- The exceptionally favourable conditions mentioned render the consumption of electric current by a Bulle clock extremely low, so that a very small battery is all that is required to assure the continual working of the clock for many years.

6. The Battery.- A specially constructed battery is supplied for use with the Bulle Clock, but any type of battery suitable for an electric bell installation can also be employed, Leclanche for instance. The replacing the battery when, after many years of work, it is exhausted needs no special knowledge of electricity or mechanics. The long life of a battery and its low price, make the cost of upkeep of a Bulle Clock insignificant and far below that of an ordinary mechanical clock subject to broken springs and other costly troubles.

7. System of Contact.-- We would draw particular attention to the design of the make and break contact employed in the Bulle Clock by means of which the current only passes at regular intervals and in feeble quantities, and also to the fact that the system of electro-magnetic motor employed gives a useful advantage that of being able to arrange the instant of breaking the circuit when the intensity of the current passing through it is at a minimum on account of an anti-electro-motive force being set up in the system. No spark therefore, takes place at the contact on breaking the circuit and consequently, no deterioration takes place. In fact, it is found that the contact has rather a tendency to improve by use. It should be noted also that the two parts of the contact slide on one another when in use and so the surfaces are kept clean and free from collections of dirt or dust which might tend to interrupt the working if allowed to gather.

From this point of view the contact of the Bulle Clock is far superior to the system of contact usually found with electrical contrivances and which consists of two flat contact pieces coming one against the other. The presence of a mere speck of dust on the surface of one of these pieces is sufficient to prevent proper contact being formed and stopping the movement. The Bulle Clock contact is also free from the flat steel springs which are a feature of most contacts. It is well known that these springs get out of order on the least provocation and are difficult and delicate things to adjust sufficiently accurately to give good results. On the contrary, the Bulle Clock contact is solidly constructed in such a manner that a lifetime of working will result in no appreciable wear. It is free from derangement and certain to perform its duty as an electric contact as long as the mechanical movement necessary for its performance is assured. Further, it is placed in a position in the Bulle Clock where it is always visible so that one can tell at a single glance if everything is going right.

8. Mechanical Movement.-- The movement proper of the Bulle Clock is characterised by its extreme simplicity and the small amount of energy it absorbs to actuate itself in communicating the energy of the battery to the work of turning the hands. Its reduction gear consists of a simple worm and worm-wheel instead of the cumbersome train of wheels and pinions found in a mechanical clock. The wear is hardly appreciable the spindle exerting the greatest effort being charged with a few grammes only, whereas in a spring driven clock this effort amounts to several hundred grammes.

The reduction of passive resistance has also permitted suppression of the disagreeable 'tick tock' noise made by an ordinary clock escapement.

It is to be remarked also that in the Bulle Clock the pendulum receives its electric impulsions direct and not through a mechanism, its movement is therefore smooth and free from the 'jerks' and 'kicks' which accompany a mechanical clock movement.

Everything has been done to make the Bulle Clock a non-stop clock with no delicate parts requiring the periodic services of a specialist. In particular precaution has been taken to avoid a stop even when for some reason or another the amplitude of oscillation of the pendulum decreases. The Bulle Clock in fact has the wonderful quality of setting itself going in full swing again after the pendulum has been practically stopped. This is a valuable quality. and in this direction the Bulle Clock shows a marked superiority over all known systems. Should it be displaced or receive a knock or be otherwise disturbed sufficiently to slow down the pendulum almost to a standstill, it will automatically pick up its swing again, whereas a clock of any other system would stop and have to be set going again by hand.

Appearance of the Clock.-- As we have seen from the foregoing, the 'works' of the Bulle Clock are scientifically designed and have the practical qualities of good time-keeping, solidity and suitability for general use, combining to make the system superior to any yet known. We can add to this the external appearance of a Bulle Clock which has been closely studied with a view to producing an article agreeable to the eye. In most of the models the 'works' are visible as their good finish and uncommon arrangement give them quite a decorative effect and add an aspect original and modern to the general appearance of the clock. Naturally the battery and wires are well concealed, and this fact, apart from its practical side, has the advantage of providing a character of novelty and mystery to the whole which attracts attention.

On account of their unique and pleasing appearance the Bulle Clocks find their place in no matter which interior, either luxurious or modest. Their exterior form sober yet elegant, make them articles of value, with qualities of good working, good workmanship and good taste, appreciated by all.

10. Qualities of Construction.-- Bulle Clocks are constructed partly in England, partly in France, in works equipped with the most perfect of modern machinery. The Componnet parts all produced mechanically, are controlled piece by piece. The manufacture is therefore all that can be desired and assures only instruments perfect in every respect being turned out.

11. Transport and Setting to Work.-- The Bulle Clock can be packed for transport, all ready to work, and without dismantling

the pendulum, as has to be done with other clocks.

Each clock is accompanied by a book-let giving full instructions for unpacking and setting to work, and no knowledge of any kind is required for the operation. As each clock has its own central station in the form of a special battery, the Bulle Clock can be installed quite independent of public lighting or force circuits and therefore is free from all installation costs and free from the troublesome breakdowns and stoppages to which public circuits are subject It carries on regularly and surely without attention or re-winding and gives its possessor continual satisfaction.

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Remember that

THE BULLE CLOCK NEVER NEEDS WINDING

and

ALWAYS KEEPS GOOD TIME

The Bulle Clock is driven by a small battery lasting several years, after which all that is required is to change the battery at the cost of a few shillings. This is as easy to replace as that of an electric torchlight. The Bulle Clock requires no other attention whatever, has no springs to break, is easily regulated and keeps accurate time.

We have a large selection of models to suit all

tastes, and at all prices

ASK FOR ILLUSTRATIONS

Repairing Bulle Clocks.

The robustness and extreme simplicity of BULLE CLOCKS are such as to avoid the many causes of trouble so often experienced with other clocks.

Only accidents or rough handling can possibly interfere with the good working of BULLE CLOCKS, but any trouble can very easily be put right without the necessity of any special knowledge of electricity.

Let us again remind you that:-

THE BATTERY SHOULD NEVER BE LEFT CONNECTED WHEN CLOCK IS NOT WORKING.

STOPPAGE OR BAD TIME-KEEPING.

1. See that the contact pin D is well in position between the two sides of the fork F. If not in its place pull pendulum to one side, lift gently and slide pin into fork.

See that the LITTLE pawl R pushes ratchet wheel S forward by one tooth on each swing of the pendulum. The other LARGE pawl W simply prevents wheel S turning backward.

2. See that pendulum swings quite freely. Once started by hand it should swing for at least one minute, without battery being connected up. If this is not the case see that the coil A is not rubbing against the magnet B, and if necessary adjust this by making use of the levelling screw at back of clock which will rectify the position of clock front to back.

See that no packing etc. is left inside hole of coil A. See also that suspension point of pendulum is free (front to back). See that the pawls work quite freely. Check the gearing in the usual manner (but more simple than with other clocks).

It will be noticed that the central axle carrying fork F is finished at the extreme back by a silver end with a groove in which rolls the loop of a silver spring. This spring is fixed slightly aslant thus pushing forward the central axle so as to make it press lightly against the front steel plate which acts as end plate. Should this little silver spring be damaged in any way it should be replaced. Like all other BULLE CLOCK parts it is interchangeable.

If no defects are found after this examination, the electrical circuit should be checked. This is even still more simple

CHECKING THE ELECTRICAL CIRCUIT.

1. In case a wet battery is used see that it is three-quarters full with water. Whatever the battery is, see that the red wire connected to main plate of movement J is also well screwed to positive (red) central terminal of battery, and also that the black wire is well screwed to other terminal.

In case wires were wrongly connected it will be noticed that the swing of the pendulum will be stopped as if by a brake.

2. See that there is no direct connection whatever between the two poles of the battery as this would create a short circuit and soon exhaust the battery, thus stopping the clock.

Check the circuit and make sure that all screws, wires, nuts etc. are tightly connected. See that wire ends are in good condition and have not been eaten up by acid, following the upsetting of a wet battery.

Start at the negative pole of the battery and follow black wire which is connected at top of frame work. Then through a steel wire or a spiral spring the current flows to the steel pendulum K and arrives at the coil A, which it traverses to come out by the brass rod L and the silver contact pin D. (Note that the pin holder must be insulated from pendulum rod K by fibre).

This pin D is placed between silver side G and insulating fibre side H of the fork F. The current therefore flows through to the fork when this pin D comes into contact with the silver side of the fork, i.e. on each swing of the pendulum towards f.

From the fork the current is conducted to the main movement plate J by a silver spring and the circuit is completed by red wire I, connecting this plate to positive pole.

3. See that this wire I is bared at its end and tightly connected to main movement plate.

See that this movement plate J is well insulated from frame work. It is mounted on ebonite or fibre washers. No bare part of red positive connecting wire should touch frame work (negative) as this would create a short circuit.

4. See that the steel wire or the spiral spring connecting frame to top of pendulum rod is well fixed as otherwise current will not flow through.

5. See that no oil is allowed to reach the fork F or the silver contact pin D as this will stop the contact. SEE THAT BOTH PIN D AND FORK F ARE CLEAN SO AS TO ENSURE GOOD CONTACT. It is important to note that the silver pin D when pendulum is at rest, should dip about three-quarters of its diameter

into fork A and the silver pin should be fixed tightly on pendulum.

6. Check that this pin D is well insulated from front steel pendulum rod K. This is obtained by a fibre lining fixed in between the pin holder of the steel rod.

7. See that the rubber tube, insulating brass rod L from holder at bottom of pendulum on top of coil A, is not broken as otherwise a short circuit will take place, thus stopping the clock.

BAD TIME-KEEPING.

If the clock is losing considerably this must be due to the pawls not working perfectly. See therefore that both pawls are quite free. The small pawl R should on each swing of the pendulum be displaced by one tooth and a half on the ratchet wheel S so as to make sure it is pushing one tooth forward. The large pawl W should be so fixed that its end never changes its position, but drops into the fresh tooth pushed forward.

The small pawl R can easily be adjusted by slightly twisting its holder on the centre axle. The large pawl W can be adjusted by slightly bending its end so that it drops behind a tooth.

Naturally these pawls will never be out of adjustment unless the clock has been interfered with by inexperienced hands

Never put oil on the ratchet wheel as this will cause the pawls to stick on the teeth which is not advisable, in fact BULLE CLOCKS do not require oiling anywhere.

IRREGULAR TIME-KEEPING.

If the pawls are operating properly irregular time keeping must be due to the bottom holder P or top holder of isochrone spring not being free, in which case regulating is impossible. This spring is placed between main movement plate J and pendulum rod K. See therefore that the little axles holding isochrone spring are moving perfectly freely in their bearings and that they are duly insulated from rod K.

If this is working properly, bad time-keeping can only be caused by a gross defect, which will easily be discovered by the practical watchmaker (clock right out of level, pendulum rubbing, dead battery owing to short circuit, etc). The voltage of a battery should read at least one volt .

BULLE CLOCKS have been designed so as to ensure accurate working with the maximum of safety

The different defects mentioned cannot obtain if the BULLE CLOCK has been properly treated, and they are only cited as those most likely in case of accident or undue tampering