

Princeps overview

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1 History

Also traded as:

The Telephone Manufacturing Co Ltd.

New Systems Private Telephones Ltd.

Princes Electric Clocks Ltd.

Telephone Rentals Ltd. (see Telephone Rentals entry for a detailed description of their business history.)

The Telephone Manufacturing Co Ltd used the trademark Temco for their synchronous and other electric master clocks circa 1935.

Further information provided by courtesy of James Nye (using in part info from the EHG Technical Paper 43).

I quote:

The Telephone Manufacturing Company Limited (TMC) was formed in 1924. By 1929 it had absorbed New Systems Private Telephones Limited, which became a subsidiary company and was later renamed Telephone Rentals Limited. Around the same time TMC absorbed Prince's Electrical Clocks Limited. Prince's Electrical Clocks was owned by Major Charles Edmond Prince of Stubbings Manor, Burchetts Green, Berkshire. He applied for patent no 206186 on 1st June 1922, and this was fully accepted on 1st November 1923. here is some doubt as to whether this was reliable, and it was replaced fairly quickly the a count wheel system .

The re-engineered Princeps clock became what we refer to as the Princeps New System. Chronomatic was registered as a trade name in 1935 and frequently appears on the dials of clocks which were also rented out by Telephone Rentals Limited. This was dropped in 1944, the name TR now being used on all products.

The mechanism was moved from its low position to the top of the case in the 1950s, and became known as the High Impulse Transmitter, continued in manufacture until the 1970s. Telephone Rentals also installed other manufacturer's equipment, and latterly traded under the name TR Time Services Limited, disappearing within Mercury Communications in April 1990. During its history, TR acquired Dictograph, another firm that specialised in rentals, mainly of Magneta M36/M37 master clocks.

Telephone Rentals and Dictograph had a deliberate policy of destroying equipment that came back from rental, I am told usually after two contracts - 30 years at most), and there are therefore far fewer surviving examples of what were once amongst the most commonly installed systems. For example, the production rate of Magneta clocks was nearly double the annual total of Gent's.

TMC had several locations, but one main works is at Park Hall in West Norwood, west of the cemetery. Robson Road runs down the side of the cemetery from Norwood High Street towards the works, and the staff going to work each day down Robson Road referred to it as 'walking the wall'. Several people who still live in West Norwood worked there or had relatives that did.

Colin Reynolds, formerly of Gents, has also written;

"Gent used to manufacture master clocks, time products and fire alarm products for telephone rentals and badge them with their logo. I remember designing a fire alarm equipment for them. They rented out electrical equipment and supplied the service for its maintenance and at Gent we had engineers visit the factory for training."

I understand there were four types of the Princeps/TMC clock family.

2 Clocks

2.1 Type 1

The original Princeps as developed by Charles Edmond Prince. It had side contacts that also impulse the pendulum. This clock is in the Science Museum reserve collection and a few are in private collections. The frame would appear to be of aluminium.

2.2 Type 2

When the Princeps Company was taken over by TMC (around 1926?) they manufactured for some time a "ruggedized" version of the Princeps clock, called New Princeps. The frame is now of brass, and the movement refined in design. The principle was the same (side contacts) and they also used the elegant Princeps cases. There was an excellent article in Clocks on it by Roy Conder, titled "A princely master". This clock is known (and appears to have been marketed as the 'Princeps New System'. These clocks would appear to have been more popular for large houses rather than industrial applications, which may explain why they are very scarce today. It may also explain the unusual floor standing elegant slim glass sided case that is usually found.

2.3 Type 3

A bit later TMC abandoned the *Princeps* principle completely and designed a clock with an impact arm. It was the predecessor of what was later called *Chronomatic*. The type 3 clock still had the elegant case and the *Princeps* dial placed in the middle of the case door, but it was quite different to type 2 and a clock with an gravity arm, similar to (but not as robust) as the *Synchronome*. The ‘upside down horseshoe’ frame was tall, and some at least seem to have been made of brass or bronze.

2.4 Type 4:

The Chronomatic. This has a shorter movement bracket. The dial movement is also different. These clocks were rented out in large numbers by Telephone Rentals for a period of 14 years. On return they were often scrapped by TR.

2.5 Half seconds clocks

The 0.5 sec TMC "paper clip" is quite a different clock and has a Hipp toggle mechanism. It was designed by Major Prince. There is also a hybrid 'free pendulum' clock which uses a combination of seconds and half seconds parts to make a semi precision clock shown there.

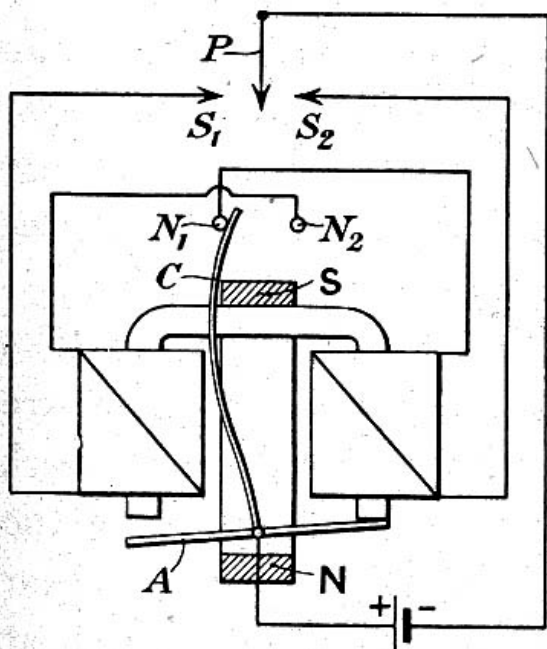


FIG. 46.—Showing the Reverser in the "Princeps" primary.

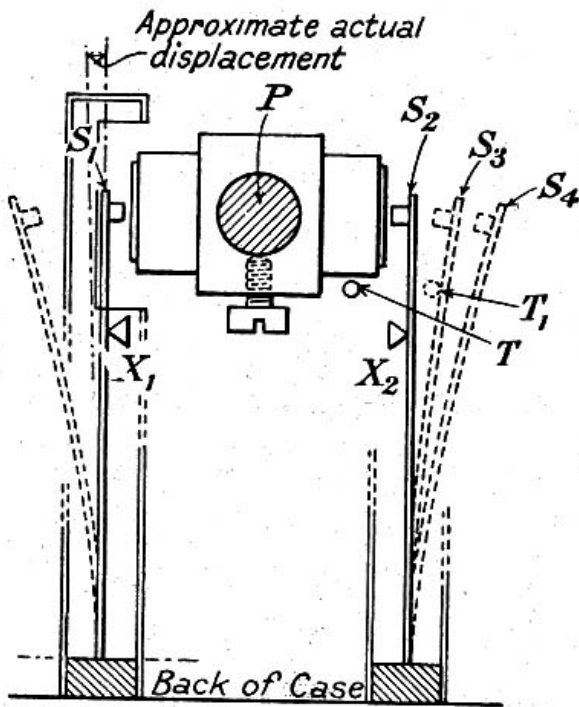


FIG. 47.—Illustrating the "Princeps" method of giving impulse.

Figure 1 - Princeps explanation diagram (see below)

3 Explanation

One of the latest introductions into the field of electrical horology is the "Princeps" clock, the pendulum of which also receives spring impulses. A noticeable deviation from the usual custom in the construction of these clocks is that impulse is given with alternate beats and no count wheel is employed.

The electrical part of the mechanism consists of a polarised electro-magnet arrangement known as the reverser, which is shown diagrammatically in Fig. 46.

An armature in the form of a rocker arm, A, is attracted first to one solenoid and then to the other, according to the direction of the flow of current, this being dictated by the movement of the pendulum, P, between two contact springs, S1, S2. With the change over of the armature, A, the contact arm, C, also passes between the points, N1, N2, and by this means closes a secondary circuit for synchronising purposes.

Fig. 47 shows diagrammatically the pendulum viewed from above and the method whereby impulse is given.

The pendulum, P, vibrates between the two contact springs, S1, S2, each of which is protected by a glass tube and provided with a stop, X1, X2. On one side there is an auxiliary stop, T, which is removed to the position T1, with the attraction of the rocker, A (Fig. 46), to one of the solenoids. As the pendulum swings to the right, instead of meeting the contact spring, S2, at rest on the stop, X2, it has to proceed to the position shown at S3, the spring having been already advanced by the motion of the stop from T to T1. The pendulum then makes contact, the stop, T1, retires because the rocker, A (Fig. 46), has changed over and the spring is carried on by the pendulum to the end of the beat at S4. On the return to the left, the spring, acting against the pendulum, remains in contact right up to the stop, X2, and the difference between the total lift and total descent constitutes the impulse which is represented in the figure by the separation between S3 and S2.

Original design by Charles Edmond Prince OBE, Major, RE C1923

Prince had been a senior man in the RFC and had been responsible for the first airborne radio telephony use during the Great War. He had also been in charge of all research in valve circuitry/usage for the Marconi Company after the war.

Sidney J Smith had been a technician working for Prince, and was the technician/engineer to Prince's 'inventor' role.

Prince made a few clocks to his own design, but very soon (1927) sold the rights to TMC who were skilled and volume manufacturers of small high grade intricate electrical and electromechanical devices.

Original clock was both as the Princeps (strict) and Princeps (TMC engineered)

Both versions use a 1 second pendulum (half seconds versions were also made and at least one survives) with a clever 'reverser' that used *very* light contacts 'made' by the motion on the pendulum, with heavier contacts performing the (potentially damaging to small contact due to back EMF) 'break' function.

The reverser also stored energy 'packets' from the electrical supply in a small light spring which delivered a small sustaining impulse to the pendulum at each and every swing. Notwithstanding this – the pendulum was essentially free, there being no 'countwheel' or drive from the pendulum, and the impulse was very constant due to the small flexure of the 'remontoire' spring.

Operation of the reverser is as a 'bistable' with a soft iron armature being toggled between two stable positions (states) by the *repulsive* action of two coils energised alternately. Once in a state, a permanent magnet latches the armature in place.

Operation using *repulsive* rather than *attractive* magnetic forces is unusual, but gives maximum force to start movement, and a more gentle 'finish' to the movement where there is a significant air gap. Nevertheless, the action of this movement is not particularly quiet.

Unfortunately, the repeated 'clacking' backwards and forwards of the soft iron armature tapping on the permanent magnetic circuit, and the need to regularly reverse the polarity of the magnetism in the armature causes the permanent magnet to decline in strength. To correct this – a coil is provided around the permanent magnet (though it's not present on at least one very early example) to 'flash' the circuit from a battery and restore the magnetism. This operation was probably needed 'from time to time' and would then have required expert re-setting of the clock adjustments.

It would seem that whilst the movement is both elegant and potentially accurate, the limited magnetic material at the time which did not allow very 'permanent' magnets meant a need for regular and skilled maintenance that was unacceptable. The clocks were not a success, and TR soon moved to a more conventional 'countwheel and gravity arm' design.

The original Princeps clocks used a slave movement designed and engineered by Sidney Smith. This initially had a jewelled rocking pallet (like a Brocot jewel), but soon switched to steel. This movement was successful and was used by TR into the 1960s.

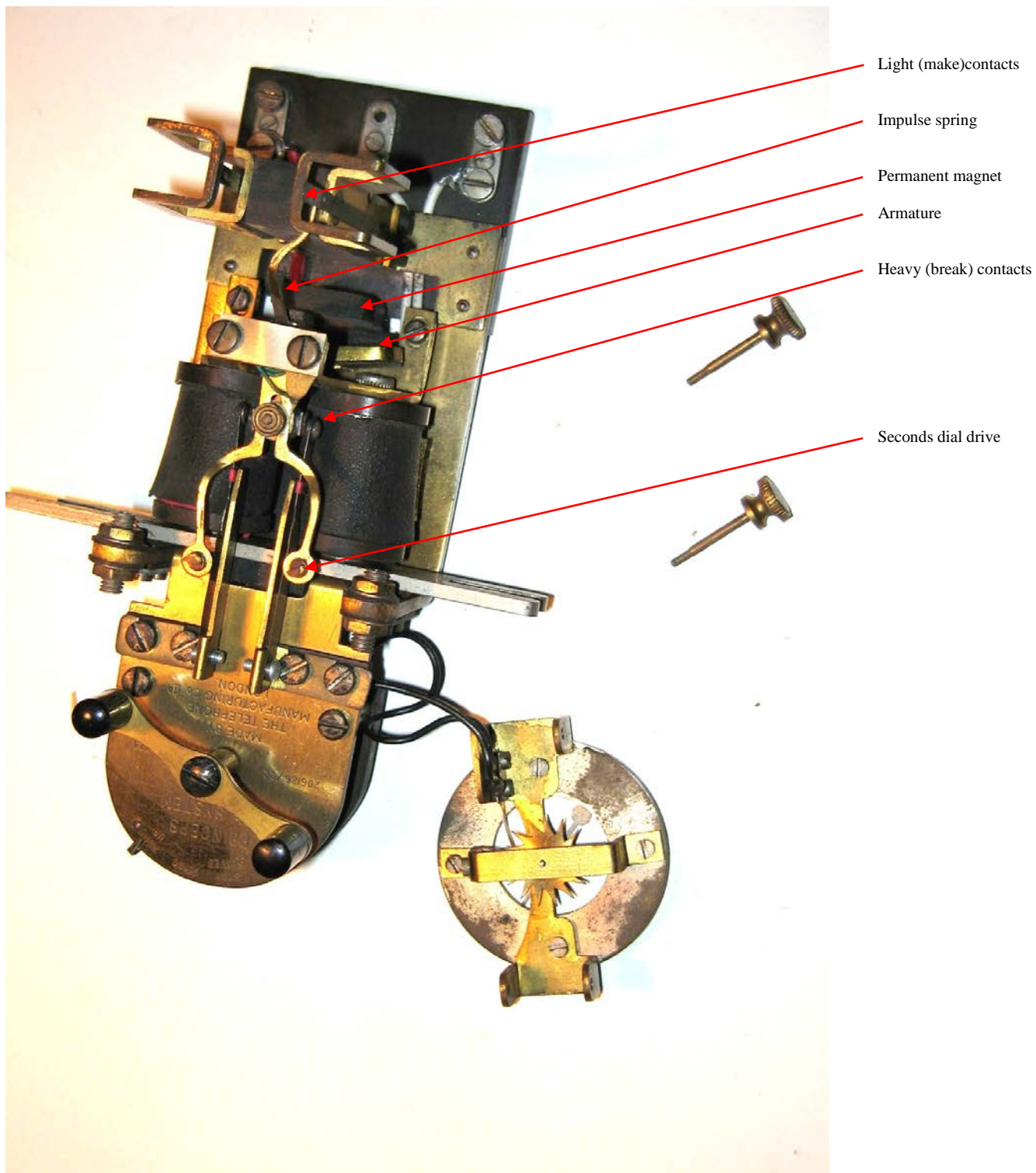


Figure 2 - Reverser system from type 2 (type 1 similar)



Figure 3 - Type 2

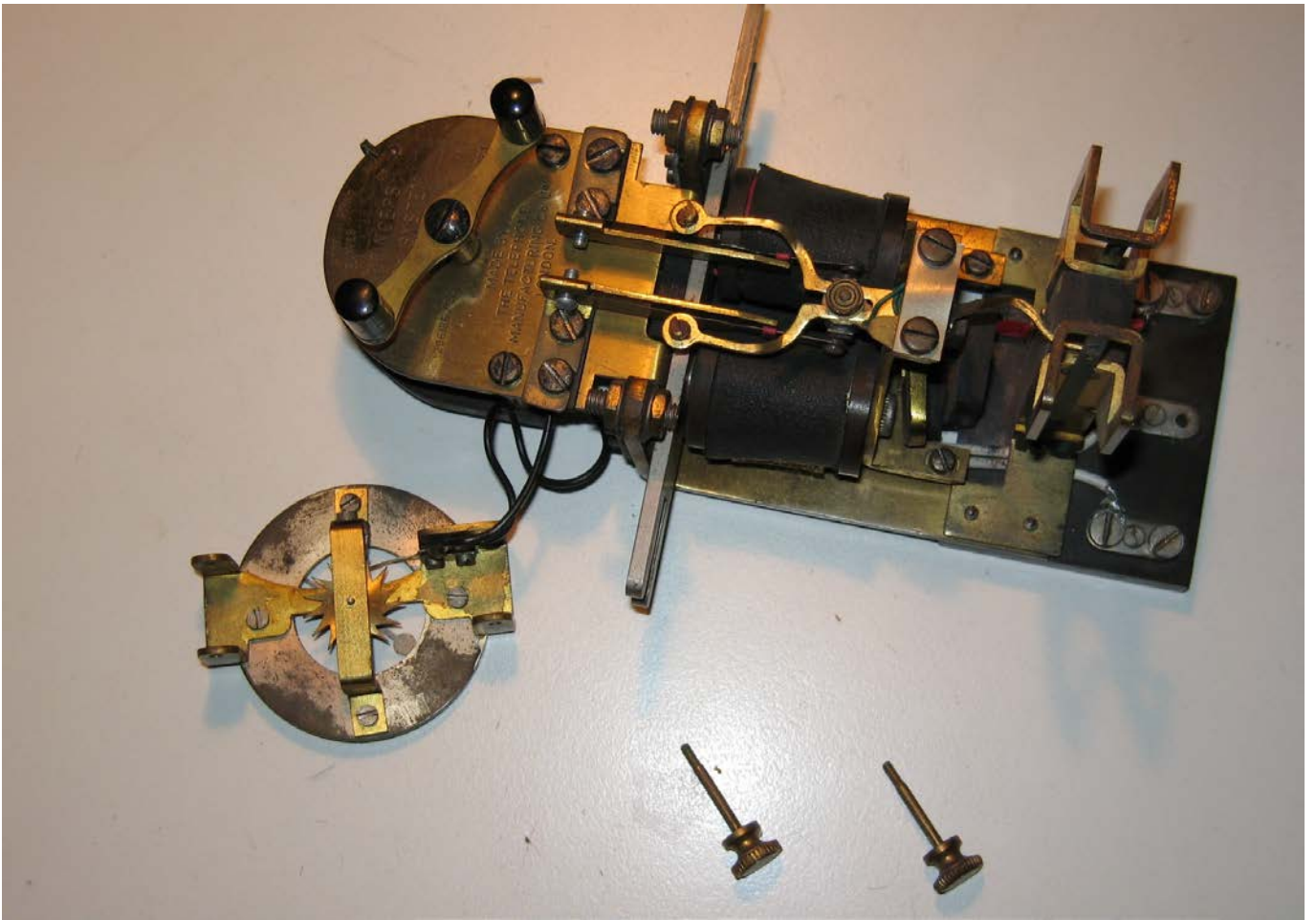


Figure 4 - Type 2 movement



Figure 5 - Type 2 movement close up



Figure 6 - Relay unit from types 2 & 3 ?



Figure 7 - Type 3 in a typical Princeps case



Figure 8 - Type 3



Figure 9 - Type 3



Figure 10 - Type 3



Figure 1 - Type 4

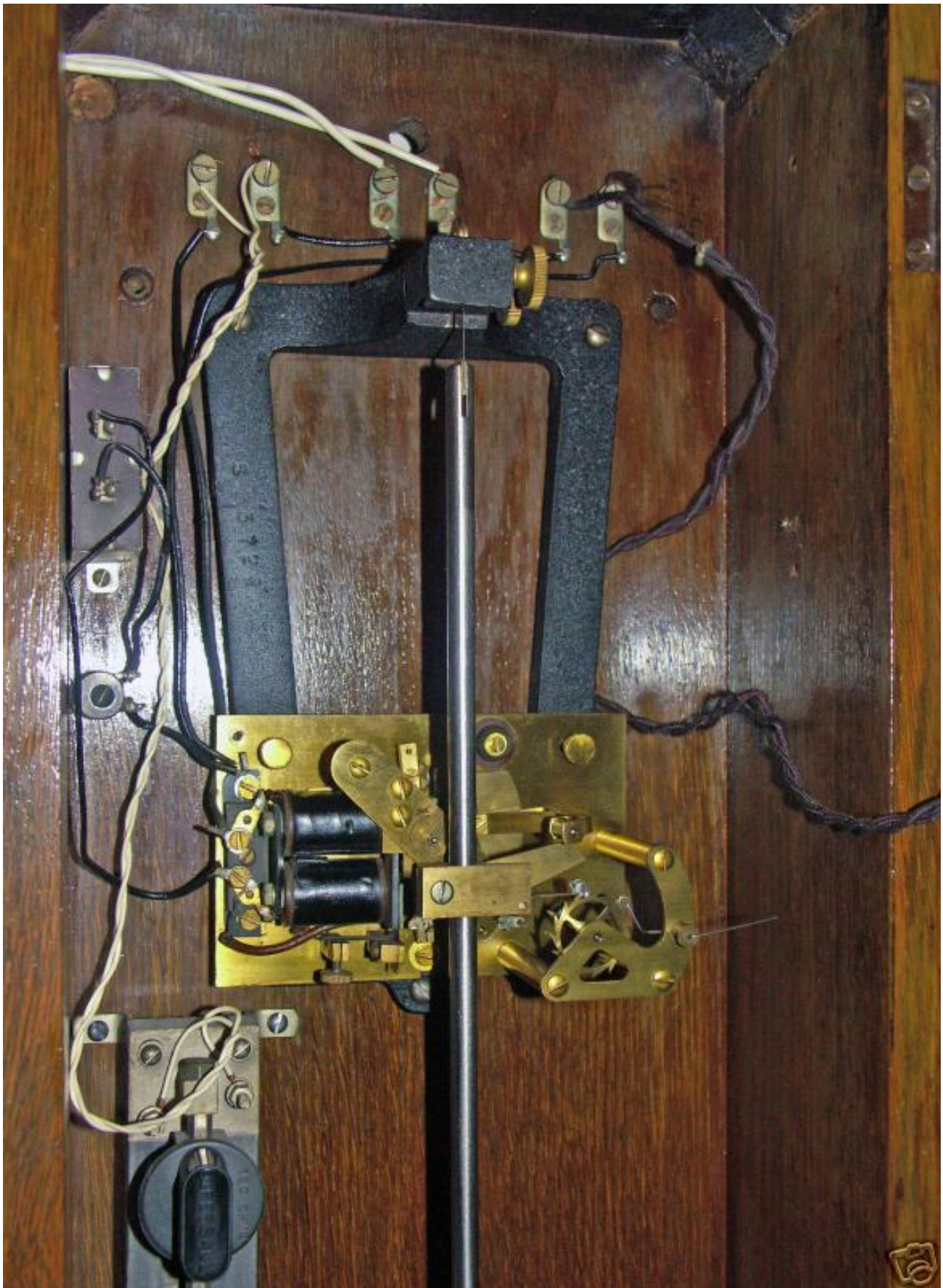


Figure 2 - Type 4 movement

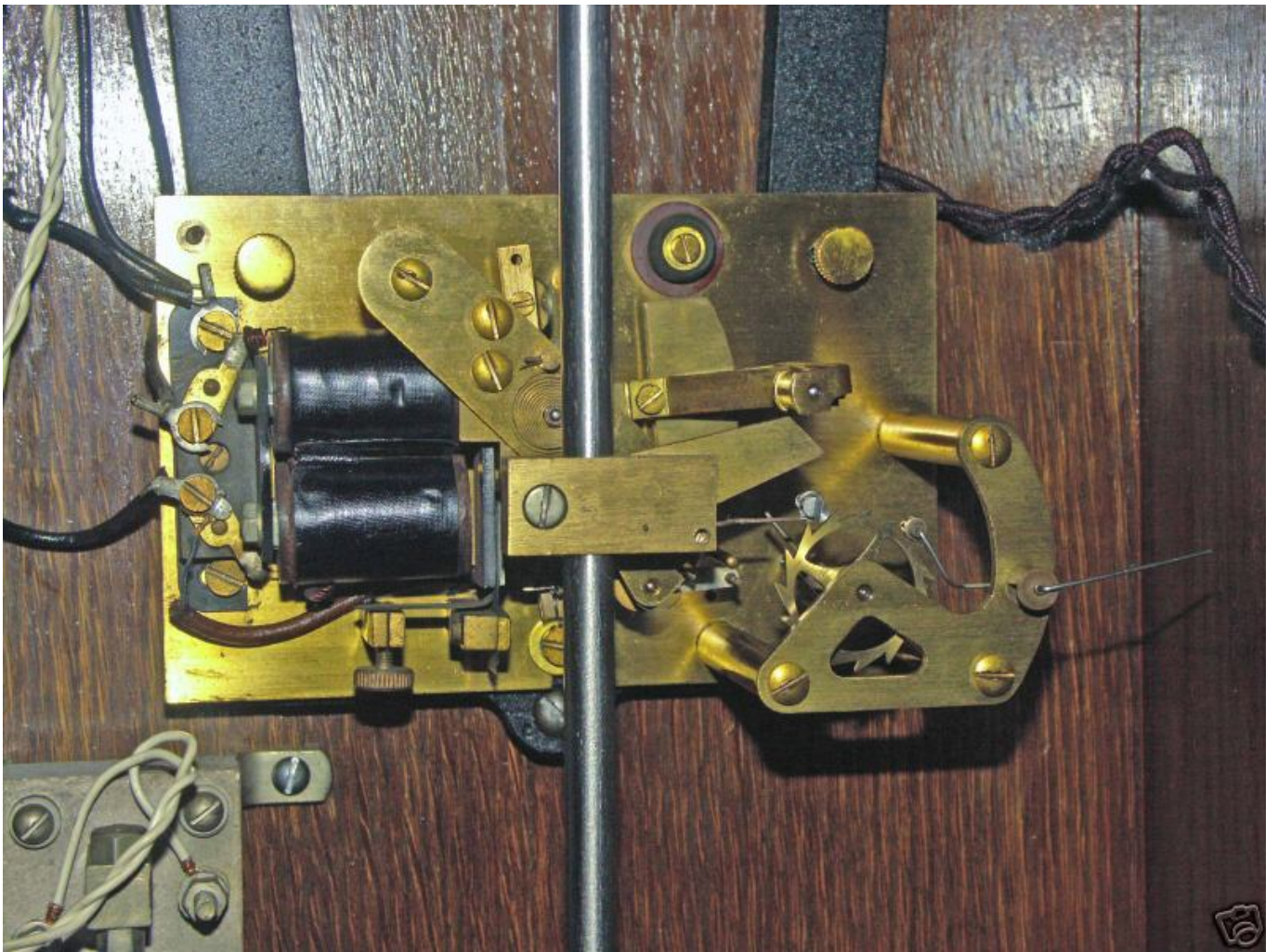


Figure 13 - Type 4 movement close up