THE WILLIAM SCOLNIK COLLECTION OF PRECISION AND RARE ELECTROMECHANICAL CLOCKS PART 2

AN UNUSUAL ETALON SHORTT TYPE OBSERVATORY REGULATOR NUMBER 26

The slave clock used in conjunction with the free pendulum contained in the vacuum tank. It contains the unique pendulum synchronizer.

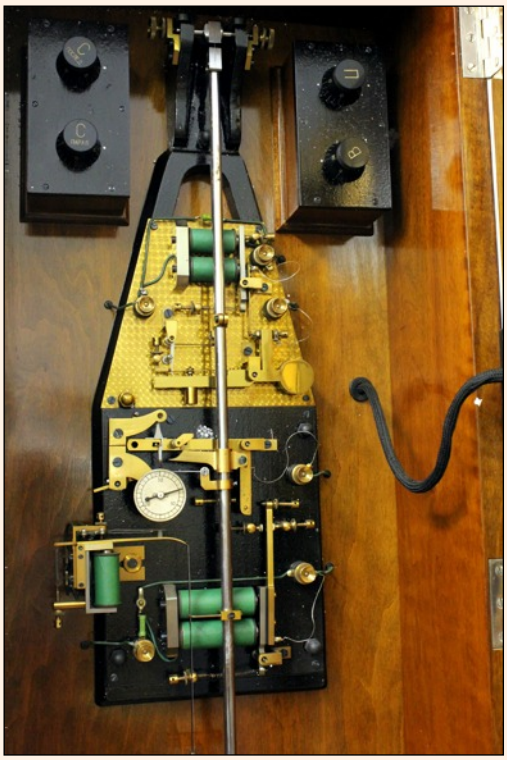
The very existence of the Russian "Etalon" manufactured Shortt clocks was literally unknown outside of the Russia until I had been offered one more than 25 years ago and the story of their development is an interesting one. In 1934 I.I. Kvarnberg with the participation Prof. N. Kh. Preipich started work at the All Union Scientific Research Institute of Metrology (VNIIM) to produce their own high precision Astronomical Pendulum Clock aimed at raising still further the precision of timekeeping. This clock design was directly based on the English Shortt Astronomical Regulator which they had been importing from England since the beginning of the 20th Century and by means of incremental design improvements was able to essentially double the precision of the original Shortt. Although work on the clock was commenced in 1934 it was not completed until 1952 because of a long interruption caused by World War 2. When the design was finished, the diurnal variation of its movement was reduced to 1 msec, an astonishing improvement over the original.

#26 is a particularly unusual clock in that it was one of only two clocks known which have a telescopic pendulum beat plate viewer. The beat plate which is the calibrated

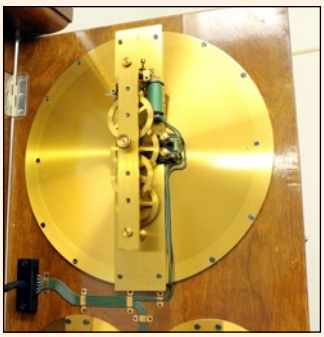
The copper tank which contains the precision Free Pendulum and the impulsing mechanism to keep it running. It's wired directly to the slave clock

AN UNUSUAL ETALON SHORTT TYPE OBSERVATORY REGULATOR NUMBER 26

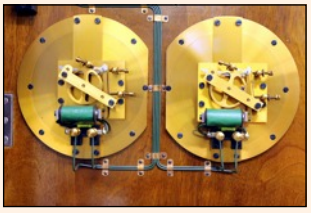
The clock is extremely well designed and particularly robust. Much attention has been paid to detail. The door of the slave clock is in two parts so that there is a door within a door to permit access to the clock dials without opening the main door. I expect this was done so as not to disturb the pendulum. This small door is not locked with a key as the main door is.



Above: Details of the slave synchronizing movement
Below: Penduluim, beat plate and voltage meter



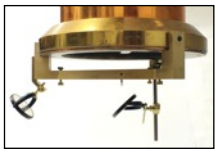
Above: The front and back of the main Astronomical Dial. The condition is excellent



The two slave dials which indicate the time on the Master Clock the the Slave Clock. They should of course ideally be the same.

AN UNUSUAL ETALON SHORTT TYPE OBSERVATORY REGULATOR NUMBER 26

scale mounted on the bottom of the pendulum rod is used to determine that the pendulum is exactly vertical and that it is moving evenly in it's excursions to the left and right. In most of the Shortt type clocks - both English and Russian - a small adjustable mirror is mounted under the clock and its angle adjusted so that the beat plate can be seen through the glass bottom of the clock by looking through a small aperture mounted on the bottom front of the clock. In order to view the beat plate, you have to lay on the floor and view it through the aperture, really quite ungainly and difficult if you're older than 40. It appears that the last few clocks made,were fitted with

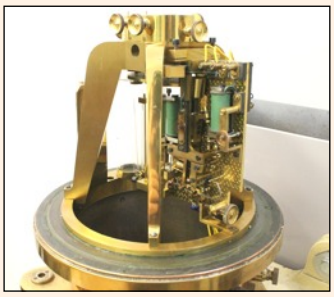


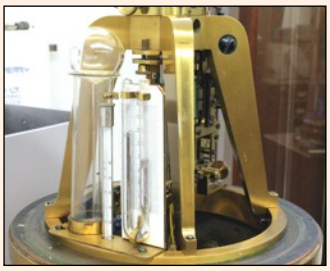
to the left the optical arrangement can be seen showing the telescope and two mirrors. The arrangement of the mirrors is shown on the right and a view of the beat plate as seen through the scope, on the right.

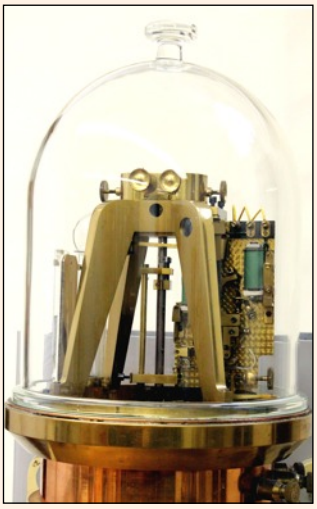
this new and much improved beat plate observation telescope which was mounted in an entirely new configuration, at the upper part of the clock so that the beat plate could be easily observed by viewing it through the telescope. An entirely new mount was evidently designed to accommodate this improvement which was practical and convenient to use.

Very few of the Etalon Factory Shortt type clocks were produced and it appears that fewer than 30 were made. It is estimated that currently only about half a dozen are known to exist.

The mechanisms of the clock including the slave clock, tank impulse mechanism, pendulum, suspension etc are in good unrestored condition and the restoration should present no difficult problems for anyone familiar with this type of clock. The observation microscope, microscope mount and bottom glass spider plate seal have already been replicated and restored and the mirrors are contemporary replacements. Along with the Fedchenko clocks, these clocks probably represent one of the last commercial efforts to produce a high precision pendulum clock and as such represent the end of an era of clock design.







Above Left: Showing the Free Pendulum impulse mechanism mounted in place in the tank.
above Left: The Thermometer, mercury vacuum guage and the vacuum bulb vernier device.
Above Right:Tank with the vacuum dome in place.
*Below. The main Astronomical Dial which is marked in Russian :*Astronomical Clock from the Etalon factory No. 26.

This clock was originally used at the Astronomical Observatory of the University of Lviv in the Ukraine, the first Astronomical Observatory in Lviv.

CAMPICHE MASTER CLOCK NUMBER 10

The Campiche Master Clock is 50" high, 12" wide and 7" deep.

Although the Campiche family lived in Cairo, Egypt, Henri eventually settled in Geneva, Switzerland.

The first patents issued to Henri Alfred and Moise Alexander Campiche of Cairo, Egypt were issued in 1893, 1894 and 1899. The operation of the clock - from the original patent - used a countwheel propelled by a pivoted finger attached to the pendulum rod. One set of contacts attached to the countwheel activated a pair of solenoids once every half minute to physically impulse the pendulum by means of a specially constructed spring relieved impulse rod which struck the pendulum rod directly.

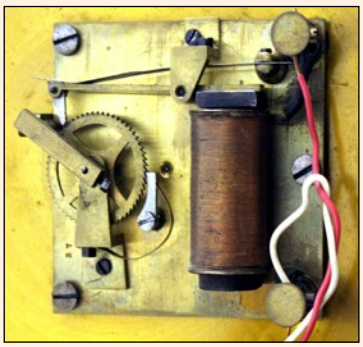
In the original configuration, the impulse was given very near the pendulum bob but it was later determined that much more precise timekeeping could be achieved by giving impulse closer to the pendulum rod assembly nearer to its center of gravitey. All of the Campiche clocks seem to have been made with this arrangement .A second set of wiping contacts on the index wheel is arranged to be used to run slave clocks and gives impulse every minute. I purchased this clock in Argentine in the 1980's where I was told, it was used as a master clock at the University of Cordoba.

Left:The Campiche Clock Logo with Pyramid and Sphinx in a rhombus

The Campiche Master Clocks never gained the popularity that other clocks in this class achieved and as a result there are not many extant today. In 1911, an attempt by a well known English clockmaker to introduce this system in London failed according to Hope-Jones in part I believe, because of Hope-Jones' own derision of the system.

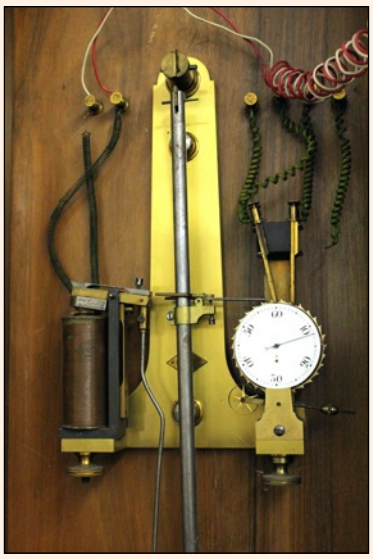
The clock is in excellent original condition and was running when I removed from my office

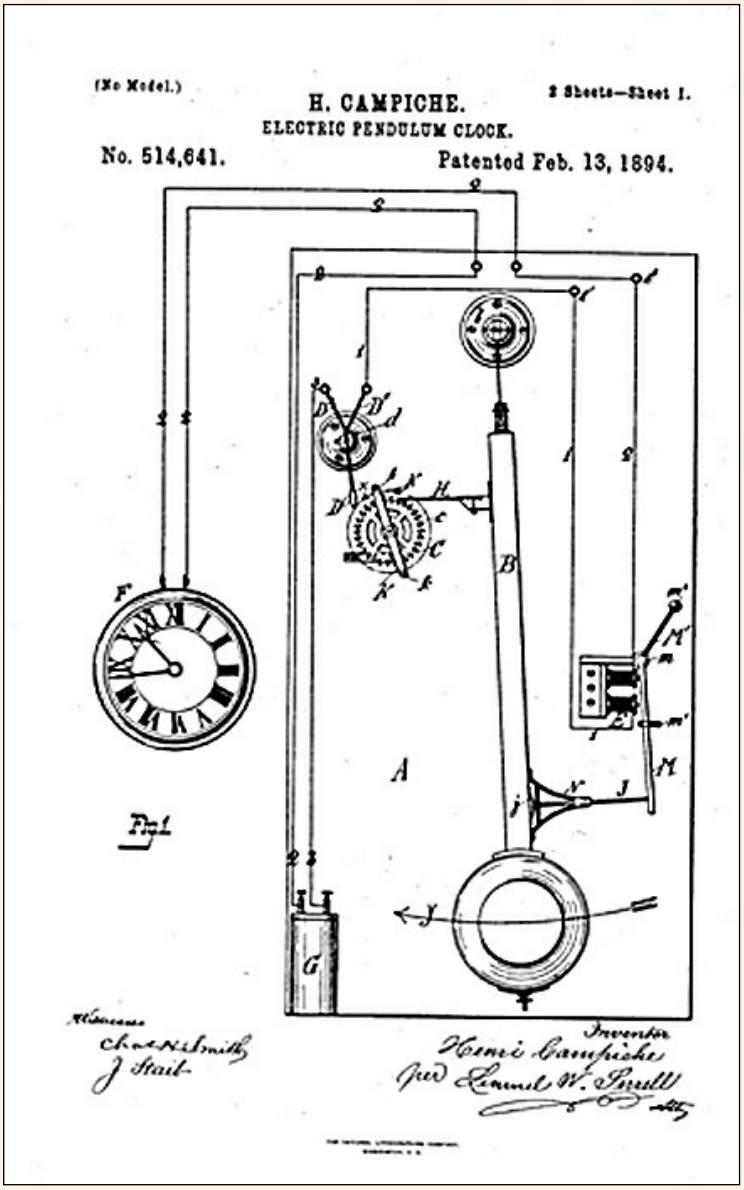
Above: The signature H.A. Campiche appearing on the dial of the clock.



Right: The slave movement which runs the Master Clock dial

CAMPICHE MASTER CLOCK NUMBER 10




(No Model.) 2 Sheets—Sheet 1.

H. CAMPICHE.

ELECTRIC PENDULUM CLOCK.

No. 514,641. Patented Feb. 13, 1894.

Fig. 1.

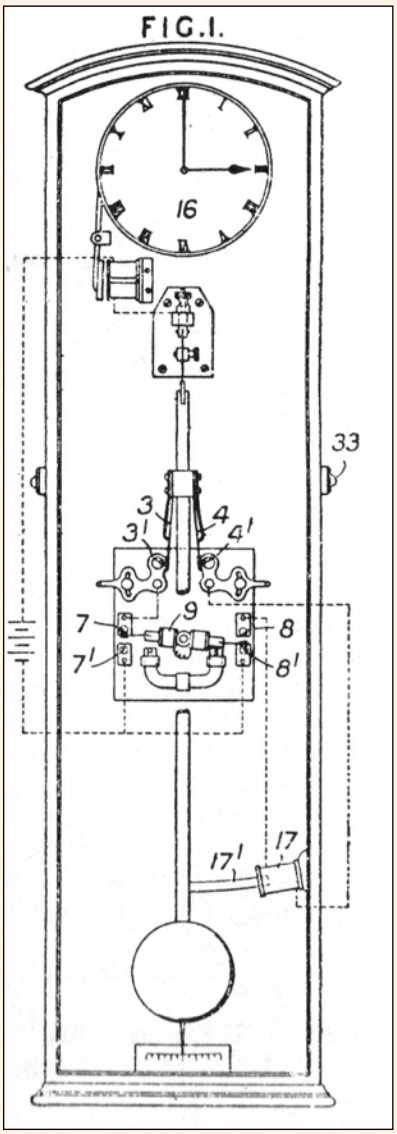
Witnesses
Chas. H. Smith
J. Stahl.

Inventor
Henri Campiche
per Lemuel W. Serrell
Atty.

RARE ORIGINAL TYPE F PRINCEPS MASTER CLOCK ALSO KNOWN AS TYPE "1"

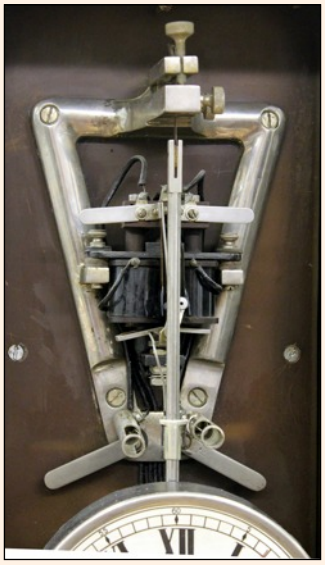
The Princeps Clock was the invention of Major C. E. Prince O.B.E., M.I.E.E. Who was the officer in charge of the Experimental Wireless Section of the RAF during World War 1 and subsequently on the research staff of the Marconi Company. He patented this clock in 1922 and then opened his business on New Bond Street, London in 1923.

The design of the movement was quite unique. He claimed that it was a free pendulum as the pendulum did no work (not quite true!) and of excellent accuracy. Very few clocks were made him in the first few years of the company's existence and this type F clock is exceedingly rare almost unknown. One is in the reserve collection of the Science Museum in London and perhaps two or three others exist in private collections. Sometime around 1926, The Princeps Company was taken over by The Telephone Manufacturing Company. When the took over Princeps they modified and refined the clock so that it would be easier to manufacture and called this "The Princeps New System". In this version the frame was changed from aluminum to brass and numerous other modifications were made. The result was quite a different clock although the principle of operation was similar. These are also quite rare and few are known. A bit later, The Telephone Manufacturing Company abandoned the Princeps principle completely and changed the clock to a gravity arm type similar to the Synchronome.



Right: A copy of the original Princeps patent. The clock manufactured by Col. Princeps is slightly different.

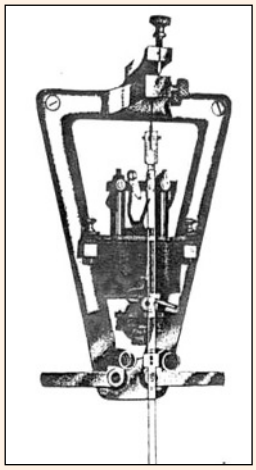
RARE ORIGINAL TYPE F PRINCEPS MASTER CLOCK



The mechanism of the Princeps Clock

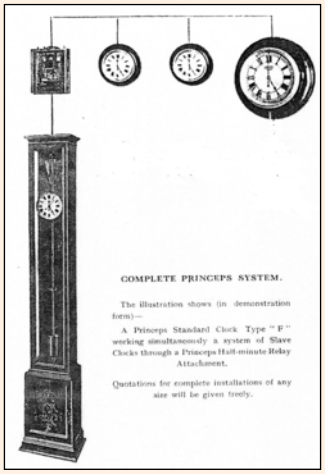
In principle, the operation of the Princeps Type F clock is fairly simple. Without going into too much detail, its operation is based upon a bipolar reversing mechanism, a pair of springy wire contacts and an impulse lever which drops on the pendulum rod. As the pendulum oscillates, it hits a contact on the right side which causes the bipolar reverser to set the impulse lever away from the pendulum rod. As the pendulum swings in the other direction it releases the impulse lever which falls upon the pendulum rod. This gives impulse to the pendulum to keep it in motion. As the pendulum swings back, it hits the contact wire causing the bipolar mechanism to reset the impuse lever which is released when the pendulum swings back and hits the contact. It quite a clever mechanism, very basic in operation and should have had few problems but because the reverser relied on a repelling force instead of an attracting force the setup of the clock was frequently misunderstood creating problems. These and other problems relating to the quality of the electromagnets in the reverser were never fully remedied and eventually, TMC replaced the movements with the Synchronome gravity type.

I ran this clock for a number of years in my home and took it out of service almost 10 years ago. The restoration should not be difficult as it is all original and complete.



The . . .
PRINCEPS
ELECTRICAL
CLOCK.

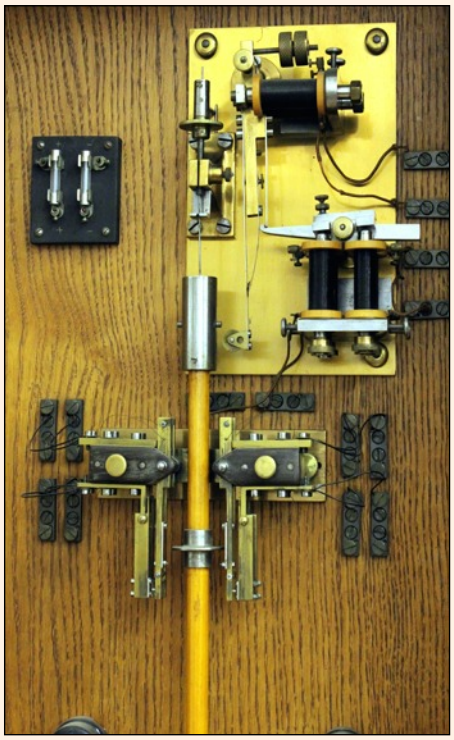
Pages from an original Princeps catalog showing the aluminum frame and the slave system



A RARE AND UNKNOWN DUTCH MASTER CLOCK BY C.D.J. JAMIN, Jr.

C.D.J. Jamin, Jr. was the first son of a well known choclatier, Cornelis Jamin in Holland. He had no interest in the chocolate business and after attending boarding school and then engineering school he moved to Moscow to persue an engineering career. When his father died, he moved back to Rotterdam. It was after this time he became interested in horology and he designed a number of unusual and interesting clocks many of which he patented. His most famous endeavor was the well known "hot wire" clock which he sold to Zenith who manufactured them for a number of years. This clock operated on the principle that a heated wire contracts. By clever design, he used this principle to operate a pendulum in the clock through a series of levers. It was clever and interesting and enjoyed a limited success.

He designed a number of other timepieces, a few of which were manufactured in a limited way. The example we have here is an unknown clock by C.D.J. Jamin, Jr. which is unusual, complicated and quite interesting. It was designed to be used as a master clock and uses a modification of the gravity arm type of pendulum impulse mechanism. By means of an unusually complicated arrangement of contacts operated by the pendulum, a gravity arm is set and reset using solenoids as the pendulum moves. The dropping of the gravity arm once every two seconds keeps the pendulum in motion. The pendulum "switches" and the nature of the gravity arm are quite sophisticated and designed to operate with little maintenance.



Above: Two views of the seconds type slave dial movement.

AN IMPORTANT CLOCK BY J.J. EMILE ROBERT-HOUDIN HOROLOGER AND MAGICIAN Ca. 1865

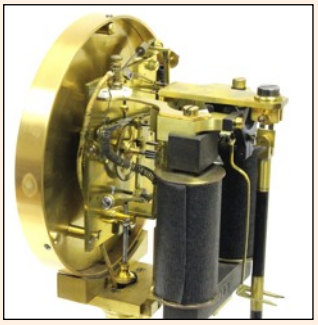
The two engraved silver plaques affixed to the heavy brass base of the clock. The one on the left is fitted with a bubble level used to level the clock.

J.J. Emile Robert-Houdin was the son of the legendary magician and horologer Jean-Eugene Robert Houdin and from a very young age seemed destined to follow in the footsteps of his famous father. His father, born in Blois in 1805, left for Paris in 1830 - probably after his apprentiship. He began to construct and invent complicated automata and clocks and was also a world reknowned magician. He is best known for the mystery clocks that made that are much sought after today. His son, Jean-Jacques Emile was born in Paris in 1831 and was the eldest of two sons. He performed with his father as a young boy but magic was not his passion. After his clock/watchmaking apprentiship concluded he went to work for the famous firm of Breguet, Neveu & Co where he rapidly proved to be a first class craftsman. It's interesting to note that Breguet at that time had taken an serious interest in the use of electricity as applied to horology and built a number of unusual electrically operated clocks. Particularly between 1856 and and 1866. Following his work there, he went to work with his father where he invented and developed a number of ingenious electric clocks. Although there are a number of clocks in collections that were made in the shop by his father (primarily "mystery clocks"), there is almost no record of clocks made by J.J Emile Robert-Houdin and this clock is probably unique.

The clock, with its dome measures 13" wide, 7" deep and 20" high. The construction is of very high quality and the mechanism clever and ingenious. There are two silver plaques mounted on the base, the one on the left reads ***Electrique Systeme Jousselin*** and contains a bubble level for leveling the clock. The plaque on the right reads ***No. 153, J.J. Emile Robert-Houdin Horloger, Paris, BD Haussmann*** (BD or Boulevard Hausmann where the shop was located was a very elegant area of Paris)

It's interesting to note that Jousselin was known for his invention of a railway electric signaling system used to keep trains from colliding and it would appear that he also ventured into clocks although to my knowledge there is no other example extant. He also sat on the Electrical Jury at the Paris Exposition of 1867.

AN IMPORTANT CLOCK BY J.J. EMILE ROBERT-HOUDIN HOROLOGER AND MAGICIAN Ca 1865



Two views of the movement which show the arrangement of the electromagnets and the contact system. It's quite unique and in 55 years of studying clocks of this type I've never come across it before.

I ran this clock for several years after I acquired and it appears completely original. I stopped it about 25 years ago and it should be properly restored. The restoration won't present any difficult challenges and should be quite straightforward.

A RARE AND UNIQUE FEDCHENKO ½ SECOND BEATING CLOCK/GRAVIMETER

The Development of Fedchenko's Clock

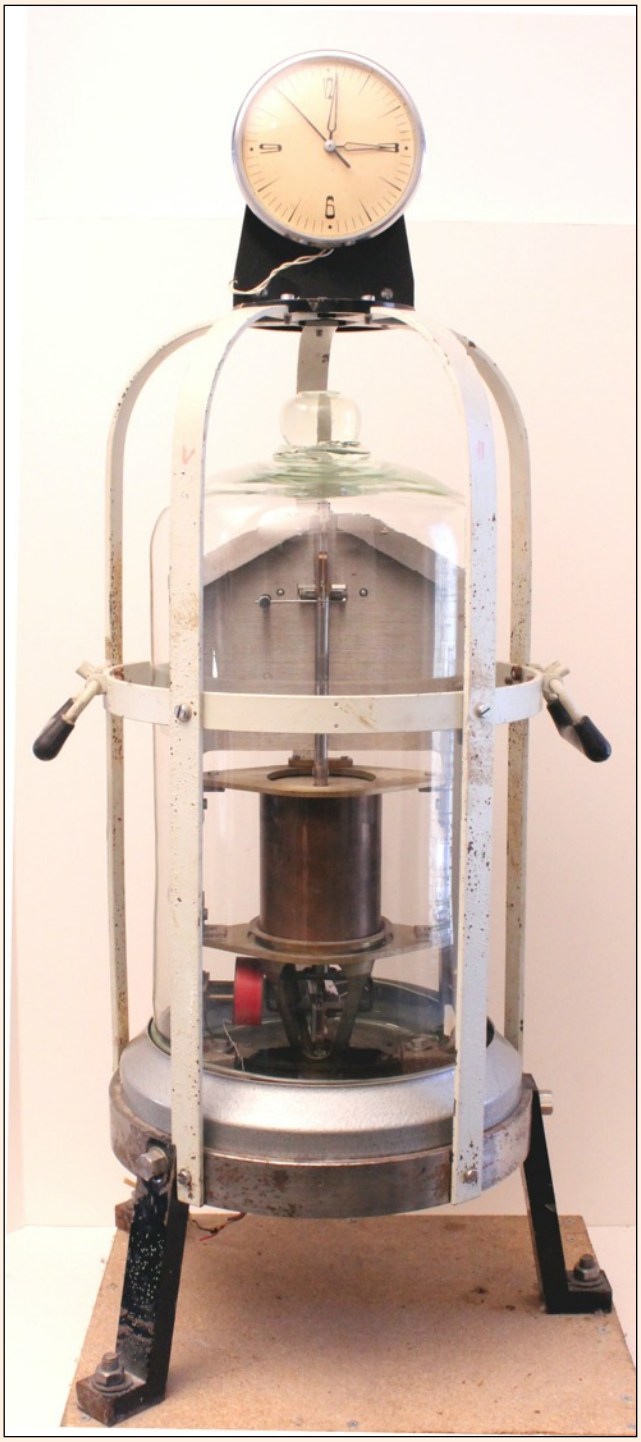
In 1948, Feodosii Mikhailovich Fedchenko, working in the Time Laboratory of the Kharkov State Institute of Measures and Measuring Instruments started investigating methods of making an isochronous pendulum. In order to obtain isochronous oscillations of a free pendulum, F.M. Fedchenko in 1952 designed, built and developed an isochronous suspension. At the Kharkov Institute during 1954, Fedchenko designed and built an astronomical pendulum clock of a new design, the AChF-1. In 1956, the investigation of AChF-1 and its improvements were transferred to the All Union Scientific Research Institute of Physicotechnical and Radiotechnical Measurements.

The AChF-2 clock was built in 1952 and finally the last development of the clock, the AChF-3 was built in 1958. It has a precision in relative units of 2-3x10(-9) which was in the range of precision of quartz clocks. The clocks were manufactured and tested at the Research Institute. (1)

The "secret" of the clock was in its special type of pendulum suspension which F.M. Fedchenko designed and discovered as a result of a serendipitous mistake in his experiments along with with his method of impulsing the pendulum.

The Fedchenko clock was the last and most accurate clock in a line extending from Riefler, through Shortt and to the final development in precision pendulum clocks, the Fedchenko.
The Fedchenko was almost unknown outside of Russia. It was Dr. George Feinstein who, to the best of my knowledge, became aware of the existence of the Fedchenko clocks although there were none outside of Russia at the time.

The Fedchenko clock was so accurate that it was discovered that the effect of the sun and moon on the earth (earthtides) could actually be measured directly and *without interpolation* as had always been necessary with any other type of pendulum clock including the Shortt. Because of this precision, Fedchenko and his colleagues felt that a version of the clock could be made portable and used for measuring the earth's gravity at various places on the earth's surface. Of course there were many obstacles to overcome in order to make a portable version of the Fedchenko clock that would be practical and portable.



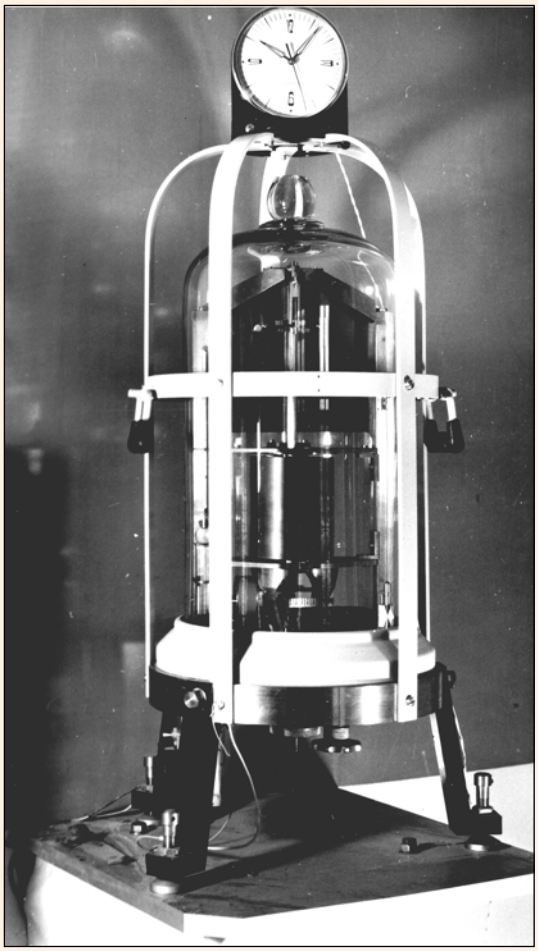
1) F.M. Fedchenko and his Pendulum Astronomical Clocks by Dr. G Feinstein. NAWCC Bulletin, April 1995

A RARE AND UNIQUE FEDCHENKO ½ SECOND BEATING CLOCK/GRAVIMETER

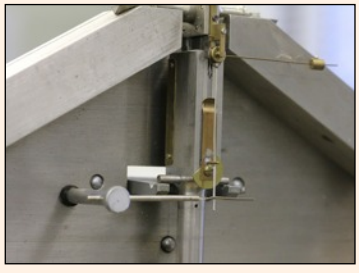
There is a great deal of precedence for using a pendulum to measure the earth's gravity and various techniques go back at least to the 18th Century. Most were cumbersome and difficult to use. Even the famous Kater's Pendulum designed by Captain Kater in 1817 was quite cumbersome and difficult to use. Later in the late 19th Century a number of smaller clock devices were designed that were more portable and could be carried about. They were not terribly accurate. A clock designed by Thomas Mendenhall for the USCGS specifically for gravity measurements however was considered to be the most accurate clock in the world at the time and was used for gravity measurements well into the 1920's.

Because of the great accuracy of Fedchenko's clock it was natural for him to turn to the gravity measurement problem but there were many obstacles to overcome. Using the same principles he used in the *AChF-3* he designed a ½ seconds beating clock using the Fedchenko suspension (somewhat smaller) and a special mount and vacuum chamber which was portable and could be moved about without losing the vacuum during transportation. Other things were also redesigned for use in this clock including the contacts (probably to eliminate bounce) and the ability to lock the pendulum in place and lift it somewhat so the suspension would not be damaged without losing the vacuum in the chamber while carrying it about. It uses the same design for the impulse mechanism as the larger clocks. This clock was designed under the direct supervision of Fedchenko and was clearly experimental in nature. It came directly from what remained of the old Etalon facility. Along with the clock is an original photograph taken at the factory after the clock was completed.

In its current state, the clock has not been restored and it's exactly as I acquired it in the 1980's, still on the shipping base. Having restored a number of the larger Fedchenko clocks I don't believe this will present any more challenging problems than the others but it's certainly worth the effort because of its uniqueness and rarity. It's the only Fedchenko half seconds beating Clock/Gravimeter that was ever produced.



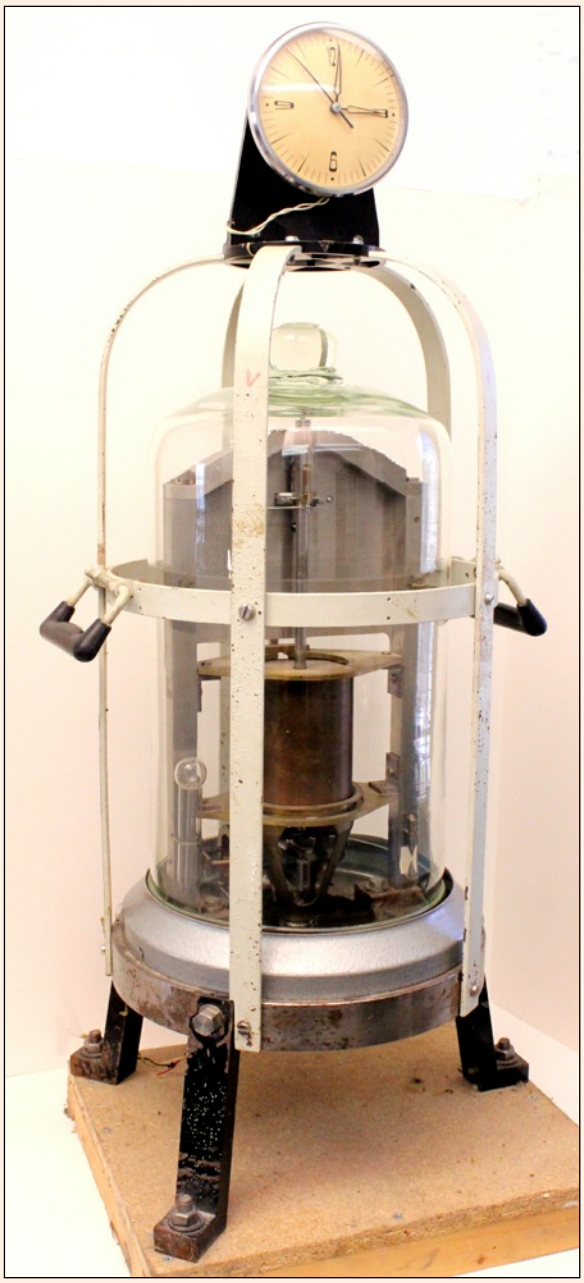
An original picture taken at the Etalon Factory when the Clock/Gravimeter was completed sometime in the late 1950's.

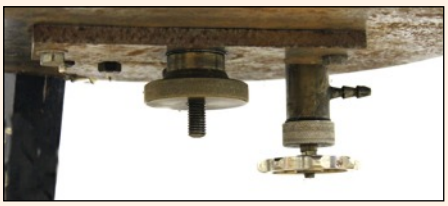


Above Left: The Fedchenko impulse mechanism with the coil and specially shaped magnets. He used this on all of the Fedchenko clocks that were made. The unusually shaped lower bracket was made to lift the pendulum bob for locking during transportation and also to give access to the impulse mechanism for adjustment and disassembly. The leveling bob can be seen at the right.

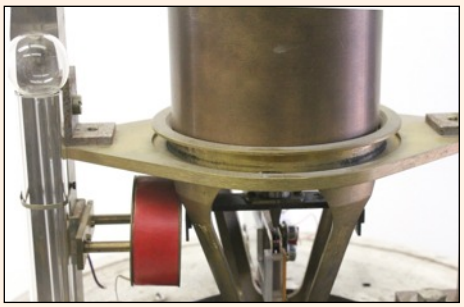
Above Right: The unusual contact device quite unlike those used on the larger Fedchenko clocks. It utilizes a gravity weight and hairspring presumably top eliminate contact bounce.

A RARE AND UNIQUE FEDCHENKO ½ SECOND BEATING CLOCK/GRAVIMETER



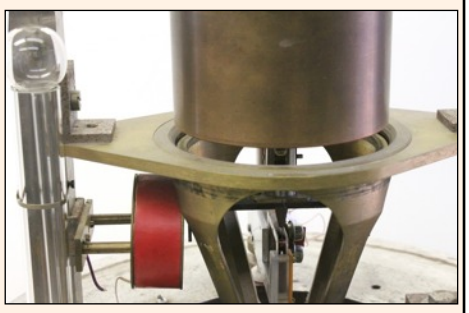


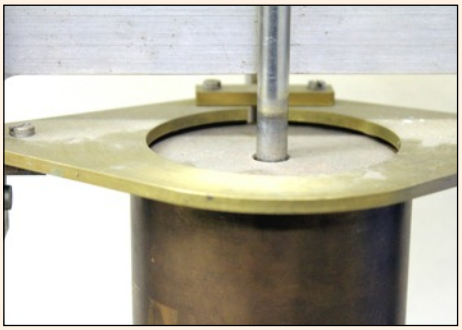
Above: A view below the clock which shows the vacuum valve and the knob which raises and lowers the pendulum in order to lock it during transportation. It operates within a steel bellows inside the clock so as to maintain the integrity of the vacuum. It's a rather clever setup.



Left: The pendulum shown in the locked position with the lock raised. On the left is the vacuum vernier guage.

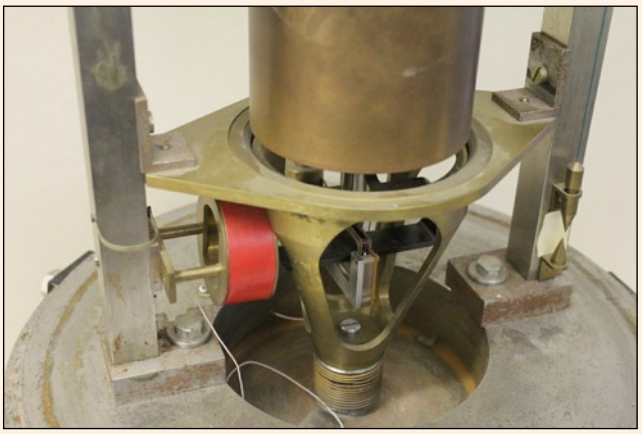
Right: The pendulum shown in the unlocked position with the pendulum locking ring lowered. The inner ring is V shaped in order to center the pendulum.





Left: The pendulum locking bar against which the pendulum is held when the pendulum lock is raised.

Below: Showing the bob in the unlocked position. You can see at the bottom of the clock, the steel bellows which is shown compressed. It is used to enclose the bob locking mechanism in order to maintain the vacuum in the bell jar. Chamber. It expands when locking ring is raised to lock the bob.



SELLIER PATENT DOUBLE PENDULUM HIGH PRECISION CLOCK

Sometime in the 1970's (can't remember exactly when) I acquired an exceedingly rare and very unusual double pendulum clock made by Pierre Sellier early in the 20th Century. It appears that it was the only one made and because the clock was so unique and interesting, I commissioned the finest horological machine shop in the US (at the time)to make two exact copies of the clock. This project took almost 4 years and the results were quite amazing. Although I no longer have the original Sellier clock, this is one of the two copies I had made. The other is currently in a prominent collection here in the US.

The rare Sellier Double Pendulum Clock copy. Almost every detail from the dome to the marble base is true to the original.

n January, 1909 Pierre Sellier of Loriet, France patented an exceedingly interesting Constant Force Escapement, Free Pendulum clock which utilized two pendulums on a single movement, It appears that only one original example was built as attempts to manufacture it failed. This is the only example of the clock that is known. The French Patent No. 398809 is listed under the heading "Precision Instruments, Electricity, Clocks".

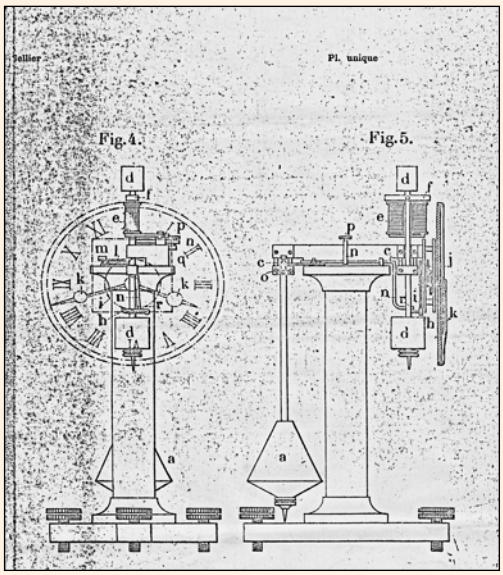
According to Henry Belmont(1) in a letter dated October 1972,

"I think that this is a single experimental model, constructed by a French inventor, who has attempted, without success, to interest an American Manufacturer. - The idea was very interesting because it consisted of making a very high precision clock by the association of a relatively free regulator pendulum and a "slave " clock mechanism which operates the hands. The principle implemented is similar to the Shortt-Synchronome astronomical clock".

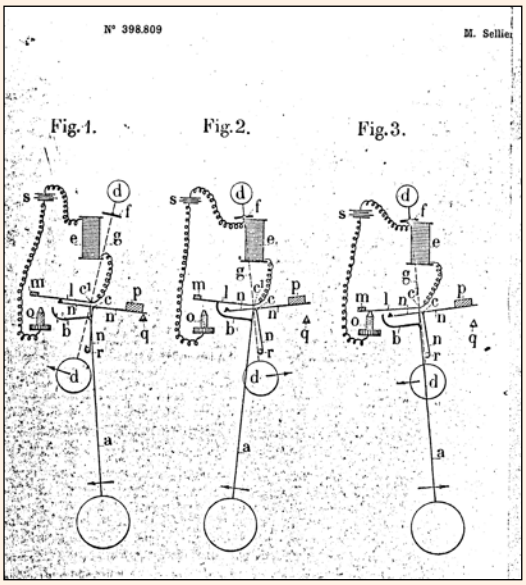
The operation is very interesting. The large trapezoidal bob in the rear of the clock is actually the free pendulum. A small hardened steel piece protrudes from the pendulum rod at the point of suspension. The compound bob which is just behind the dial, is electromagnetically impulsed and regulated by the free pendulum itself. As the compound pendulum oscillates, it drops a small weight on the arm protruding from the free pendulum giving it impulse once per second. It's an extremely clever arrangement.

(1)Henry Belmont, letter on YEMA stationary dated 10/18/1972. Henry Belmont is the holder of most of the patents used in the entire world under the designation "ATO"

SELLIER PATENT DOUBLE PENDULUM HIGH PRECISION CLOCK



To the left and right: a pretty bad copy of pages from the Sellier patent document that shows this clock..



A little additional information about Bill Scolnik and the collection

For almost all of my adult life, I've had an abiding interest in time. I really can't say why that's the case but I realize now at 77, that most of the things I've done over my lifetime led in one direction. My interest in things related to time and timekeeping, precision time in particular, took me along an interesting and at times a rewarding path. After graduating as an Electrical Engineer, I worked at that profession quite successfully for a few years, but it wasn't completely satisfying. In the early 60's I started a business restoring and dealing in mechanical musical instruments which eventually lead to repairing, restoring, buying and selling rather interesting timepieces and automata. One day while visiting a dealer friend of mine, I noticed in his basement a rather unusual clock. I made an offer for it and it was eventually mine. The clock was a fine 18th Century organ clock made by Pierrre Jacquet-Droz. I spent several months restoring the clock and advertised it for sale. One evening I received a telephone call from Seth Atwood. He had seen my advertisement and had recently become interested in clocks. He eventually purchased this clock and visited me in New Jersey. He told me that it was his first clock purchase and he appeared to be extremely pleased when he saw the clock. Seth eventually went on to create the Time Museum, one of the great clock museums in the world which has since been dispersed. Years went by and in the late 60's I became interested in pocket watches. I apprenticed to a well trained Russian watchmaker for many years and became a restorer, dealer and expert in complicated pocket watches.

During my frequent horological travels in Europe during that period, I had the opportunity to visit many museums in England and on the Continent. I became aware of an unusual class of clocks that were amazingly interesting to me and were directed to one end – precision timekeeping. They appealed to me from many points of view. They were invariably mechanically interesting and they combined mechanics with electricity to create precision time and the creators and inventors of these clocks were scientists in the true sense of the word.

I started collecting precision electromechanical timepieces more than 50 years ago. As the years passed, I refined my collection to what I thought were the best and most interesting of these clocks. Because of the esoteric nature of precision time and unusual electromechanical timepieces by most standards, few of these clocks were produced. I expect that because they were not "decorative" in appearance, and as they fell into disuse and as better standards were produced, they were not preserved. As a result of this, very few really important precision electromechanical clocks survived. The fact that clocks of this type were produced for only 50 years more or less also added to the few surviving number. I've had a great deal of pleasure and excitement over the years pursuing these clocks, understanding them and working on them. It has been a great part of my life and I would have to say most satisfying.