

THOSE WERE MY TELEGRAPH KEYS

INTRODUCTION

There are, worldwide, very few collectors who, like me, have focused on the receivers (the 'registers') of landline telegraph systems. Most of those collectors have concentrated on the Morse keys at the transmitter site. This choice is understandable because Morse keys are present worldwide in large numbers and in great varieties, and the price is usually (except for the rarer specimens) cheap to reasonably affordable. For the registers the situation is the other way around. The reason that they are scarce has to do with the fact that the many metal parts were mostly made out of brass, which resulted in many being melted down during times of war towards the production of weaponry.

As my searches progressed, I came more and more in contact with Morse key collectors, especially abroad, and saw their collecting passion. I discovered more and more the great diversity of Morse keys and so some interest grew. My first interest was in keys from the 19th century, in order to associate them with my registers.

I never went wild, but when the opportunity presented itself, and the prices were reasonable, I sometimes struck. A number of them also came into my possession through exchange. And eventually some important and/or rare pieces came to enrich this sub-collection. Over the period of about 35 years of collecting, the average number of keys I collected comes to about four a year...

It is known that I have, spread over a large number of years, heavily reduced my telegraphy collection. The keys were the first items that were sold off. Below you can see about a hundred of them which were once part of the collection. Only about fifteen remain now in my possession...

When collecting Morse keys, I limited myself to the classic models: essentially a springy lever that closes a contact when pushed down. The picture on the right shows a typical example of a Siemens & Halske model, with simply a spring-loaded lever. But that's a bit of a short cut, because (this for the attention of readers who are not collectors) Morse keys are not as simple as one might think at first glance. The proof: in America alone, some three hundred patents (not including military ones), which are directly related to the operation and construction of the key, have been taken out.



So, I only searched for 'straight keys' (hand keys) and did not collect such differently conceived Morse key mechanisms as semi-automatics (also known as 'bugs'), paddles, iambics, or electronic keys. And, sorry American fiends, there were only just a couple of US models in my collection.

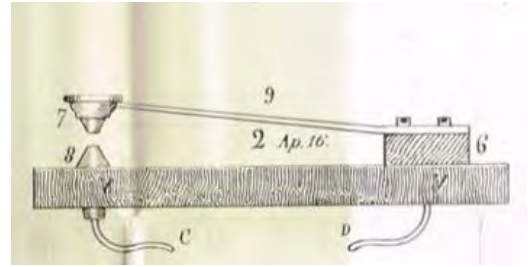
I have never really delved into the matter of the development and technical evolution of Morse keys and their different ways of producing Morse code. That's why I made only brief comments on the pictures. But then my good friend Kees van der Spek (see KvdS), while reviewing my script, has added here and there very valuable information. His experience as a former radio operator in the Signal Corps of the Dutch Army was one reason that inspired his interest in collecting Morse keys. Many former professional telegraphists who have since become collectors or amateur radio operators will be able to recognise themselves in Kees' reflection why collecting telegraph keys is meaningful to them:

For those who have worked in Morse code on a telegraph key, the Morse key is their 'tool of the trade'. As a collectible artefact, in all its variety, it is an enduring symbol of their particular skills (sending Morse code by hand and receiving and 'deciphering' Morse code 'between the ears'); for professional operators it is the remaining tangible reminder of their occupation which now no longer exists; and for both former professional telegraphists and today's amateur radio operators, it encapsulates for us the history of communications and telegraphy in one small and often beautifully made artefact. (KvdS)

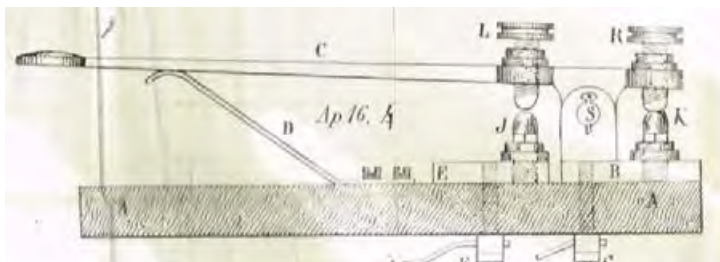
- At the end of this article, I am giving a short list of booklets related to Morse keys and there you will also meet Kees (what's in a name?!).

1. The beginning: Morse & Vail

It started as one would expect with Samuel Morse (many details can be found in my third book 'GREAT TELEGRAPH INVENTORS and in several other articles on this website'). His first, very primitive model can be seen here on the engraving: the 'Vail Correspondent'. The name suggests that it was most probably made by his faithful collaborator (from 1837 onwards) Alfred VAIL. It is simply a tinkered on/off switch to which the name 'Correspondent' was given.



This ultra-simple model was soon followed by a more 'industrial' model, the 'lever correspondent'. The picture below on the right is my replica produced by Kent Engineers in England.



2. Double tappers (or pedal keys)

Before going further with typical Morse keys, I want to present, in order to be somewhat chronological, the double tapper key. Indeed, these keys were already in use in the early days of telegraphy in England, working with different bipolar receiving systems such as the 'Bright's Bells' and the 'Double Plate Sounder'. Because these receivers are hardly known by most collectors, I am taking the opportunity here to elaborate a bit on those two types of receivers that used such double tapper keys (photos further down).

Bright's Bells

This unit uses a polarized relay and two chimes. A polarized relay can divert a 'positive' current to a first receiving circuit and a 'negative' to a second circuit. In order to send a positive or a negative current, one needs a double Morse key. In the pictures below you see two bipolar Morse keys. Depending on whether one pushes the left or right 'pedal' one sends a positive or negative current ('reversal' of the battery).

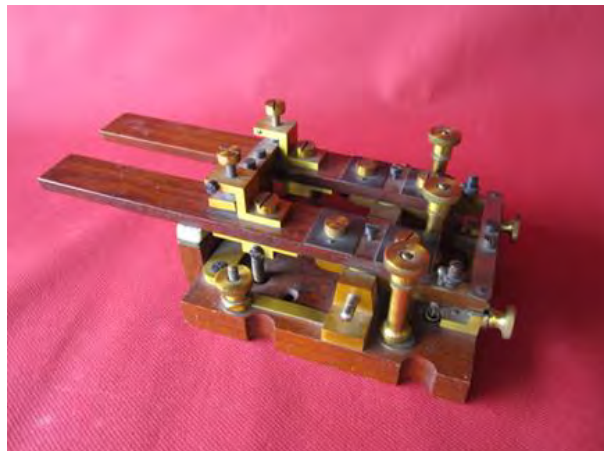
On the receiver side, the typical operation of a 'polarized' relay causes the current to be diverted to the left or right bell. The chime system contains a strong electromagnet that drives a clapper that knocks with force on a metal plate. Choosing a different type of metal on each side results in a strong 'cling' or 'clang' sound.

As you can see, the receiver is also equipped with a galvanometer to monitor the current on the line. As such, it also functions as a simple needle telegraph.

Double Plate Sounder

The double plate sounder is an updated version of the Bright's Bells, primarily due to the more modern technology for the polarized relay (it separates the positive currents from the negative ones) and a different over-all construction. It was built into a parabolic sound box to amplify and direct the sounds. This is clearly visible in the picture below. The chimes have largely kept their original shape. The galvanometer was no longer built in but was located on the worktable.

The model at left, below, is the model of Highton (of about 1850); the ancestor of the 'double tapper'. The one on the right is the later 'classic' model:



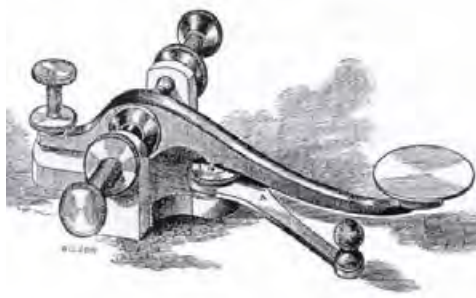
Left the 'Bright's Bells' and right the 'Double Plate Sounder' with their double tapper key:



3. 'Camelbacks'

From 1848 the 'camelback' keys appeared for the first time in America. The lever had somewhat the typical shape of a camel hump. They are graceful keys and still very much sought after. See below the engraving of a very old American model.

My understanding is that the earliest concept required no spring, and the hump's centre of gravity caused the lever to come up from itself. (KvdS)



Later American models were not so elegant as demonstrated by my small Tillotson model of a later date (1880-1890?). (Acquired from the late Tim Patton.)

Nice to see the replacement 'safety pin' spring. (KvdS)



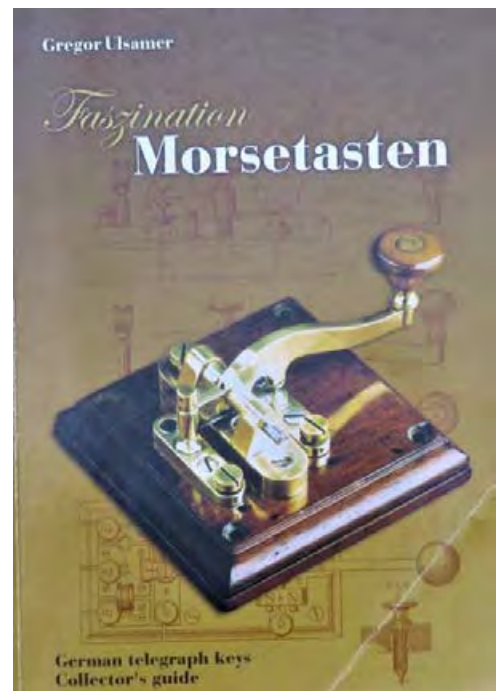
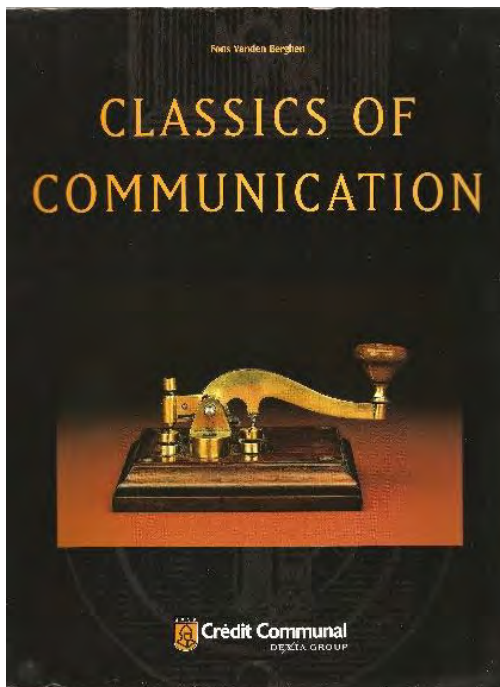
Later on, the typical European models appeared.

Note the hump forward of the fulcrum, which also necessitates the position of the lever to be moved back in the upward ('break' or rest) position by means of a spring. The spring here is a blade-spring. (KvdS)

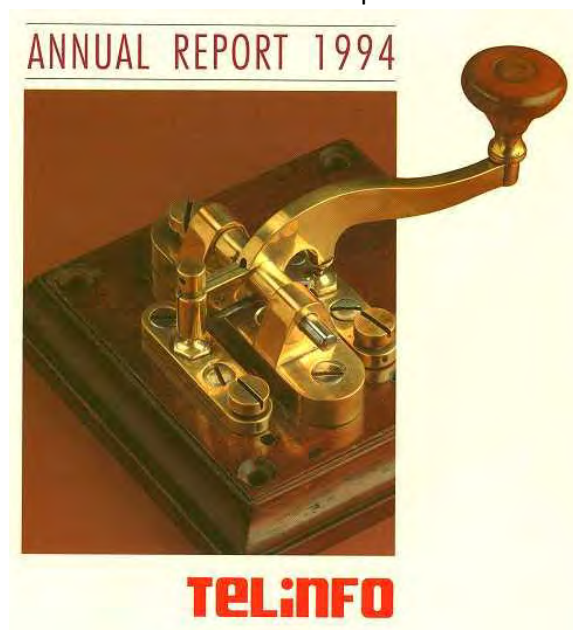


I saw this model in a dustbin in a museum and could take it with me. It was thrown away by the curator because the knob was missing! I put an alternate knob on it (not an original one).

I have chosen this model as the 'emblem' on the cover of my first book: 'Classics of Communication' (1999). And my friend, Greg Ulsamer, used my model to illustrate the cover of his first book:



The telecom holding 'TELINFO' put it on the cover of their Annual Report 1994:



Also, in those days one could ask the Belgian Post Office to make an official stamp with a chosen photo:



More of those:



The less curved, more common, models of the following pictures are typical for Austria, Hungary, the Czech Republic and neighbouring countries and have lasted a very long time.



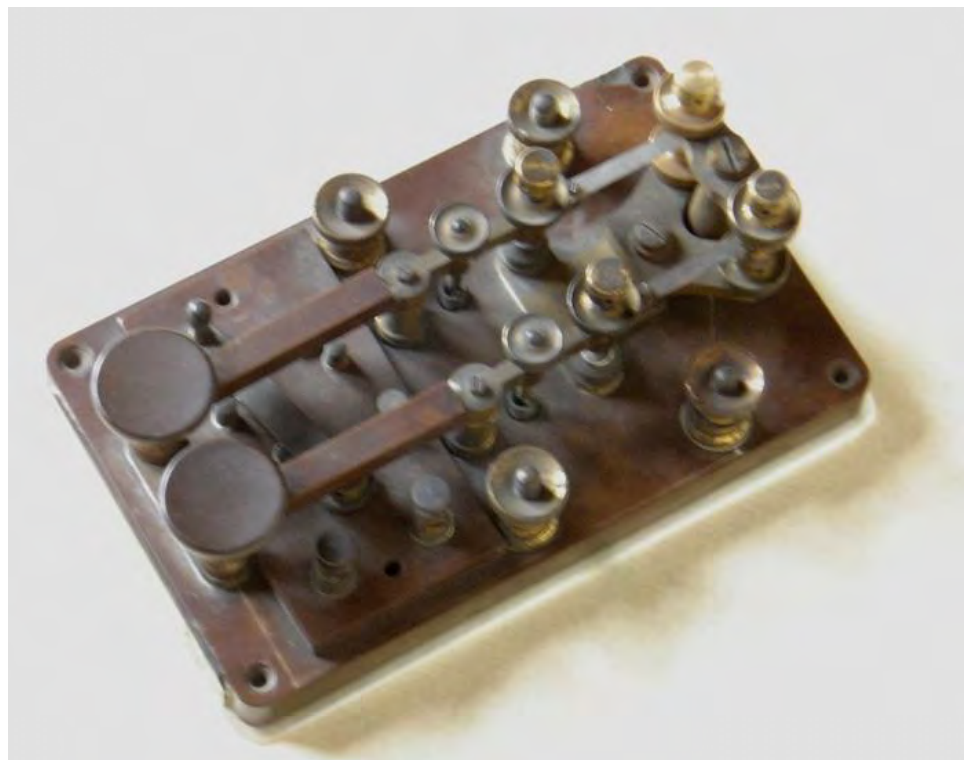
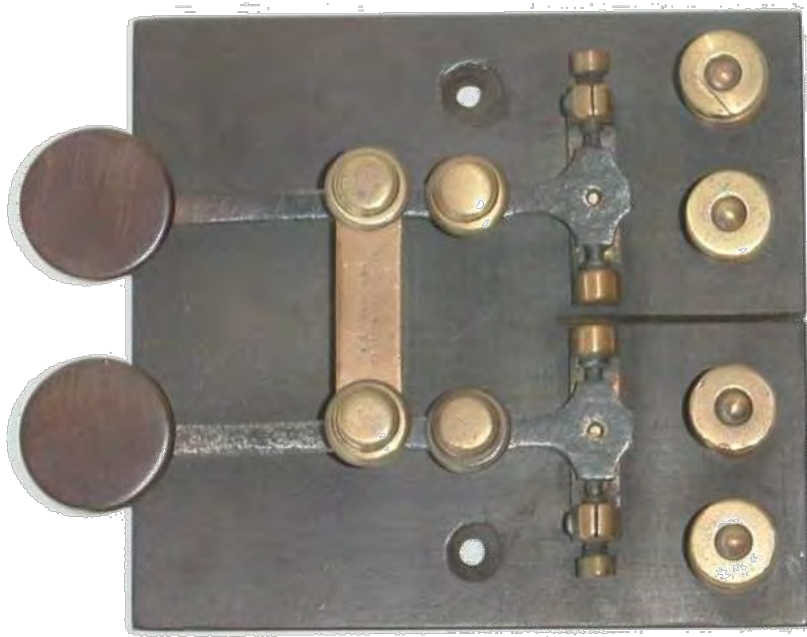
4. Dual lever keys ('reverse polarity keys')

Those double lever keys were used on submarine cables. With the key on the left one sends a positive voltage (Morse dot) and with the key on the right one sends a negative voltage (Morse dash). That action is the same as with the double tapper key that we have seen above.

A short refresh: the use of this reverse polarity reduces to some extent the negative effect of the large capacity of a submarine cable and therefore the distortion of the signal.

Not all of them are 'real' Morse keys. Some of them (typical for the Sullivan ones) were only used in laboratories in measurement setups.

The model directly below was made by Bunnell (USA):





Ducretet



Silvertown



Sullivan



Muirhead



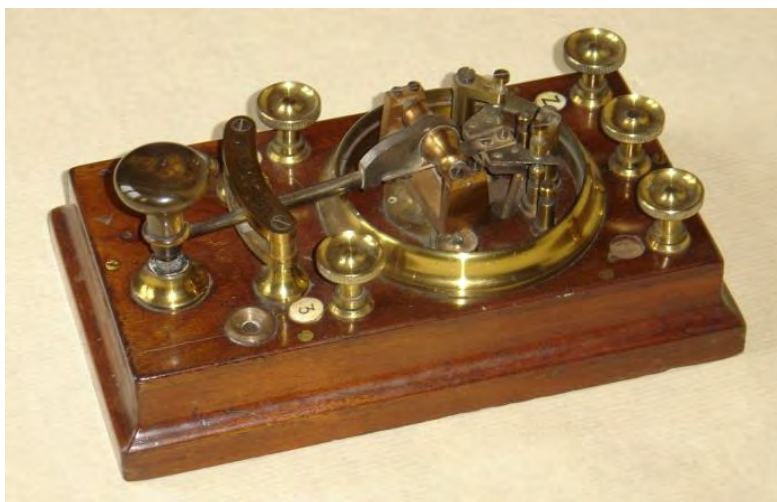
Sullivan

5. Two remarkable ones.

1. This one is a very old and rare one. It is the 'Varley wheel key' (patent from 1854). At front left there is a changeover switch 'send/receive'. Back in 2000 Dennis GOACHER (see also below) made a set of 29 fine 'industrial' detail drawings of its parts:

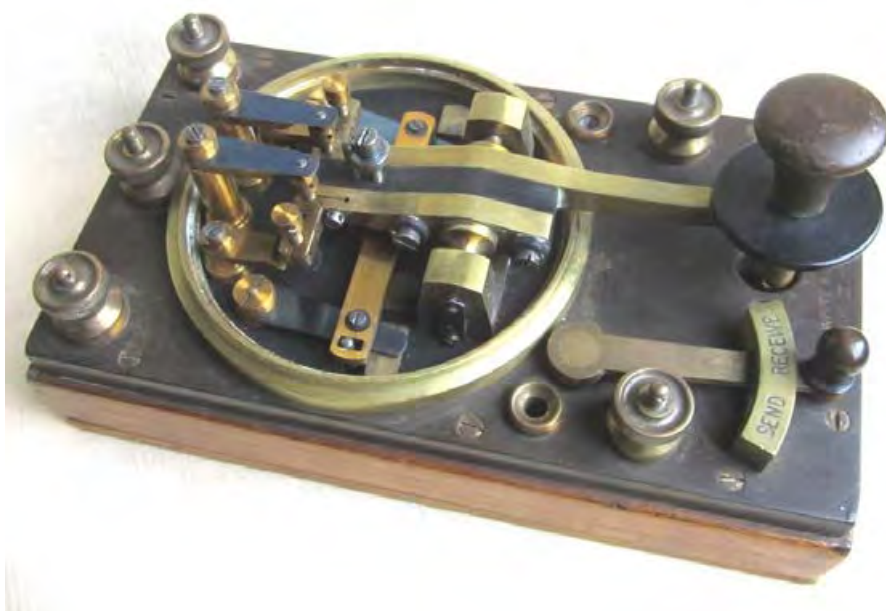


2. An 'A. Stroh' London. Double Current Telegraph Key – patent 1868. The lever can be moved to the left or right, and therefore switches from the 'receive' into the 'send' position. It is certainly very old and rare.



6. 'Big' (G)PO keys.

These keys, valued by collectors, are the typical English (General) Post Office keys that in most cases have a round brass and glass or brass only protection above the contact mechanism. When I first saw such one, I fell in love, and searched for more. I was willing to swap my oldest and very rare radio tube, an 'Idzerda' (Dutch people will know this one) to get my first one, the model here below. That is the most common model:



But there are quite a few (much rarer) variants for use in special applications such as multiplex systems. They have special names like 'double current key', 'increment key' and 'reversing key' (these were used in 'quadruplex' systems).

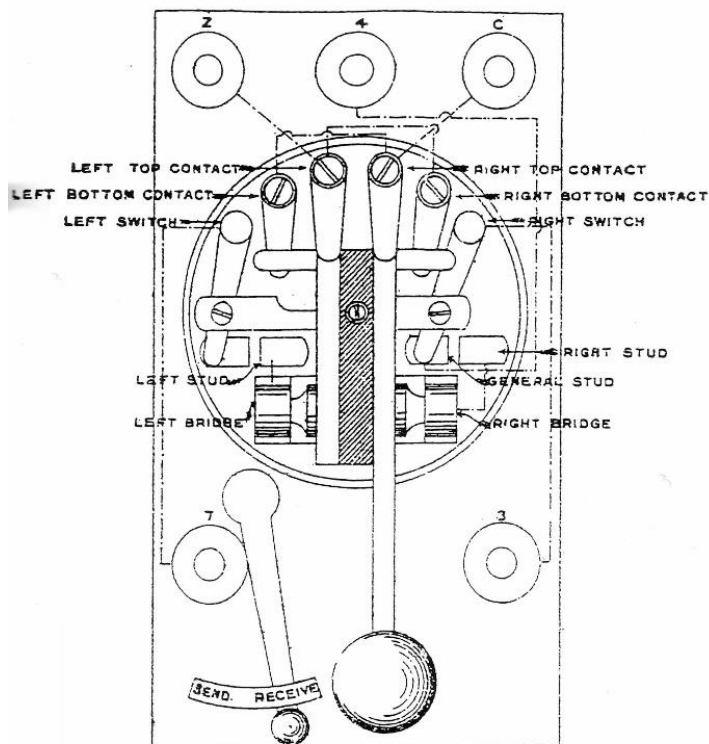
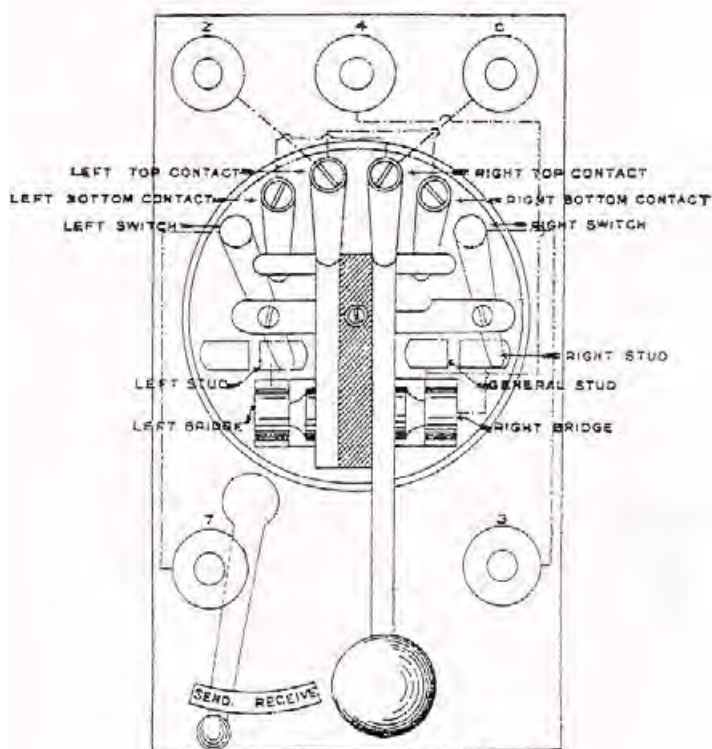
Below you see see my (rather unique?) subset with those variants:



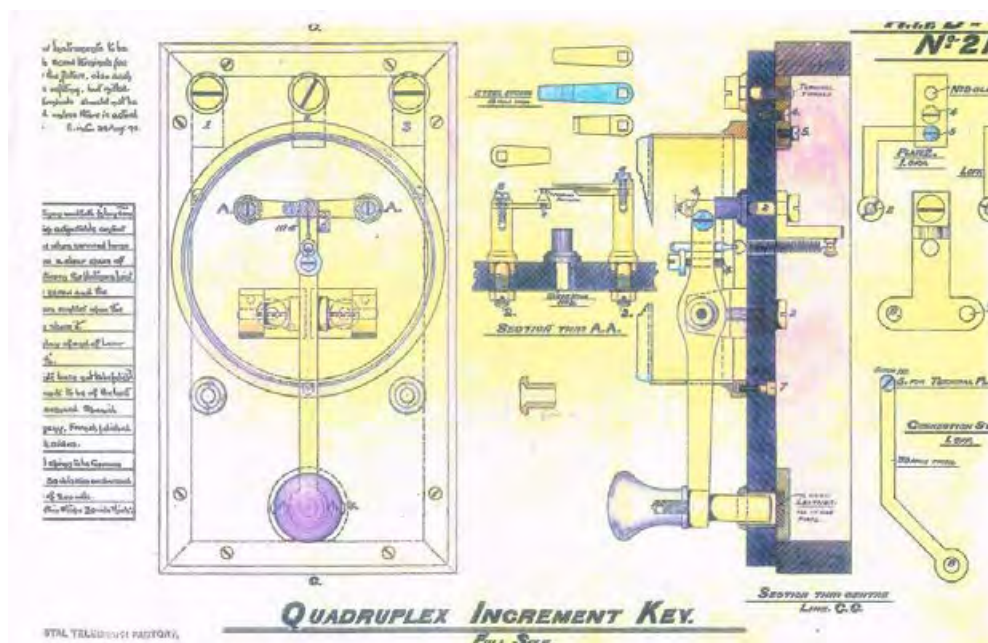
Here a better view with at left an 'increment' one, and at right a 'reversing' one:



The drawings below and on the next page come from the very informative monograph by Dennis J. GOACHER (G3LLZ) 'A history of the GPO Mark 1, 2 and 3 Morse Telegraph Keys' of April 1999. First the classic 'double current key' (left: in the send position, right in the receive position).



And here a drawing of the quadruplex increment key



This picture, and yes, I am ashamed, proves that I spent more attention to my registers than to my Morse keys....:



7. Keys from Breguet

The company Breguet is first and foremost known for its dial telegraphs. Later, they also brought several Morse telegraphs on the market, and (thus) also Morse keys and other telegraph equipment. Since I had quite a few Breguet devices in my collection, I also actively searched for their telegraph keys.

The first one shown below is special in that, in addition to the 'regular' Morse key, a smaller key is also present. I assume that it rang a bell in the nearby room where the 'telegraph boys' were located. This way they could be notified immediately when a telegram had to be delivered:



☐ Much more about Breguet can be found in my third book 'GREAT TELEGRAPH INVENTORS'

8. Keys from various countries.

The one here below is a typically classic French key.

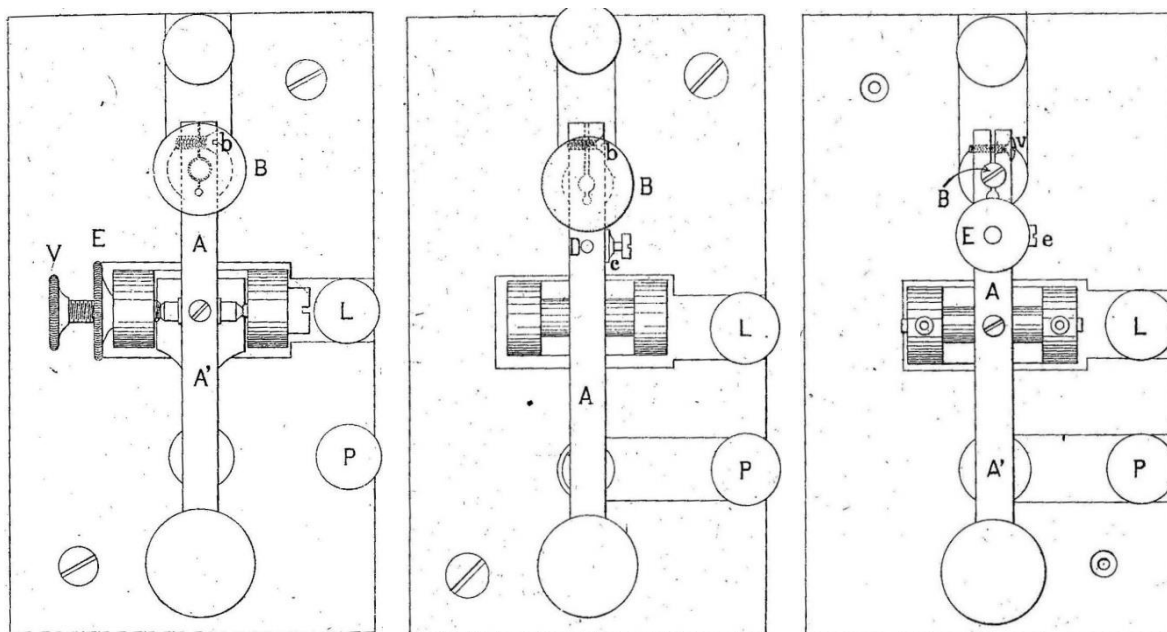


Below two Ducretet (Paris) keys, their special characteristics being the style of the wooden base and the terminals (binding posts):



This Ducretet key is significant because it was used in early aviation wireless telegraphy (which explains the drilled holes in order to reduce weight). It had to switch quite high currents and therefore had, besides large contacts, also a small barrel filled with oil. This was where the electrical connection was made and the oil dampened the sparks, thereby preventing damage to the contacts. The large finger skirt (of which it is said that it contains dried ox blood) served to protect the operator from the high currents.

Top view of the three typical **French** P&T (Poste & Télégraphe) keys (From: 'Instructions Appareils Télégraphiques' P&T 1920):



Old model

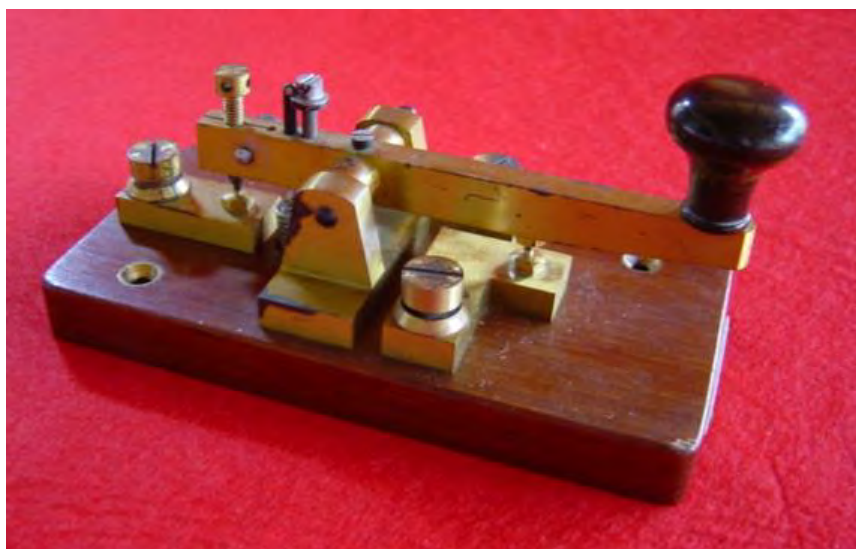
Model 1907

Model 1913

I had eight different French models:



The picture below shows a typically classic model from **England** (by Walters Electric):



Below a model with a slide switch for send – receive:

Key DC/163/16 by Signalling Equipment Limited (S.E.L.), c 1945. Standard GPO knob. (KvdS)





This **English** key has a changeover switch 'send - receive':

A typical **Swiss / Italian** key:



And this one comes from Australia:



This model was designed by the Siemens Brothers Werner, William and Carl in London before 1880. The Siemens keys made by them before 1880 carry the inscription Siemens Brothers & Co. Keys made by them after 1880 are inscribed with: Siemens Bros. & Co. Ltd. When Australia ceased to be a British colony in 1901 (in Australia known as 'Federation'), both these Siemens keys were used by the Australian Post Office. After Federation, when the Post-Master General (PMG) was formed, the Post Office used PMG-made brass-wooden Morse keys which were direct copies of these Siemens Morse keys, and which continued to inspire the later PMG keys when Bakelite replaced the wooden base. (Kvds).

Morse keys from **Germany**:



The one below is from 1885:



Guido Roels recently told me that the two models here below, left and right (the one with the wrong knob), date from the 1930s, maybe even somewhat earlier. He added that they are precursors of the next model, a WW2 type with the eagle and swastika, which is definitely a German model ;o)



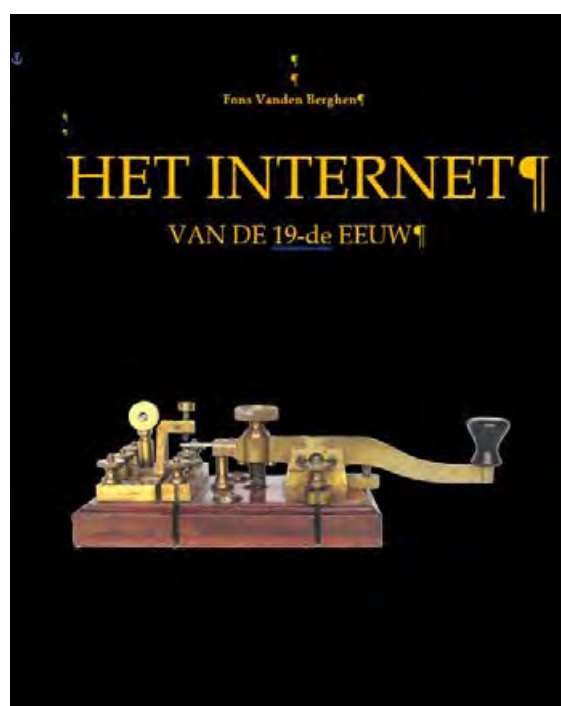
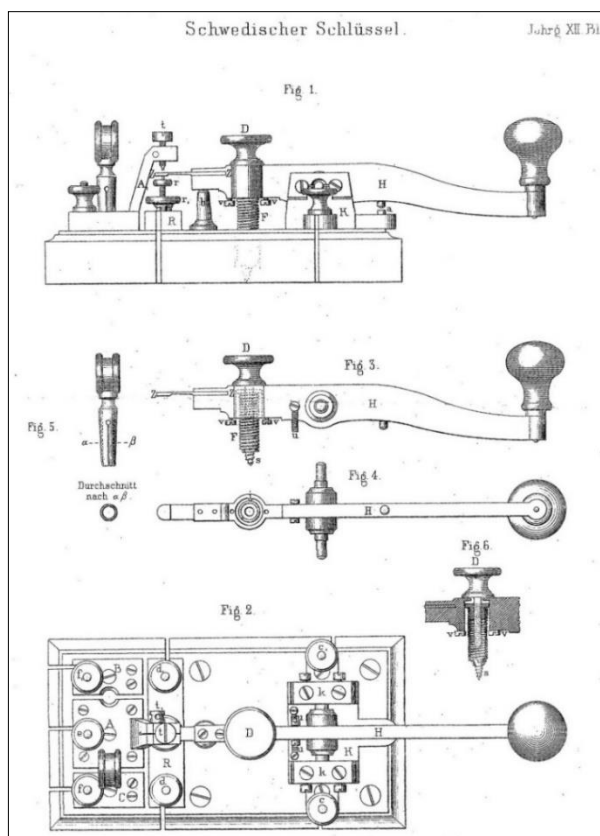
And this one was the 'master key' in the training of telegraph operators in **Switzerland**:



Now we are moving to Scandinavia. In **Sweden** it was Anton Öller who started the manufacturing of the typical keys that you see below. Before starting his own company in 1876, Lars Magnus Ericsson was a trainee in Öller's company.

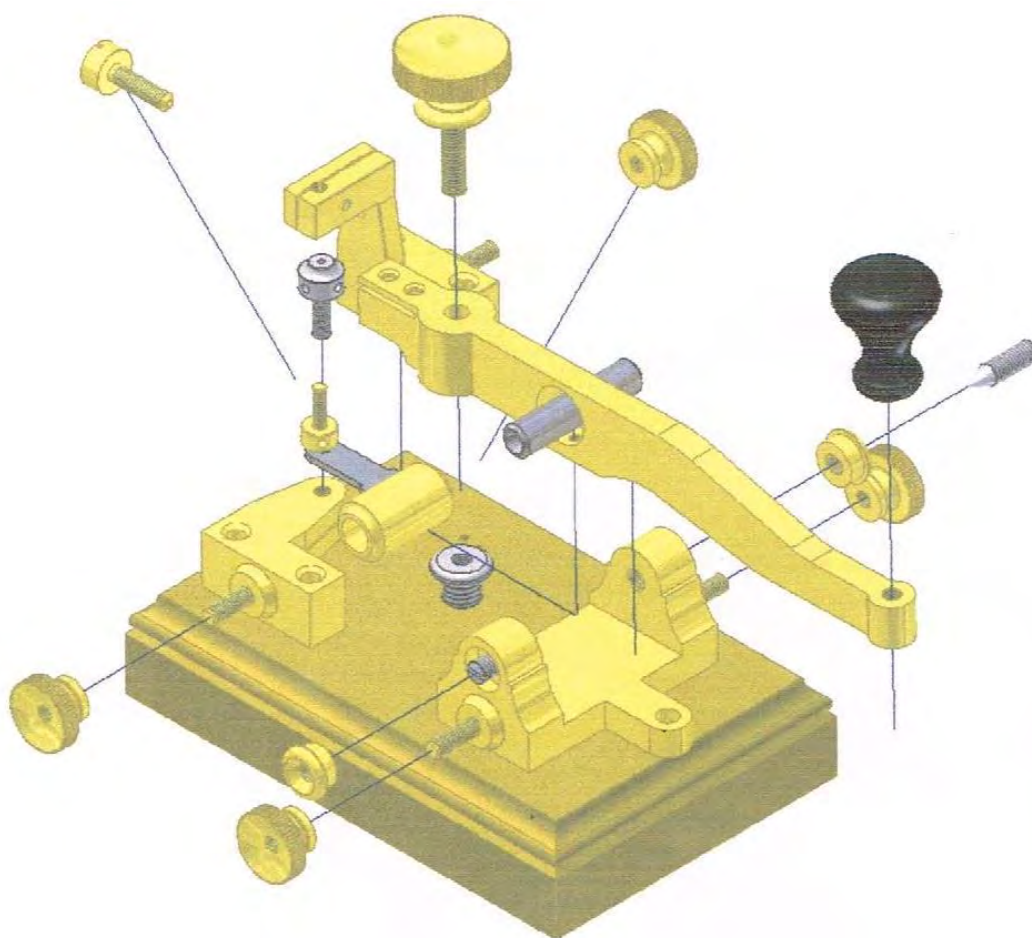


Because of the engraving (below) published in 1865 in the 'Zeitschrift des Deutsch-Österreichischen Telegraphen Verein', I can state that this Öller key is from before 1865. Later on, it was brought out by Ericsson as the TA660.



I have chosen this key as the 'emblem' on the cover of my second book 'Het Internet van de 19de Eeuw' (In Dutch, 434 pages, about 650 images).

The following ones are from Ericsson. The first one is 'No.810' in the Ericsson catalogue of 1897, labelled TA610 in the catalogue of 1914. The second then (next page) is the a TA620:





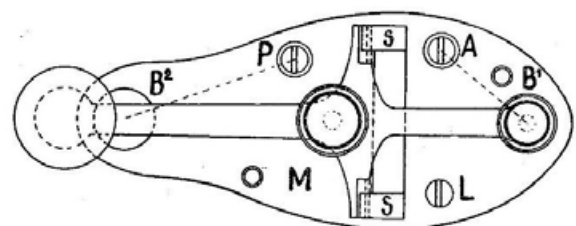
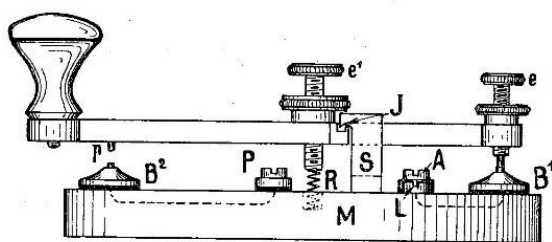
The one below is a Lennart Pettersson, also from **Sweden** (Hoverberg):



➤ Much more about Ericsson can be found in my third book 'GREAT TELEGRAPH INVENTORS'

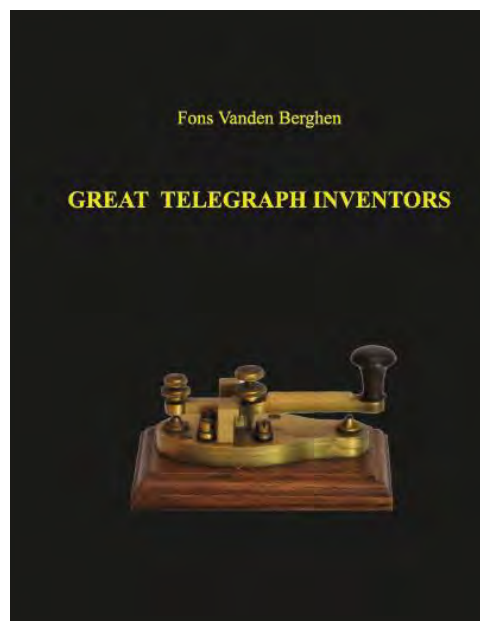
9. The 'Belgian' Victor key

It was the L.G. Tillotson Company who in 1882 came up with a new principle for the hinge. Instead of the lever rotating around an axis, a hinged 'knife' system was used. This became known as the 'Victor key'. The typical **Belgian** pear-shaped keys (pictures below), which were used here well into the 20th century, are based on this principle. Manufacturers were, amongst others, Richez in Brussels and Gérard in Liège.



In 'Addendum' I have reproduced an article as a tribute to the late Roger Reinke (Alexandria, VA, USA), who became a good friend of mine. In August 1996, he published an interesting article about the 'American' Victor key in the Antique Wireless Association's 'Old Timer's Bulletin'.

- I have chosen this key as the 'emblem' on the cover of my third book: 'GREAT TELEGRAPH INVENTORS' (365 pages)
- For more details on this key, I refer you to my article 'ABOUT THE -BELGIAN- VICTOR KEY'



The only other **Belgian**-made Morse key that I know of is this one from 'La Compagnie Belge des Téléphones Société Anonyme' (the Belgian Company of Telephones Ltd.) in Brussels:



10. Now some keys of which I do not know their origin

This first one would, according to friend Guido ROELS, formerly have been used by radio repairers of the Brussels company SAIT. When they went on board in the marconist room they could slide their own key, this one, which they were sure worked perfectly, onto the table top (the bottom plate in the picture is spring loaded).

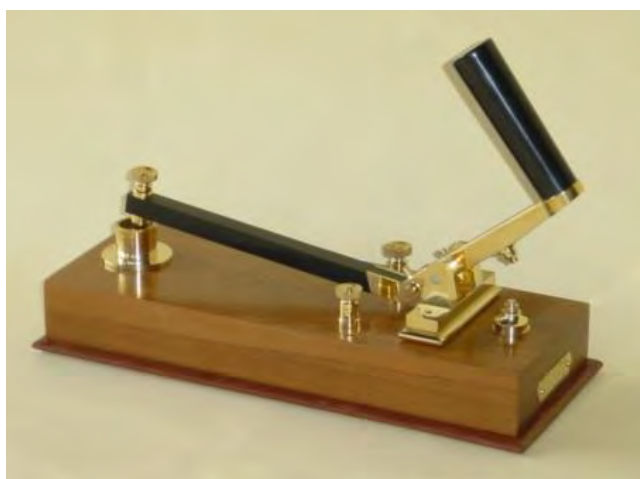


11. Marconi

This is a Marconi PS213A, used by British coastal radio stations. As there are no markings on the base, it is likely the export model. The skirt below the knob looks a replacement: too small and too thick. Former professional operators still think this is one of the best, if not the very best, straight key. Its design is based on the Swedish long lever keys with the rear upper contact. Expensive and very hard to find! (KvdS)



Here are two of Marconi's most famous keys from his early period (around 1900): the 'Grasshopper' and the 'Guillotine'. These Morse keys are faithful replicas; the original ones are, if not untraceable, then priceless. Thanks to Master craftsman Phil BOYLE!



Much more about Marconi can be found in my third book 'GREAT TELEGRAPH INVENTORS'

12. Some toy keys



The difference between a toy key and a training key for professional use may be difficult to establish, apart from size and robustness. Maybe the first 4 are too small for proper training keys, but they look reasonably well made. True toys often have the Morse code printed or moulded into the base of the key, as with the last two images. (KvdS)

Left a wooden demo one, and right a professional execution of a toy version:



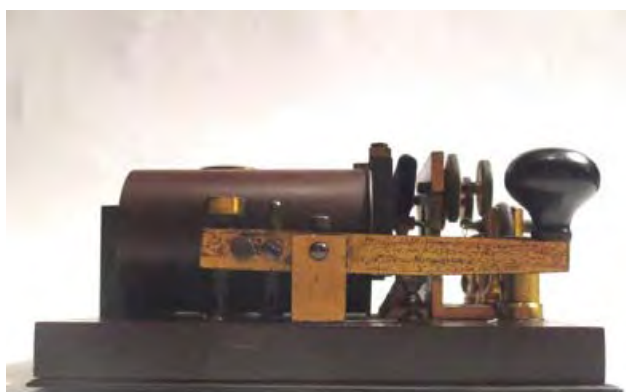
13. A very special key.

Special, as you will have already noticed. It's evidently not suitable to send Morse code, but you can at least use it to open the door of our garden house and, even better, a bottle of beer!
(Is it still with you, Christie?)



14. On KOB sets

Obviously, as KOB is the abbreviation of 'Key (and sounder) On Board' [or 'Key (and sounder) On Base'].





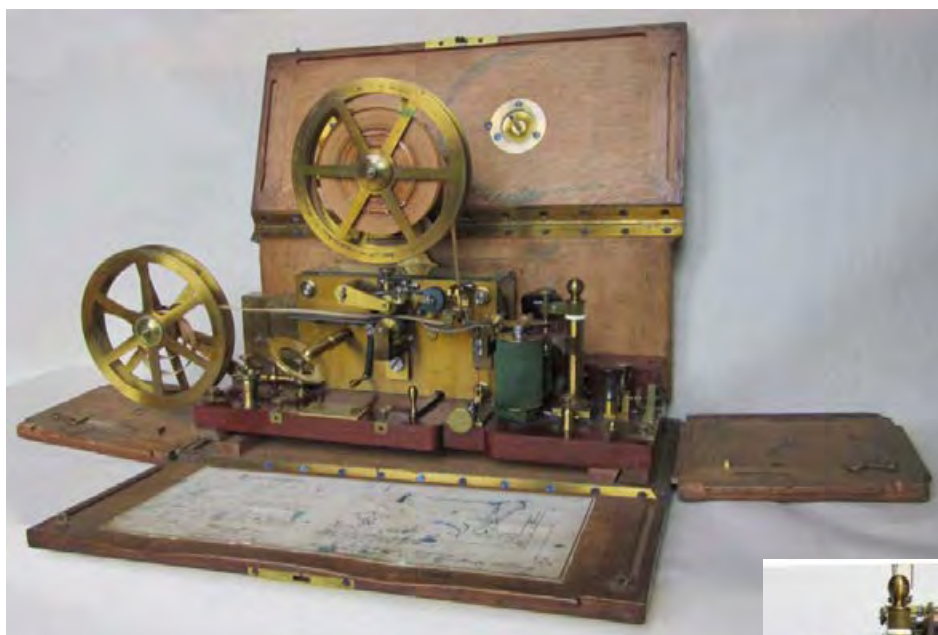
And on the 'big' key on boards, the so called (military) 'baseboards':



15. 'On board' keys

Especially here in Europe, there were quite some Morse 'stations' that were designed as portable devices and they had, of course, a key built in. Often ancillary equipment (a galvanometer, a lightning arrester, a relay, even sometimes a bell) were placed on the base. Usually, it was made to slide into a box and therefore could be more easily carried around. The biggest users were of course the military. Here are several out of the many ones that once were in my collection. Look for the Morse keys...



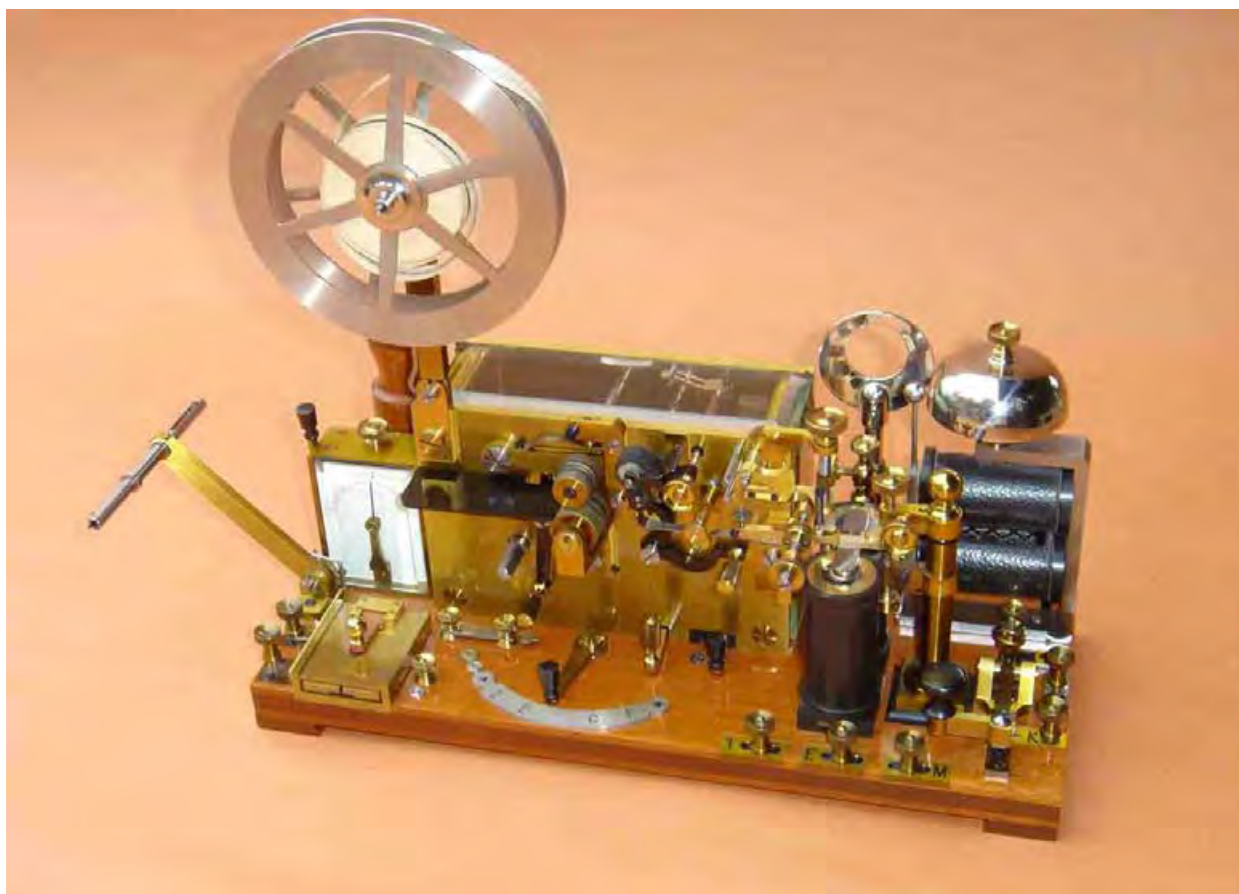


A 'foldable' key!

A French 'Télégraphe Municipale'; a transportable (very heavy) one for use in different villages:



I'm ending this chapter by showing my favourite telegraph: the portable from Ericsson... (it has it all!):



BIBLIOGRAPHY

-FASZINATION MORSETASTEN > Gregor ULSAMER - 2001 - 176 p.
 -FASZINATION MORSETASTEN -Supplement > Gregor ULSAMER - 2012 - 150 p.
 These two books describe in detail many (mainly) German keys

-MANUAL OF TELEGRAPHY AND ... (Students' Manual) > J.H. BUNNELL Cy. - 1884 - 48 p. - reprint
 -INTRODUCTION TO KEY COLLECTING > Tom FRENCH - 1990 - 64 p.
 -KEYS, KEYS, KEYS > Dave INGRAM - 1991 - 96 p.
 -BUNNELL'S LAST CATALOG > Tom FRENCH - 1991 - 32 p.
 -THE STORY OF THE KEY > Louise MOREAU - 1995 - 60 p.
 -TELEGRAPH COLLECTOR'S GUIDE > Tom PERERA - 1998 - 80 p.

These are, in chronological order, five US-oriented booklets, that give a lot of interesting information

> See also:

-A HISTORY OF THE GPO Mark 1, 2 AND 3 MORSE KEYS > Dennis GOACHER 1999 - 16 p. + drawings.
 - The TELEGRAPH COLLECTORS REFERENCE CD-ROM > Tom Perera: <http://w1tp.com/tcrd.htm>

FURTHER REFERENCES

O dear, there are so very many key collectors in this world that have great websites. Apart from those that are mentioned in the article, I do not dare to list all the others here as I will certainly forget some of them and I do not want to lose good friends...

But, to start with, you can question my friend Google. Ask him to tell you what he knows about 'telegraph key collectors' and you will be overwhelmed!

And my www.telegraphy.eu is not bad either ...; o)


THANK YOU

- And out of the many (key) collector-friends I have, in order not to forget to mention some of my very many friendly colleagues, I have only chosen those that are already mentioned in the article: Phil BOYLE, Roger REINKE (+), Dennis GOACHER, John CASALE, Guido ROELS and Greg ULSAMER.
- And I would also like to mention the driving forces of the key collector's 'closed user groups' on the Internet of which I am tolerated as a member: the late Tim PATTON, now Doug PALMER for 'Telegraphkeys' (ex 'Keyfolks'), and first Lynn BURLINGAME then Tom PERERA for 'Morsecode'.
- Here a picture of a typical passionate key collector with part of his collection: my good friend Kees van der Spek, former National Service radio operator in the Signal Corps of the Dutch Army and now living in Australia. Kees has been kind enough to correct my 'Flemish English' and to add valuable comments in several places (see *KvdS*) [See also page 1]




➤ See next pages for the ADDENDUM by Roger REINKE (+)

ADDENDUM



KEY & TELEGRAPH

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 Please include SASE for reply.



SIMPLICITY IS STRENGTH! COMPLEXITY IS FATAL!

Reading about pivots on telegraph instruments may cause acute apathy, but it is in fact rather interesting what can happen when levers must be made to move freely in a fixed plane. Regardless of the year of manufacture or the maker, the manner of pivoting a lever on a telegraph instrument is remarkably consistent, whether it be a key or sounder lever, or a relay armature.

Pivoting levers are usually held in place by pointed trunnions, which fit into screws that are machined to accept the points of the trunnions. (On a few early instruments, the screw is pointed and the trunnion is recessed.) The trunnion screws may be adjusted to provide the right "play," which is an important element of efficient keying, of course, and in the case of sounders and relays, the play can affect the proper functioning of the instrument.

Mechanically, this pivoting arrangement made sense to the early makers, since the components were produced inexpensively and offered the ability to easily adjust the play. Electrically, the design left something to be desired. In the case of keys, or any other instrument that depends on the pivots to complete an electrical connection to one side of the line, if the trunnions' adjusting screws are loose, circuit continuity could be adversely affected. An additional electrical problem could be caused by the oxidation of the trunnions (usually iron or steel) in contact with a brass adjusting screw. Makers of many radio keys

avoided this problem by securing a flexible wire or strap between the key lever and the base.

"Simplicity is strength! ... " is from the title of an E. S. Greeley & Co. advertisement of the 1890s which extolled the merits of "simple" pivots for instruments, and particularly the knife edged pivot used on "Victor" keys. The Greeley ad condemned conventional pivots. "It is a principle of mechanics that is universally admitted that an adjustable feature ... where adjustability is not absolutely required, is a weakness, and it has been our opinion ... that adjustable trunnions in telegraphic apparatus is (sic) a serious fault. ... There is one fixed central position that is desirable in the axis of a telegraph key, relay, sounder and kindred instruments, and when that fixed center is departed from, an injury commensurate with the degree of deviation is inflicted. Wabbling levers, chewed off contacts, choked transmission and general 'drunkenness' of action are the inevitable results of badly made and 'worked loose' adjustments."

The company went on to claim that the "the hurried and worried instrument maker of the pioneer period" used trunnions by accident. Finally, after roundly faulting others for their lack of attention to mechanics, the ad urges the reader to "Become acquainted ... with the merits of Victor Telegraph Instruments, and you will soon have occasion to smile at your affection for the clumsy 'old timers.' The world moves! Move with it." Alas, the world was largely unmoved, for very few instruments of the

Continued on page 38

15"; base diameters ranged from 7 7/8" to 8 7/8".

Neck Texture: most respondents reported the neck texture as rough and brown or dark brown. One respondent described the color as black while another used the term light brown.

Base Shape: Four respondents noted a convex contour shape while five reported a concave shape.

Misc.: One respondent showed a photo of a bell unscrewed from the neck. I recommend that collec-

tors not try to unscrew their bells, or at least refrain from applying too much torque.

The following people participated in the survey: R. Foster, V. Baker, J. V. Terrey, J. Kreuzer, D. Crocker, Sam Seldon, Greg Michaels, Jim Cross and myself. After the survey results were published the following collectors reported information to me: J. Horvat, A. Douglas, C. Watson, and two horn owners who supplied no data. All data provided in the late reports fell within the parameters reported above.

— KEY & TELEGRAPH

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Victor family turn up these days. It took this writer about 25 years to find a Victor sounder, for example. With it was a nickel plated Victor key, a style about as rare as the sounder. None of the commercial telegraph companies or the railroads seemed to have used Victor instruments in any significant number, with the possible exception of the key. Greeley simultaneously and without apology offered a complete line of instruments equipped with conventional trunnions, so one wonders how serious Greeley & Co. really was about the merits of the Victor pivots.

The Victor key, made in both legged and legless styles, was popular with some operators for good reason, advertising hyperbole notwithstanding. The knife edge pivot does offer a different but comfortable feel which led to its use in speed contests, and its users were apparently winners a good share of the time. The key was the only Victor instrument that employed the knife edge pivot. All the others — pony relays, regular relays, sounders, polar relays, polechangers — used a pin and socket (or a groove on one side) type of pivot, as shown in the photos. This pivoting arrangement differs from a conventional pivot only in that the pin is fixed, rather than adjustable, and that the axis is vertical rather than horizontal. The first Victor keys, made by L. G. Tillotson based on the patent of E. M. Hamilton granted on Dec. 26, 1882, did have a design problem that was not noted in the Greeley ad. The knife edge

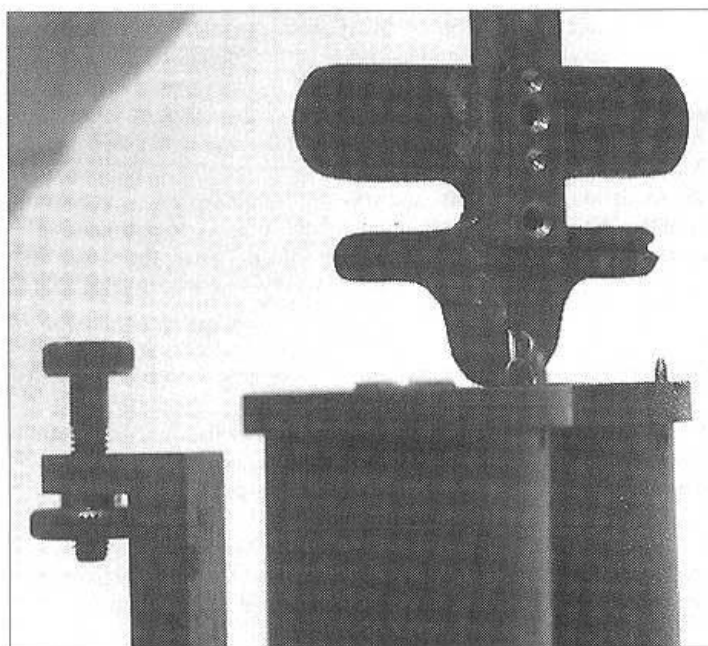
pivot could slip slightly to either side so that the contact points were out of alignment. This was remedied in later production by the addition of a small steel pin in one side of the pivot between the lever and its support¹.

The popularity of the Victor key appears to have given rise to at least one interesting "copycat." Austrian or Belgian or Dutch makers, perhaps all of them, offered the key pictured in the drawing². Apart from the open circuit wiring and the knob, it is remarkably similar to the Victor, especially the knife edge pivot. Patent information for the key was not available. The popularity of this key in European circles seems to parallel U. S. experience in that few have survived. Perhaps Tillotson or his successor Greeley licensed the design, but that awaits discovery. Beyond the makers noted, Jesse H. Bunnell was the only other American maker known by the writer to incorporate the knife edge pivot, in one cable key and in his very limited production of the regular Victor key.

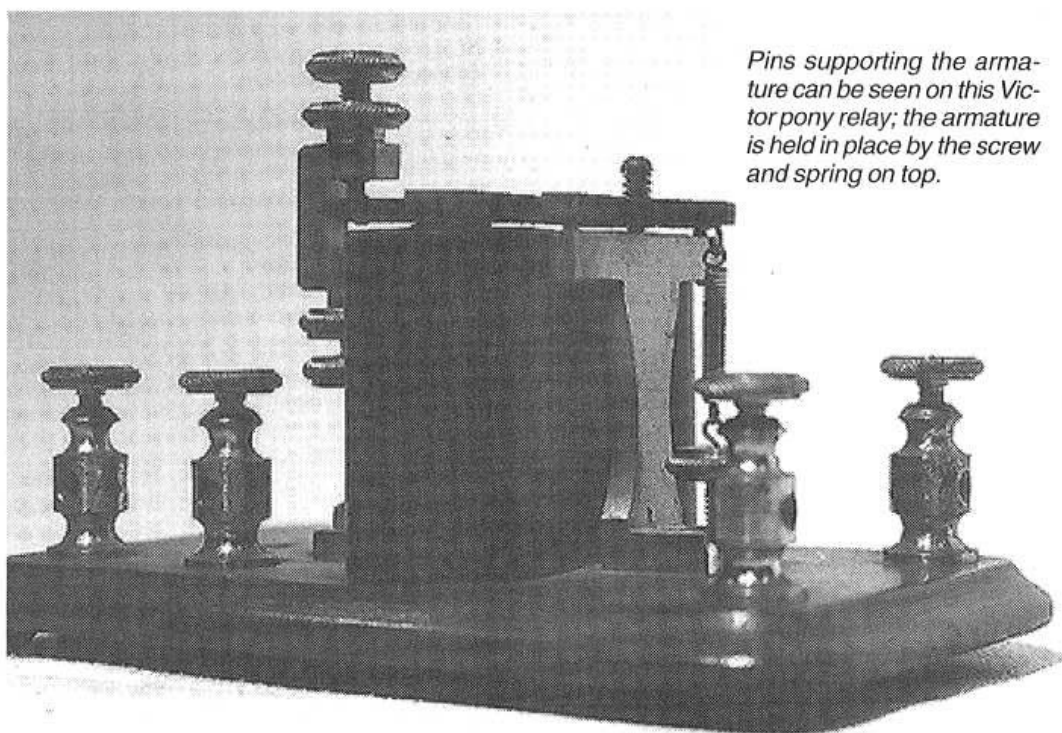
NOTES

¹ Interestingly, Hamilton's patent specification noted that lateral shifting could be prevented by inserting a pin, but apparently a number of keys were made initially without them.

² Thanks to Fons Vanden Berghen of Belgium for the copy of the drawing. It is assumed that European makers were inspired by Hamilton, but Hamilton could have copied the European key. Until dates can be determined, we're inclined to be nationalistic.

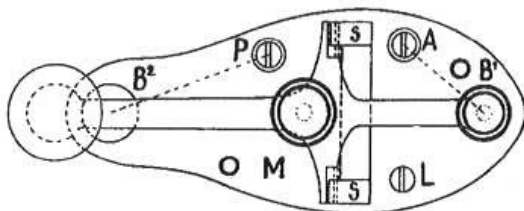
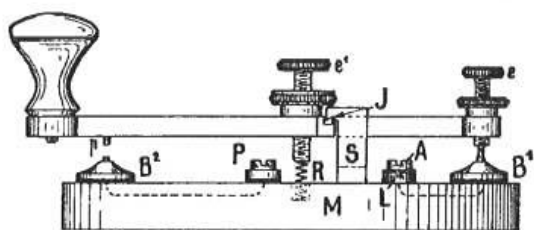
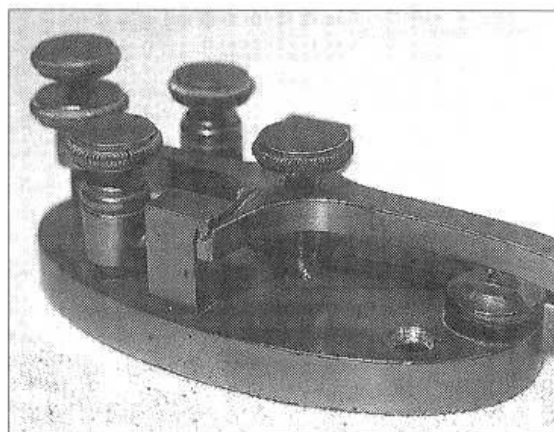


Pins inserted through the top cover of the coils provide a pivot for the Victor sounder. Note the groove on the far side of the armature piece; the near side has a socket for the pin.



Pins supporting the armature can be seen on this Victor pony relay; the armature is held in place by the screw and spring on top.

The Victor key's knife edge pivot, which is held in place by the compressed spring near the axis of the lever.



The European version of a Victor key. From the Belgian R.T.T., Elementary Lessons: Part 3, Telegraphy, 1931.