

UNUSUAL MILITARY MORSE KEYS

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SUMMARY

Described in this paper is a fascinating selection of unusual and "concealed" Morse keys used for military and semi-military signalling, with emphasis on British and Continental armed forces. Much effort has been taken, not just to depict a key by itself, but to describe briefly the type and function of the signalling instrument with which the key was used. It is apparent that a standardized key of a particular pattern was often used in a number of different sets or instruments.

In World Wars I and II, on both sides of the line, very similar signalling systems were devised, but the general layout of the instrument and shape of the Morse key differed considerably.

A classification of design and variations of the British standard "KEY W.T. 8 AMP" is given, including a number of applications in which this key was used.

Changes in the Warsaw Pact countries' policies have lifted the barriers on information on military communication equipment. The USSR and its then-satellite (Warsaw Pact) countries designed military Morse keys; their applications are included in this selection of keys.

INTRODUCTION

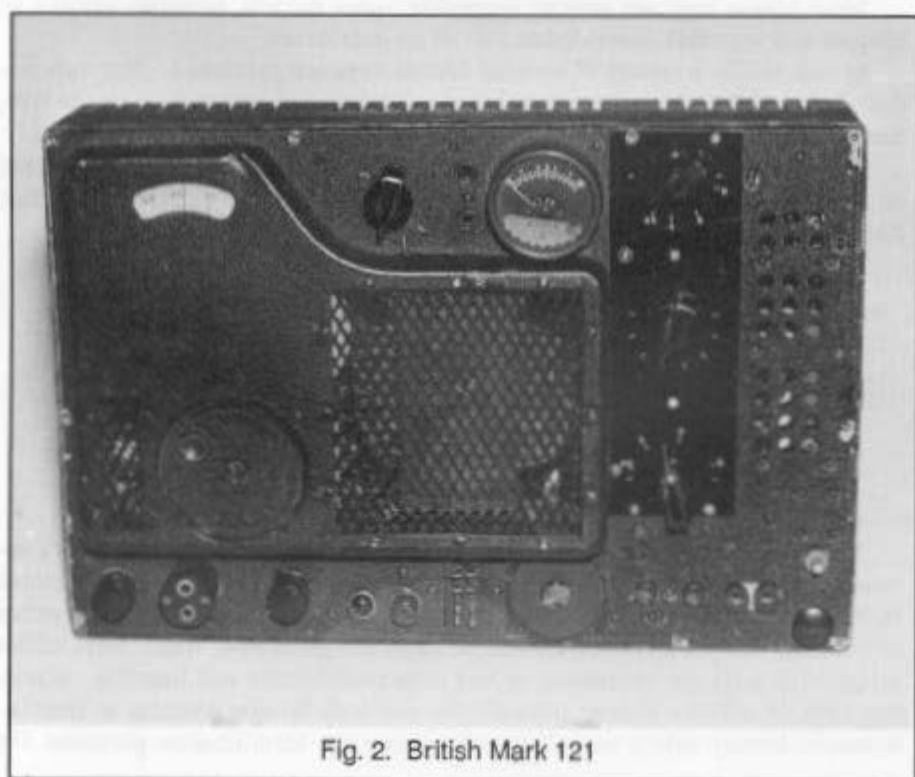
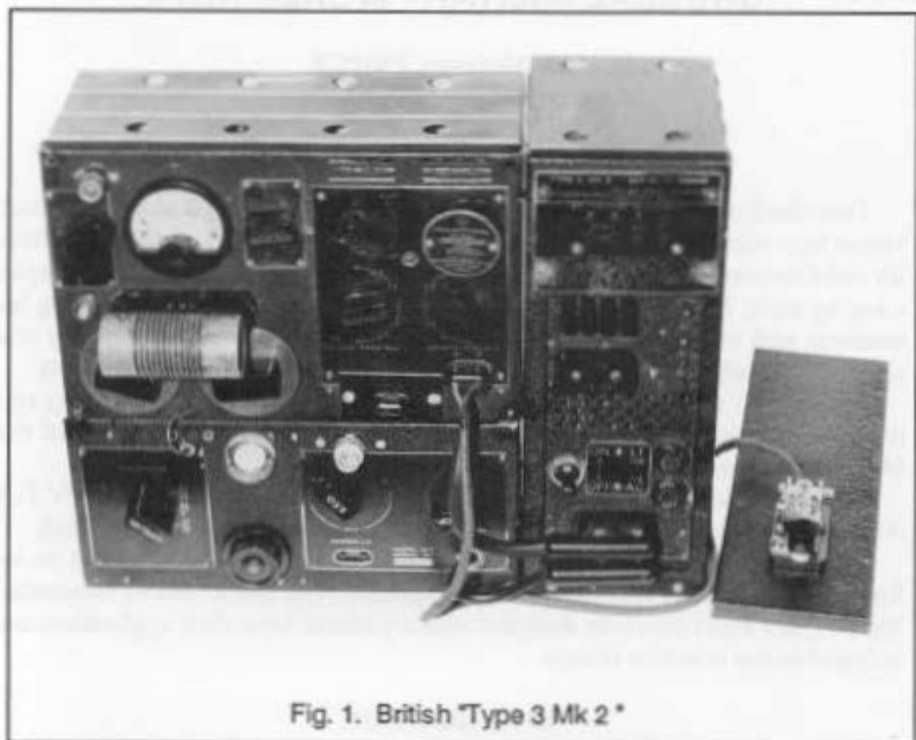
Most Morse keys are easy to recognize; some models, however, are not so obvious and are often concealed as part of an instrument.

In this article a variety of unusual Morse keys are presented. Not only is a description of the Morse key given, but also background information on the type, function, and operational use of the instrument in which the key was mounted.

The Morse keys in this paper are classified by the function of the instrument or its epoch, as shown below, rather than by the model or pattern of the key. The exception is the KEY W.T. 8 AMP, which receives special attention.

- Clandestine ("suitcase") Radio Communication
- Beacons and Homing Systems
- Remote-Control Units
- Visual Signalling
- World War I Radio
- Wireline Equipment
- Miscellaneous and Warsaw Pact Radio
- Training Keys
- The KEY W.T. 8 AMP

Morse keys used with suitcase radio equipment for clandestine (agents') operations were usually of the miniature type. However, they were often mounted in the set to reduce the number of external accessories. Additionally, a number of conventionally styled military Morse keys are presented, which were either mounted in a special instrument or had a unusual feature and function. Signalling keys on Air-Sea Rescue transmitters and such homing systems as Eureka-Rebecca, having only a secondary role of use for identification purposes like



sending a few pre-arranged letters in Morse, were considered within the scope of this treatise.

Following the unification of East and West Germany, a large portion of the armed-forces radio equipment of the former German Democratic Republic has been scrapped. A small part of it has found its way to the surplus market in Western Europe, including interesting Morse keys designed in the USSR and its satellites. Only a few years back, these keys were virtually impossible to obtain. Photographs of examples and their applications, which only recently came to the attention to the author, are included.

Collecting Morse keys mentioned in this article not only would take much space, but would be a difficult task, as most of the equipment is extremely rare. However, an individual key in the reader's possession may have been mounted previously in an instrument described in this paper. Of the vast number of signal instruments and key varieties, only a representative selection was made for inclusion.

It is interesting to see how such design features as the folding key, making its first appearance in World War I, were still used well after WW II.

Included is the history of the British KEY W.T. 8 AMP, giving an account of the development and basic variations of this well known standard Morse key, including its use in a variety of "Key and Plug Assemblies." Other applications of this key are found throughout this paper.

In some cases where both photographs and drawings were available, preference was given to drawings, as they often provide a better view of the key. Unless stated otherwise, all equipment is British.

CLANDESTINE OPERATIONS

Although now virtually obsolete and replaced by satellite communication, short-wave radios, sometimes hidden in a suitcase, provided the primary means of communication between agents or isolated special forces (e. g., the Special Air Service of the British) and their bases. Except for special radiotelephone (R/T) systems such as the British S-Phone and U. S. Joan-Eleanor*), communication was in only Morse, allowing the use of simple, low-powered transmitters.

The system of pre-coded messages on tape or other means, speeding-up the transmission of a message to reduce the risk of interception, was used in only a few cases during World War II. Generally use was made of more or less conventional Morse keys. On the whole, the one thing the keys had in common was miniaturization.

Fig. 1. "Type 3 Mk 2" ("B2") was one of the most successful British suitcase sets. Developed early in WW II, it can hardly be considered as miniature. The set comprised four units: transmitter (top), receiver (bottom), power supply (right) and accessories case (only lid shown). In use, the miniature Morse key is mounted on top of the accessories lid. This model key was typical for many types of British suitcase sets of that era.

* Both operating on UHF full-duplex, usually from an aircraft at high altitude to the agent on the ground. This allowed rapid communication, usually recorded on a wire recorder in the aircraft.



Fig. 3.
British
"A Mk III "

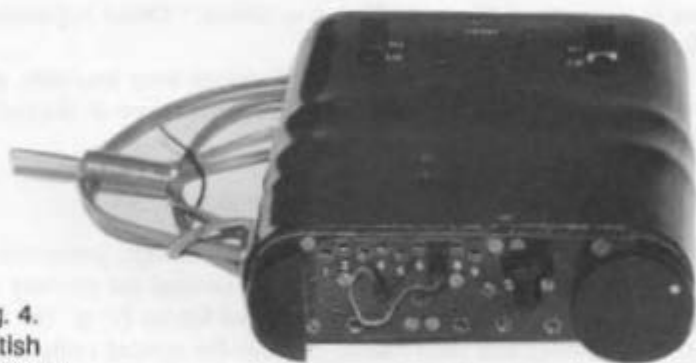


Fig. 4.
British
"Mk 51/1 "

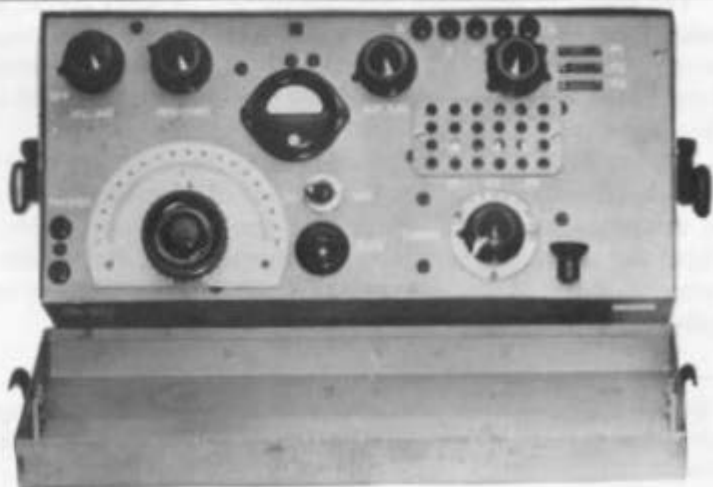


Fig. 5.
German
SE 99/10

Fig. 2. British Mark 121 (model B), developed in the 1950s. The set is powered from its internal mains power unit or, alternatively, by a hand generator or six-volt vibrator power pack. The crystal-controlled transmitter, operating from 4.3 to 9 MHz, gives 10-13 watts RF from a 2E26 power amplifier. The receiver is a three-tube superheterodyne. The internal Morse key is custom-made, its contacts mounted in a plastic block and suitable only for mounting underneath the front panel. The key does not appear very strong; the main lever of the one in the author's set was badly bent on receipt. A socket on the front panel provides for connecting an external Morse key or high-speed Morse transmitter.

Fig. 3. British "A Mk III" was a clandestine radio, primarily for communication over medium distances. The Morse key, similar to that used with the "B2," is mounted in a bakelite box with an additional protective cover over the lever. In operation the key is clipped onto a steel plate, providing a stable fixture. The case is marked S250/LB.

Fig. 4. British WW II agents' transmitter "Mk 51/1." This remarkable miniature transmitter was so small that it could be carried in the agent's pocket. It was self-contained and powered by 200-250 volt AC mains. It operated between 3 and 10.5 MHz in two bands and produced about 1-2 watt of RF from a crystal-controlled oscillator/power amplifier. The internal sub-miniature Morse key is visible to the left of the tuning control, above the crystal socket.

Fig. 5. German "Kleinst-Agentenfunkgerät SE 99/10" of WW II. This transmitter-receiver was used not only with German agents, but also with the SD (*Sicherheitsdienst*, or internal security). Note the Morse key mounted on the bottom right front.

Fig. 6. In the British Mark 122, having three frequency ranges but otherwise similar to the Mark 121 of Fig. 2, the fragile Morse key was replaced by a more robust type, fixed on top of the front panel. The key is of straightforward construction, made of pressed steel.

Fig. 7. Close-up view of the Morse key used in the German agents' set type SE 99/10 of Fig. 5.

Fig. 8. Radio Station Mk 217 had an internal key similar to that of the Mk 121. The set is divided into four units for concealment and ease of transport. Receiver (left), transmitter (center), mains power supply unit (right) and vibrator power pack (extreme right, not connected).

Fig. 9. British Radio Stations Mk 123 and A3 were developed after the war for agents and special forces. Both sets had an internal Morse key of the same pattern: a square button, mounted at the side of the transmitter-receiver. It had a fixed gap and pressure. While looking awkward to manipulate, this type of Morse key operates easily and smoothly.

Mk 123 dated from the late 1950s. It was compactly built, having three basic sub-chasses. The set operated from 2.5 to 20 MHz. The transmitter was crystal-controlled, delivering 15 to 25 watts of RF, depending on frequency. When no mains source was available, it was powered by a hand-generator or 12-volt power pack. Provision was made for connecting an external Morse key or mechanical keyer. Though tubes were used throughout, the transmitter side-tone circuit used a transistor.

Fig. 10. British postwar agents'/special forces Mk 128. This was a portable station housed in a wooden case and carried in a canvas pack. It was powered by



Fig. 6.
Key of
Mark
122

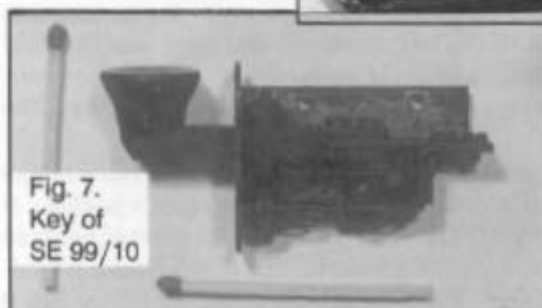


Fig. 7.
Key of
SE 99/10

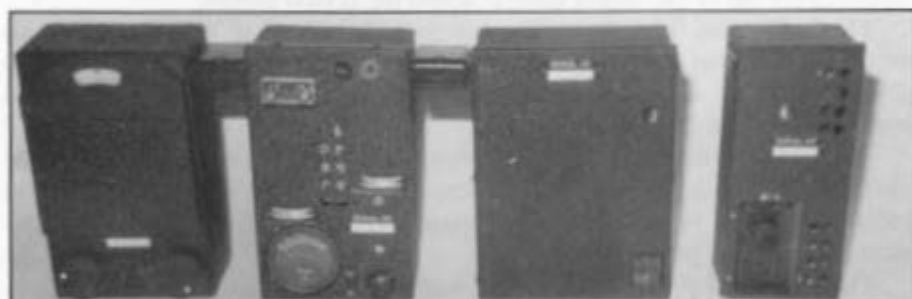


Fig. 8. British Radio Station Mark 217

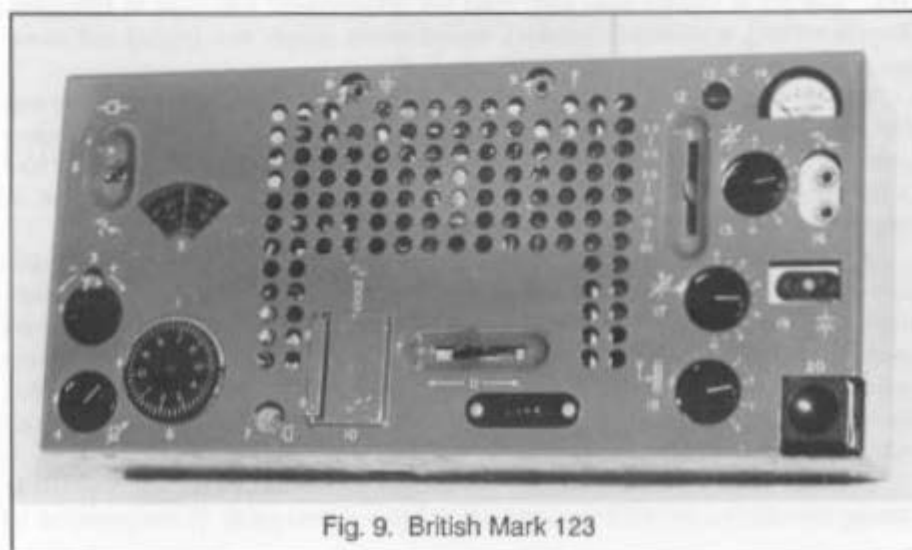


Fig. 9. British Mark 123

dry batteries. Mk 128A and Mk 128B were other versions, having a different case. The station was used in the 1960s. Top: receiver unit, center: transmitter unit, bottom: battery compartment. Other compartments held accessories to make the station self-contained. The set covered the range of 2-8 MHz in two bands. The crystal-controlled transmitter delivered approximately 1 watt RF, CW only. The Morse key was mounted on the inside of the front panel, which formed an operating table when the station was set up.

Fig. 11. Mk 128B Morse key, mounted on a plastic base. Removing the bakelite cover reveals a key of very simple construction, apparently without a space contact. The key examined by the author had no sign of the maker's identification.

Fig. 12. British Radio Station A3, developed in the early 1950s, operated from 3.5 to 17 MHz. It comprised three units. Shown in the photograph are the mains power unit and transmitter only.

Fig. 13. Transmitter unit RT-6 of US clandestine radio station RS-6 shares several interesting constructional features with the German SE 109/3 (Fig. 14). The RS-6 was a miniature postwar transmitter-receiver comprising five units including separate transmitter, receiver and power unit. The transmitter has an internal key which can be folded away into the case when not in use. A separate Morse key or automatic tape keyer can be connected to the key jack on the front panel. The frequency range of the set was 3-16.5 MHz in two bands, delivering 6-10 watts RF.

Fig. 14. The German SE 109/3 agents' transceiver (1944-45) was the last model developed by the former Abwehr. The set was built into a pressed "bis-cuit tin" case with easily removable top and bottom cover plates. It operated on dry batteries. The transmitter was crystal-controlled; the receiver had three type DF11 metal tubes. The Morse key, seen here ready for operational use, has a removable (plug-in) lever.

Fig. 15. British M.I.9 transmitter concealed in an imitation-leather covered cigarette tin. The transmitter is crystal-controlled. It operates from AC mains, having a tiny internal transformer. The Morse key of this ultra-miniature transmitter slides back into the case when not in use.

Fig. 16. USSR transceiver type GRANIT. The 1960s set operates on short wave between 3.5 and 4 MHz (one would suspect amateur use . . .), and is powered by dry batteries. It has a plug-in lever-type Morse key.

Fig. 17. M.I.9 transmitter disguised as a cigarette tin. Apparently the transmitter was powered by internal dry batteries. Considering the aerial length (30") and the size/windings of the transmitter coil, its estimated working frequency is in the low end of the VHF band (50-70 MHz), consequently having a very limited range. The Morse signals were modulated by a small buzzer unit. The armature of the on/off switch, here seen on the side of the case (in operational use, on top) acts in "on" position as a Morse key.

BEACONS AND HOMING SYSTEMS

Air-Sea Rescue (ASR) transmitters operating on the 500-kHz distress frequency were developed in World War II for ditched air-crews. Most of the sets were self-contained and powered by an internal hand generator. They had a re-

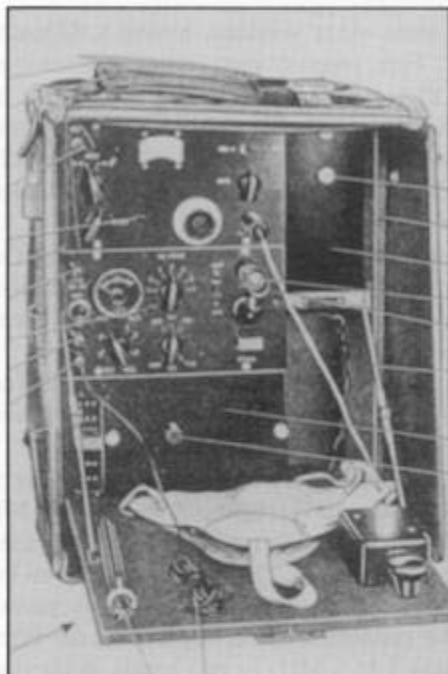


Fig. 10. British Mark 128

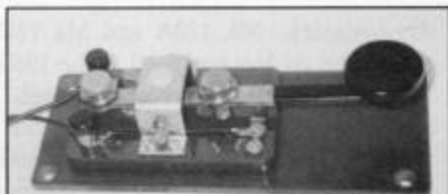


Fig. 11. Key for Mk 128B

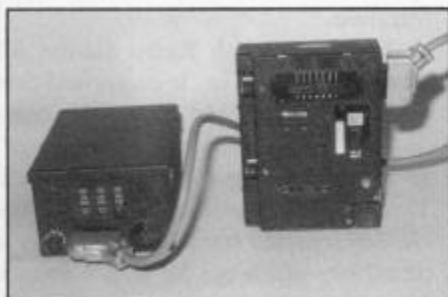


Fig. 12. Radio Station A3.



TRANSMITTER RT-6

Fig. 13. US RT-6



Fig. 14. German SE 109/3



Fig. 15. British M. I. 9 transmitter

markedly ergonomic shape, fitting between the operator's legs during operation. Transmission of pre-coded "SOS," followed by a long dash, was automatically sent in Morse by turning the generator handle on the ASR transmitter. However, when a rescue aircraft was in sight, a normal Morse message could be transmitted by using the key mounted on the front of the set.

Figs. 18, 19, 20 (top to bottom). Air-Sea Rescue transmitters: German NG2, British Type 33, and USA SCR-578. All operated on the 500-kHz distress frequency. The Allied transmitters were copies of the NS2.

The Rebecca-Eureka system was developed by the British early in WW II, primarily as a homing device for dropping agents and supplies into occupied Europe. Soon the possibility of use by paratroops was realized and the equipment enhanced for this purpose. It was used in virtually all airborne operations in the second half of the war. The system consisted basically of the "Rebecca," an airborne VHF interrogator set, and a "Eureka" ground transponder.

The Rebecca-Eureka system used pre-arranged code words. Two-letter codes were usually transmitted to the aircraft in Morse prior to a drop in order to verify the authenticity of the ground station. The key is mounted on the front panel under a rubber weatherproof cover. Keying the Eureka involved changing the pulse-width of its transmitter, which was read by the airborne operator on his Rebecca screen. The Rebecca was keyed simply by switching the interrogator-transmitter.

Fig. 21. US-made Eureka responder beacon RT-37/PPN-2 (1945). A head-set jack, providing reception of Morse signals sent by the airborne operator, is located to the right of the key (a push-button switch for coding).

Fig. 22. British Mk II Eureka transponder beacon TR3174 (1943). On the left is the six-volt power pack, at right the transmitter-receiver unit. Pulse-width keying was accomplished by the "K" button.

REMOTE CONTROL UNITS

It is not always convenient or even possible to place a radio exactly at the position where communication is required, owing to the need of concealment and to avoid screening. Most British field radios were designed for remote-control working, enabling a second operator situated some distance away from the set to transmit and receive in Morse and voice. Usually two remote-control units were used with a radio, one directly connected to the set (the nearby or "local" control) and the other at the distant point (the "remote" unit), both units connected by twisted field wire. Of the large number of remote-control units known, only a selection is given. Most of them differed only in general layout and added features.

Fig. 23. Wireless Remote Control Unit "A." It provides the facility to operate Wireless Set No. 1 or No. 11 from a distance. The unit is enclosed in a metal case and includes a standard KEY W.T. 8 AMP No. 2 (design 1B, described later), which is fixed-mounted on the chassis. An additional feature is the connection to a buzzer-call telephone switchboard for connection of a telephone set to the radio.

Fig. 24. Wireless Set No. 21. This British set was a low-power transmitter-receiver for short-range R/T and CW communication in infantry brigades and



Fig. 16. USSR GRANIT transceiver

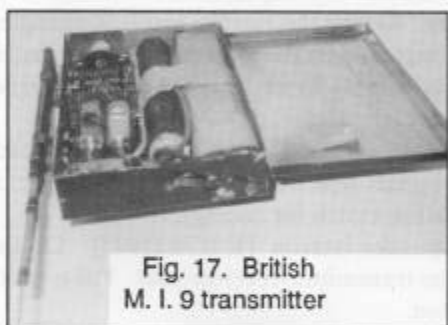


Fig. 17. British
M. I. 9 transmitter



Fig. 21. US RT-37/PPN-2
Eureka transponder

Fig. 18. German
NG2 distress
transmitter



Fig. 19. British Type 33
distress transmitter



Fig. 20. US
SCR-578 distress
transmitter



Royal Artillery regiments, operating at 4.2-7.5 and 19-32 MHz (1940 onwards). It carried a detachable panel with essential controls including a Morse key. When in use, the control unit was removed from the case and mounted on the operator's table, normally connecting to the set by a short cable. When required to work at a distance, it was connected to the set through a special five-wire extension lead 120 meters in length. The operator at the control unit could transmit voice and Morse, hear received signals, switch between receive and transmit, and make slight adjustments to the receiver tuning. No local operator was necessary when operating from a remote position. The Morse key in this unit is a standard KEY W.T. 8 AMP No. 2 Mk II (design 2B), with an extension rod on the key knob.

Fig. 25. Remote-control unit "K," and remote-control unit "K," Mk 2, British stock code ZA 51445 or NATO Stock No. Z1/5820-99-949-1174. Note the different sockets on the two units and the absence of a call button on the Mk 2 unit.

Remote Control Unit "K" (also called "K" box) was part of the postwar British Army radio control harness type "B," used from the mid-1950s onwards. This unit was used for remotely controlling vehicle-mounted HF radio sets in the Larkspur range, e. g., Station(s) Radio C11, C12 and C13, when Morse keying functions are required. It connected to the (local) radio by means of paired field cable, for which the terminals can just be seen on the right side of the key cover.

Two screw adjusters on the key enabled the user to vary the spring tension and the length of the gap. As with many of the British field keys, two canvas straps were provided for securing on the operator's knee when in use. Two five-way sockets were fitted on the unit for the attachment of headsets and microphones. A call button sounded a buzzer at the local side, enabling the user to call the local operator and speak to him via the intercom.

An alternative "KV" version is known, produced for fixed installation (local keying) in vehicles. It has two round six-point sockets (one on each side, for connecting the unit to the cable harness) and no straps or call button.

A later manufactured "K" Mk 2 remote-control unit was very similar to the "KV" unit. It could be operated adjacent to the installation or at the remote point. Two carriers were provided into which the K unit was fitted for operation: the "Carrier, fixed remote control, K, Mk 2" could be screwed to the operator's table, while the "Carrier, free remote control, K, Mk 2" had two straps for securing it to the operator's knee. It is similar to the key made in South Africa, depicted in "Foreign and Military Telegraph Keys," AWA Review Vol. 3, p. 116, Fig. 50.

Fig. 26. "Remote Control Unit L NO. 2" (ZA 29007) was used with Wireless Sets No. 62 (Fig. 105) and C12 from the late 1940s to the 1960s. The unit is very similar in shape to the Key and Plug Assemblies Nos. 8, 9 and 19, having a KEY W.T. 8 AMP NO. 2. However, the key in the "L" Control Unit is the miniature type as used with clandestine sets B2 and A Mk III (Figs. 1 and 3). Two pairs of headphones can be connected on the sockets on the right side. The left side of the unit has a four-point socket for a microphone and a pair of slotted terminals (one just visible in the picture) for connecting the control line to the "Set Control Unit L No. 1."

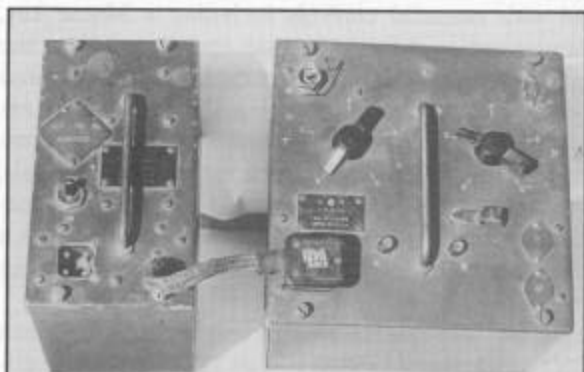


Fig. 22. British Mk II Eureka transponder



Fig. 23. Wireless Remote Control Unit "A"

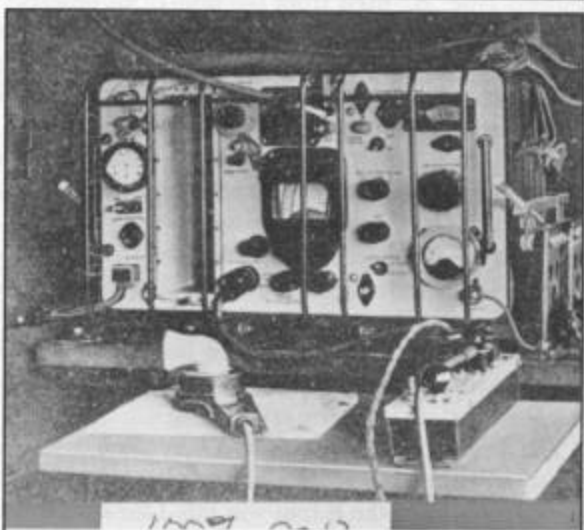


Fig. 24. Wireless Set No. 21 and control unit

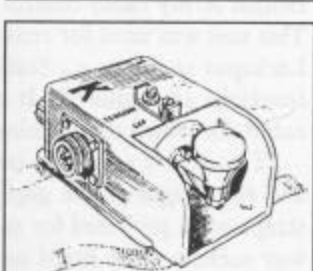


Fig. 25. Remote control units "K" (above) and "K," Mk 2 (below)

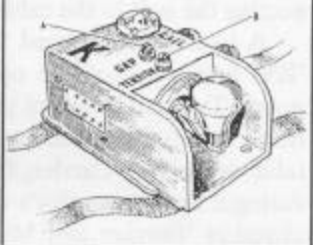


Fig. 26. Remote Control Unit L NO. 2

VISUAL SIGNALLING

In the early part of WW I trench warfare, the British Signal Service used the "Lamp, Signalling" for visual Morse communication over relative short distances. Having wide dispersion of its rays, the lamp quickly drew the attention of the Germans, usually resulting in heavy shelling of the unfortunate signal-post. In 1915 a new lamp was devised by a Signal Division using an empty 4.5" shell, a spare motorcycle mirror and a small lamp, all mounted to slide for focusing, complete with an improvised sighting tube on top. This lamp appeared to be a great advance and was so successful that a model was sent to the Joseph Lucas Company at Birmingham to produce on a large scale.

Fig. 27. The "Lamp, Signalling, Daylight" was devised in WW I for short-range visual signalling. It was initially manufactured by Lucas Co., as marked on top of the key lever, hence the common name "Lucas Lamp." A second source was Arthur Lyon & Wrench Ltd. It saw wide use in the British Army throughout both world wars. It comprised basically a dry-battery operated lamp, normally mounted on a spike or tripod. The complete set and spare parts were carried in a wooden (later metal) box, covered with canvas and divided into two parts. The Morse key is fixed to the underside of one of the lids, which hinges back into a convenient position for operating. The lamp was connected with a flexible lead to two-pin sockets, mounted near the key. In Position 1, used for normal working, a resistance was inserted in the socket. When an extreme range is required or the battery was nearly run down, Position 2 was used. A number of variations of this instrument are recorded; the basic layout, however, has never changed.

Fig. 28. "Lamp, Signalling, Daylight, Short Range, Lightweight" using a standard KEY W.T. 8 AMP NO. 2 Mk. II (design 2A) without lever-protection cover. Late in WW II, a special lightweight version of the standard British Army short-range signalling lamp was made. The lamp could be mounted on a bayonet, used as a spike to secure the lamp in a fixed position, and controlled by an external Morse key mounted in the battery case. Alternatively, the lamp was hand-held, with the beam directed toward the other station by means of the sighting tube, and controlled by the Morse key ("pressel" switch Q) attached to the lamp.

Fig. 29. "Lamp, Signalling, Daylight, Short Range," WW II version. The drawing shows the lid of the lamp compartment in the carrying case, with alternative arrangements of parts. To ease manufacture and maintenance, use was made of a standard KEY W.T. 8 AMP NO. 2 (design 1B). In addition, two sockets J were available for connecting a lighting attachment.

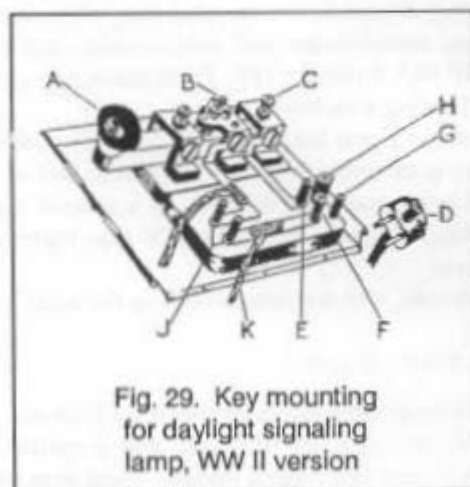
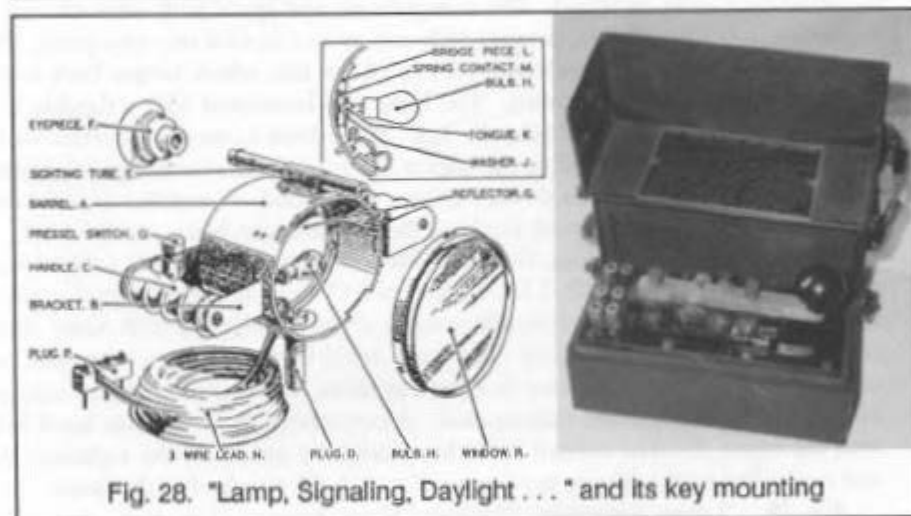
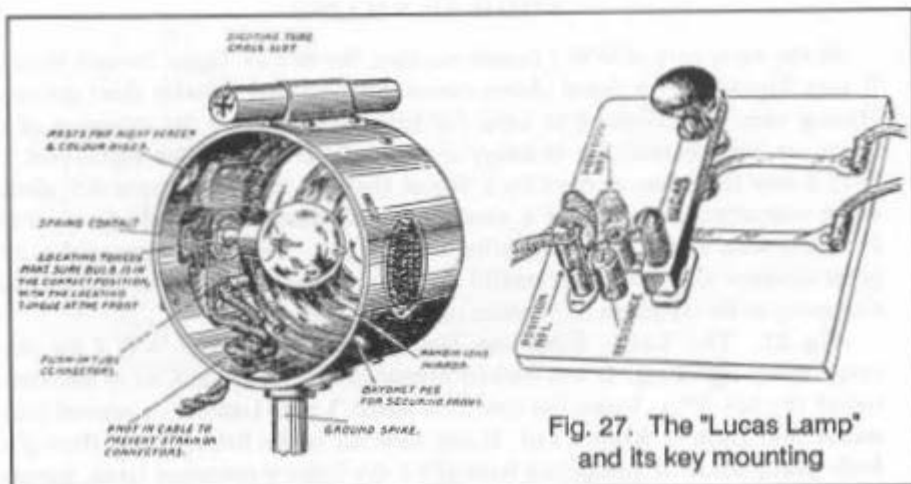
Fig. 30. "E" combined oil and electric signal lamp, early WW I. The Morse key for the 2- $\frac{1}{2}$ " 3.5-volt electric lamp is mounted in a dust-proof box, and stowed in a compartment in the oxidized-brass case. At the rear, in a second compartment, is a small oil lamp for reading. The case holds three "S" type batteries, and three spares in a third compartment.

Fig. 31. Signal lamp made by Eveready, with key mounted atop the case.

WORLD WAR I RADIO

Keys were often built into early wireless transmitters intended for field use.

Fig. 32. "Wireless Trench Set, DC 50 watts," or "B.F." set, was a combined spark transmitter and receiver of very simple but rugged design. Used primarily



in front-line trenches, it operated on fixed wavelengths of 350, 450 and 550 meters (857, 667, and 545 kHz respectively). The key mounted on top of the ebonite control panel is of unusual design, having an extra contact protecting the carborundum detector during transmission.

Fig. 33. German WW I spark set "K-Fuk-Gerät" (*Klein Funk Gerät*, or Small Radio Set) type AKS 58, made by Telefunken. This equipment has the same function as the British 50-watt Wireless Trench set (Fig. 32), finding use primarily in the front lines. Note the similarity of the layout and some of the controls to those of the British set. It had fixed transmitter wavelengths of 150, 225, and 300 meters (2000, 1333, and 1000 kHz respectively). The receiver tuned from 150 to 600 meters in three ranges, having a pyrite detector. The key of this set is remarkably small and could be operated when the cover was closed through a hole in the lid covered with waterproof canvas.



Fig. 31. Signal lamp made by Eveready.

Fig. 34. Although the rugged and easy-to-operate spark radio sets remained in general use in the trenches, tube equipment appeared late in WW I on a limited scale. The transmitter unit of "W.T. Set, Trench, Continuous Wave, Mk III" saw service primarily with artillery observation parties. It covered the wavelengths of 450 to 2000 meters (150-667 kHz). The power input to two type "B" or AT25 tubes was 30 watts. The Morse key, officially known as "Key, WT, Folding" is mounted through the side of the waterproof cover, for use of the set with the lid closed.

Fig. 35. German WW I spark transmitter-receiver type "A," designed for use in single-seater fighters or artillery observation aircraft, having the Morse key mounted on top of the instrument. Later models used a key mounted on the aircraft's control column. The set was of contemporary simple-but-rugged design, manufactured by Telefunken around 1916-17. It was pre-set before flight and operated from 150 to 350 meters (857-2000 kHz).

Fig. 36. Keys WT 10 Amp. No. 1 and 2 were used with several types of CW radio station. The keys, having a spigoted lever, are similar, with an auxiliary contact added on the No. 2 key.

Fig. 37. WT Set, Field, 60-Watt CW. This transmitter is part of a CW radio station operating on the long waves, primary intended for rear communication. Transmitter and receiver were separate instruments; the transmitter had an input of 60 watts to two type "B" tubes in parallel. The Morse key is a "Key WT 10 Amp, No. 1," mounted directly on the ebonite baseboard near the tubes. Note the absence of the knob guard shown in Fig. 36. Virtually no protection is provided against a nasty shock from the open high-voltage connectors.

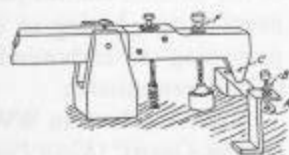


Fig. 32. "Wireless Trench Set, DC 50 Watts"

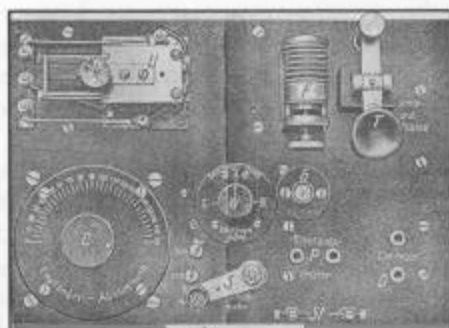


Fig. 33. AKS 58 spark set



Fig. 34. Transmitter of "W. T. Set, Trench, Continuous Wave, Mk III."

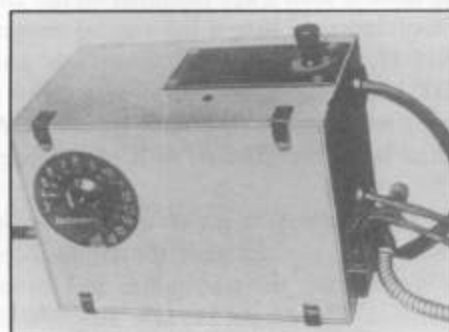


Fig. 35. Type "A" spark transmitter-receiver



Fig. 38. A rare original drawing of a Morse key used in Dutch Artillery observation aircraft during the years 1925-31. The key was normally mounted in the observer position and issued only during flights. It was therefore easily removable and fixed by a handle (*los*: loose, *vast*: fixed).

Fig. 39. Further evidence shows that this model key had previously been used for radio communication on German long-range Gotha bombers which appeared in bombing raids over London during 1917. The type R set (R: *Riesenflugzeug*, or "giant airplane"), shown here in the aircraft's radio cabin, was made by Telefunken. It comprised a 500-watt spark transmitter and crystal receiver. Below the table is a four-tube type EV136 audio amplifier for the receiver.

Fig. 40. Wireless Telegraph Set, 120 Watt, Mk I. This unit was developed in WW I but saw service only after 1919. It was intended for medium-range communication and operated on wavelengths between 600 and 8000 meters (37.5-500 kHz) with a nominal range of 200 miles. Mounted in a wooden transit case, it comprised a transmitter unit (left) with two "B" tubes; rectifier unit (center left) with two "U2" tubes; detector-amplifier "C," Mk. IV (center right) with three "A" tubes; and the receiver RF tuner (right). The key, visible in front of the "C" Mk IV amplifier, is a Key, WT 10 Amp. No. 2.

Fig. 41. Transmitter of British "W/T Set, C, Mk I" (1924) showing KEY, S.C. [single current], 4 AMP, in front and close-up views. The key is mounted on a base for easy replacement. It may also be found on other British Army radios of the period. The "C" set was primarily used for CW communication at brigade and division level. It operated between 650 and 2000 meters (150-462 kHz). The transmitter output tube shown in the photo is an AT50. A later Mk II version of the set, introduced about 1925-26, uses a KEY W.T. 8 AMP (design 1A).

WIRELINE EQUIPMENT

Telephones

Early field telephones were inefficient and were suitable only for relative short-range working. For operation over longer distances, a buzzer telegraph set was often incorporated into the telephone set, having the advantage of giving audible signals over very bad lines.

Fig. 42. The Telephone D Mk III* was developed in WW I and saw wide use well into WW II. It combines a telephone set with a buzzer telegraph. The DIII* instrument (sometimes affectionately known as "Don three star" from the British phonetic alphabet of the time) shown in the picture with leather case and handset removed, was manufactured as late as 1937 by AT&E Co. Ltd. At that time it was badly outdated, lacking both a magneto call and an anti-sidetone bridge circuit. The Morse key, shown between two terminals, is a miniature type used for both signalling and making a buzzer call to the switchboard. Two batteries are contained in the compartment behind the key. It can call only by buzzer, giving visual indication to a switchboard U.C. ("Universal Call"), which can be called by both magneto and buzzer.

Figs. 43A and 43B. Telephone set D Mk V was developed in the late 1930s to replace the D Mk III for use in forward formations. It had a range of about 15 miles for speech and 25 miles using Morse buzzer telegraphy. The Morse key on the D Mk V is a miniature type known as "KEY SIGNALLING NO. 1." The

Fig. 36. Keys WT 10 Amp. No. 1 and 2

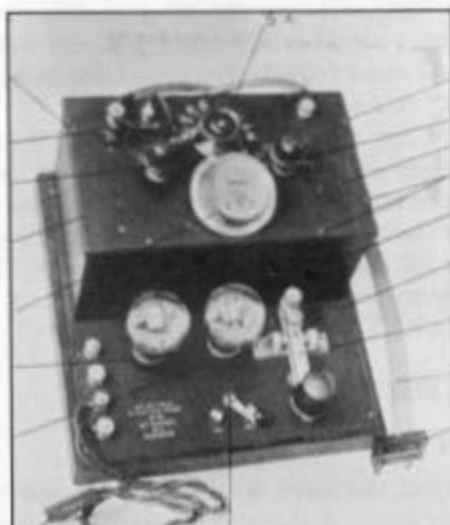


Fig. 37. WT Set, Field, 60-Watt CW

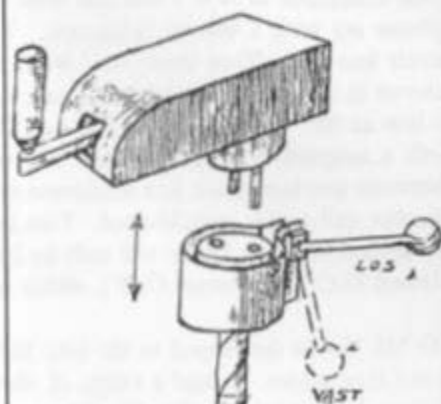


Fig. 38. Aircraft key

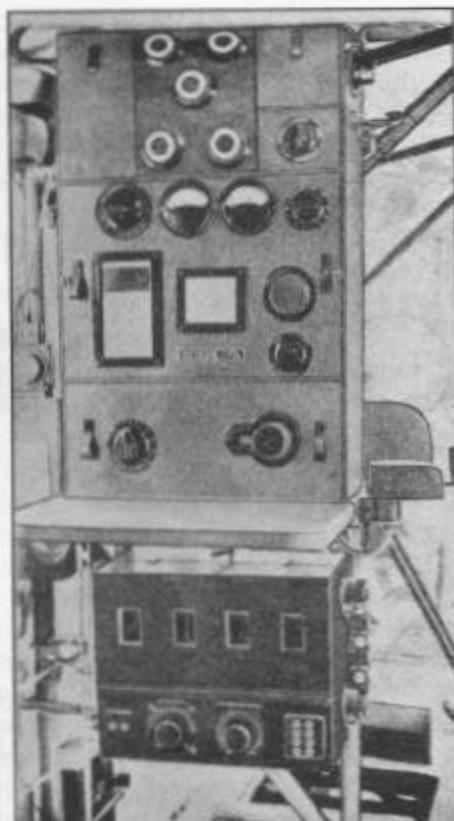


Fig. 39. Radio cabin, Gotha bomber (note key on right)



Fig. 40. Wireless Telegraph Set, 120 Watt, Mk I

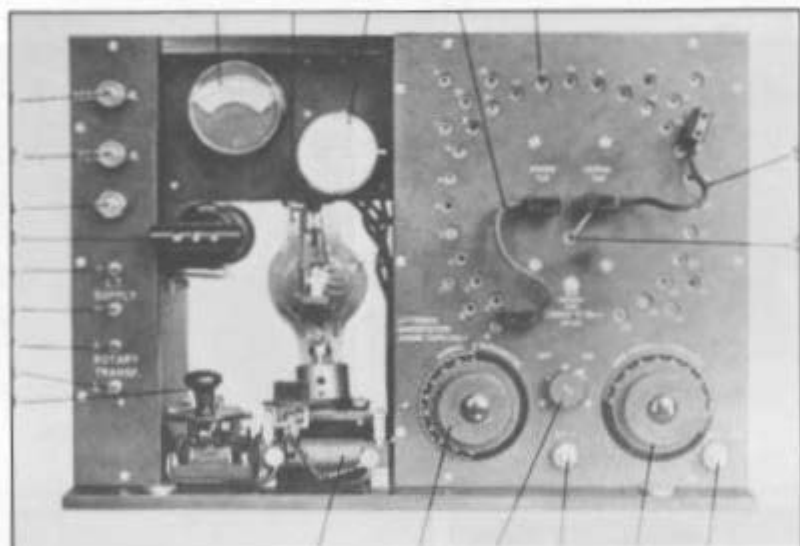


Fig. 41.
"W/T Set,
C, Mk I"



Fig. 42. D Mk III*
field telephone



Fig. 43A. D Mk V
field telephone

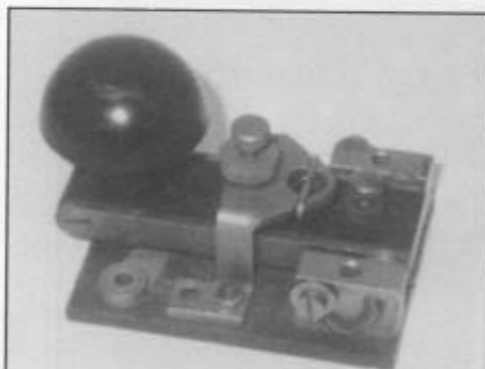


Fig. 43B. Key in
D Mk V telephone



Fig. 44. Japanese
field telephone



Fig. 45. British "power buzzer"



Fig. 46. Power buzzer amplifier

key is interesting mechanically, having two metal levers separated by a bakelite insulation piece. It has a pair of mark contacts and a single space contact. The "mushroom" type knob is similar to the one used on the KEY WT 2 AMP.

Fig. 44. Japanese field telephone of WW II pattern, showing buzzer Morse key. The telephone handset has the microphone and receiver back-to-back at the listening end. On unscrewing the cap, the earphone assembly comes out and then the microphone capsule. A second receiver was also issued.

The Power Buzzer

Water or the earth can be used as a conductor for electricity. At a very early stage in the history of electric signalling, ground return was employed in telegraph circuits. Experiments with signalling through the earth without wires started as early as 1842 and continued until the advent of radio telegraphy at the turn of the century. However, at the WW I front, where wire lines and even radio aeriels could not be maintained due to heavy shellfire, the system attracted renewed interest. The advent of tube amplifiers made it possible to attain ranges and results unattainable before the war. Communication was established over comparative long ranges by using two well separated ground spikes, connected by insulated cables to a high-power AC or interrupted-DC source as transmitter and a sensitive AF amplifier connected similarly on the receiving side. The French introduced this system, *Telegraphie Par le Sol* (TPS), soon to be adopted by the Allies, including the U. S. Signal Corps. The system was used to the same extent by the German Signal Service.

Fig. 45. British "Power Buzzer." It was mounted in a wooden case covered with canvas. The heavy-duty buzzer (T) provided approximately 80-100 volts interrupted DC. The Morse key (A-H-J), having a hinged extension, is shown in transit position. In operational use the lid is closed, the key extending outside the lid through a cutout. The system provided only one-way signalling, which was considered a heavy drawback due to lack of indication that a message had been received. Later combined Power Buzzer/Amplifier sets were developed which allowed two-way working.

Fig. 46. Power Buzzer Amplifier. This was a self-contained earth-current instrument and further development of the power buzzer in Fig. 45. It comprised a combined power buzzer and three-tube audio amplifier, providing two-way signalling. The folding Morse key (E), seen in the picture in working position on the right of the front panel, is similar to the key shown in Fig. 34.

Vibrator or Buzzer Telegraph

Vibrator and buzzer telegraphs, operating with interrupted DC, were intensively used by the British (and other) armies in the 1890s up the end of WW I for their great ability to signal through leaky or broken lines. Their use (including the buzzer mode of field telephones) within 3000 meters of the front lines ("Danger Zone") was forbidden in 1915 due to danger of overhearing and interception by the enemy.

Fig. 47. Transmitter Vibrating Mk IV (similar in operation to the US "Buzzer, Service," "Cavalry Buzzer," etc.).



Fig. 47. Transmitter
Vibrating Mk IV



Fig. 48. Fullerphone Mk I*



Fig. 49. "Apparado da Campo ..."



Fig. 50. Fullerphone Mk V



Fig. 51.
Sutel 40

The Fullerphone

As a technical countermeasure against enemy interception of line communication, caused by induction or conduction, Captain (later Major General) A. C. Fuller invented the Fullerphone in 1915. It is a DC telegraph; the Morse signals are made audible at the receiving side by an interrupter or "buzzer-chopper" and headphones. The Fullerphone was an instant success and remained in use with the British well after WW II.

Not only the British used Fullerphones; in other armies the threat of line overhearing and interception was also realized. Independently, and at virtually the same time, similar instruments were devised: in Germany, the "Utel" (*Unabhängbarer Telegraph*, or Non-interceptable Telegraph); in Italy, the "*apparado da Campo per telegrafia inintercettabile*" or "apparatus, field-telegraph, non-interceptable."

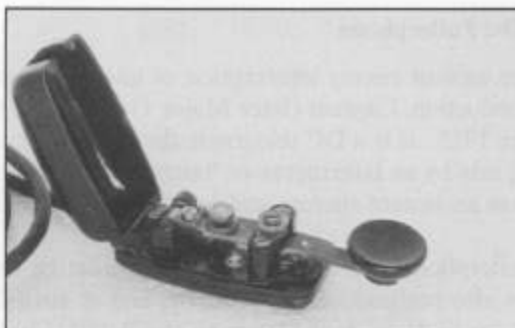
Fig. 48. Fullerphone Mk I*. This set was manufactured by Siemens Bros. in 1916. The Morse key, which is fixed-mounted on the control panel of the instrument, is very similar to the key used with the Transmitter, Vibrating Mk IV (Fig. 47).

Fig. 49. "Apparado da Campo per telegrafia inintercettabile."

Fig. 50. Fullerphone Mk V. This model is a tropicalized version of the standard 1939 Mk IV type. DC earth currents, interfering with the signalling, are nulled-out by means of the potentiometer and reversing key on the front panel. In order to meet tropical test requirements, dome-shaped silver-nickel contacts are used instead of the flat tungsten contacts on the KEY W.T. 8 AMP No. 2 Mk II (design 2A) used with the Mk IV Fullerphone. The dome shape increased the contact pressure, which was advantageous, as the current through the key of a Fullerphone is only about 1 mA. Since this key would not be suitable for heavy-current use, it was cataloged "KEY SIGNALLING NO. 2," having Army stores vocabulary number YA 6897. Note the absence of the lever cover.

Fig. 51. German Sutel 40 (*Summer Telegraph*, or "Buzzer Telegraph"). This was a development of the WW I German "Utel," primarily replacing the awkward mechanical buzzer-interrupter by a cunningly designed electronic audio-frequency generator. The circuit operated with a single space-charge tube, powered from a dry battery of only nine volts. Due to line capacitance the Morse signals tend to "blur," reducing the signalling speed on long lines to a rather slow 5 to 7 WPM. The key is a common German "mouse" model, encapsulated in a dust-proof bakelite cover, mounted on a steel base plate. When not in use, it was fixed in the lid of the fiber case, which is very similar to that used with the standard Model 33 field telephone. The set saw limited use during WW II.

Figs. 52 and 53. Two examples of German keys used in WW II, affectionately known as "mouse" keys, long before the later-type (computer) mouse. Both were used primarily with portable communication equipment: the Sutel and such radios as Fu d2 and Torn Fu g. They were also issued with agents' transmitters. They are virtually identical, the one on the left having a longer lever arm and a round knob. Both are marked TKP (*Taste Klein P*, or "Key, Small, P").



Figs. 52 and 53. Two German "mouse" keys



Fig. 54. Wireless Set No. 46



Fig. 55. Radio Control Box BC-451-A



Fig. 56. Experimental Wireless Sender X66 (also see Fig. 57)

MISCELLANEOUS AND WARSAW PACT RADIO

WW II Keys

Fig. 54. British Wireless Set No. 46. It had an internal Morse key ("Press To Send"), located on the front panel, which also functioned as transmit/receive button on R/T. The No. 46 set, developed in 1941, was intended primarily for communication in beach-assault landings by Combined Operations Command. It was very strongly built and fully waterproof. Crystal control of both receiver and transmitter was employed to avoid time-consuming tuning when establishing vital communication in initial stages of landings. Three channels were available in one of four bands between 3.4 and 9.1 MHz, delivering 1-½ watt RF. Due to physical limits of the key, the maximum speed was restricted to 12 WPM.

Fig. 55. Radio Control Box BC-451-A. Part of the US Army Air Force SCR-274N "command" set, it was used for controlling up to four transmitters. It had an auxiliary Morse key on top. This key-equipped control box resembled such similar-shaped control boxes as BC-AT-232 for the Army SCR-183/283 and CW-23097 for the Navy GF-11 set.

Fig. 56. Experimental Wireless Sender X66. This was a development model for long-range airborne "rear link" CW communication. The internal Morse key, mounted in the center of the front panel, is obviously the miniature model shown in Figs. 1 and 3 without lever cover.

Fig. 57. Reception Set R109A (left) and Wireless Sender No. 66 (right) in use. Apparently the key construction in the X66 was impractical and in the final model, the internal key was discarded. Instead, a British "KEY AND PLUG ASSEMBLY NO. 9" was issued, comprising one of the versions of the standard KEY WT, 8 AMP, No. 2, in a metal protection cover (see Fig. 97). The photo shows a British Airborne signaller using a "rear-link" HF set comprising Reception Set R109A and Wireless Sender No. 76. Faintly visible, strapped to the operator's thigh, is a "KEY AND PLUG ASSEMBLY NO. 9."

Fig. 58. Morse key J-48-A. This unit was used with US Army radio set SCR-284-A, here shown installed in Car, ½ Track, M2. It was fixed on the lid of the field case for the BC-654-A transceiver, which provided a suitable operating table when operational. The J-48-A assembly shown contains a J-38 type Morse key.

Fig. 59. Key and T-R switch box for US Marine Corps TBY portable VHF transceiver. This unit is shown with its tight-fitting rubber cover pulled back. In operation the box clipped on top of the transceiver case or to any convenient canvas strap.

Fig. 60. "KEY AND PLUG ASSEMBLY NO. 17" (ZA 25381). It was used with the Wireless Set No. 42. It appears to be very fragile, having a thin bakelite case. A send-receive switch is incorporated and can be seen on the upper part on the side of the case. The miniature-type Morse key is made from pressed steel.

Postwar Miniature Keys

An example of a postwar miniature key is the Key, Telegraph, Lightweight (Aust.), No. 1. This type was used with lightweight jungle patrol radios, usually working on HF, e. g., the Australian Wireless Station A510. The key is completely sealed, having a fixed adjustment of 0.013" travel and 10-ounce pressure.



Fig. 57. Reception Set R109A and Wireless Sender No. 76



Fig. 58. SCR-284-A
radio, J-48-A key



Fig. 59. Key for
TBY transceiver



Fig. 60. "KEY AND PLUG
ASSEMBLY NO. 17"

Grooves at the bottom of the key, corresponding with a gateway on the side of the transmitter, enable the key to be attached to the set.

This key model was quite common and saw use with British HF man-pack radios of the 1950s through 1970s (e. g., Station Radio A13 and A14). A strap at the key base provided for fixing it on the operator's knee.

Fig. 61. "Key, Telegraph, Lightweight (Aust.) No. 1." The case is made of light brown plastic, bearing the maker's initials and date of manufacture: TSE(W)9-2-1956-. It was used with Wireless Station A510 (Aust), an HF man-pack set with separate transmitter and receiver carried in canvas pouches. The transmitter unit is shown in the picture.

Fig. 62. A similar lightweight key in use by a British signaller operating a Station Radio A13. The second signaller is operating a hand generator, float-charging the batteries. Designated "Telegraph Key Assembly, BCC type B8000-196," the key has a black case with inscription of the NATO stock number 5805-99-949-9618. The dark-green canvas strap is permanently attached.

Fig. 63. British Patrol Station Radio A16. The lightweight HF patrol SR A16 (UK/PRC-316) is a compact, simple-to-operate transceiver, developed by the Signals Research and Development Establishment (SRDE) in the 1960s. It was intended for operation in dense jungle and for long-range communications up to 800 km for patrols or special-operations parties. It provides 45 crystal-controlled channels in the 2-7 MHz band with an RF output of approximately 4 watts. The complete self-contained set weighs only about 4 kg. The Morse key is built into the set, fixed at top right of the control panel. Although the set was developed primarily for CW working, short-range (AM) radiotelephone communication was included. A remarkable feature is an engraved plate on top of the set with the international Morse code, guiding inexperienced patrol members in the transmission of low-speed Morse in an emergency.

Fig. 64. British Station Radio A16 (UK/PRC-316) in operational use. Note the employment of a dipole wire aerial, directly connected to the set's aerial terminals.

Fig. 65. RAF key assembly "CONTROL REMOTE GROUND STATION TYPE D," Air Ministry Ref No 10J/65. This unit was used for keying fixed transmitters from a remote point (e. g., an airfield control tower). The key on the unit is a "KEY MORSE TYPE D," Air Ministry Ref No 10F/7373. Note the use of civilian-type mains switches for transmitter control.

Warsaw Pact Radio

Fig. 66. USSR Morse key issued with type R104M pack/vehicle station (variation 1). The R104M set operates from 1.5 to 4.25 MHz, delivering 3.5 W CW or 1 W AM on low power, and 20 W / 10 W on high power. Developed in the early 1950s, the set has been used extensively in the USSR and its satellite countries. Indications are that it is still in operational use in some countries. In operation, the Morse key is clipped on top of the lid of the power-supply/battery case. When not wanted it is stowed inside the lid. The R104M in the photograph was used in the former German Democratic Republic and consequently has inscriptions in German.

Figs. 67 and 68. Additional USSR keys for the R104M radio. Variation 2 (left) resembles the US J-38 in many details. Variation 3 (right), date of manu-

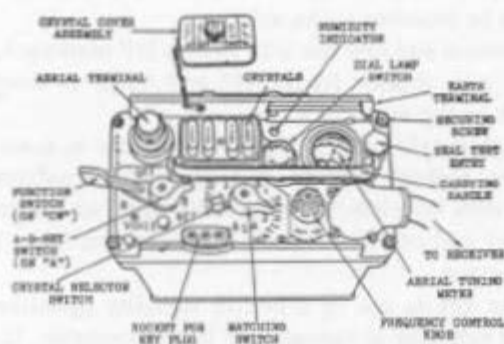


Fig. 61.
Wireless Station A510
(Aust) and "Key, Telegraph,
Lightweight (Aust) No. 1"



Fig. 62. "Telegraph
Key Assembly, BCC
type B8000-196" and
Station Radio A13



Fig. 63. Station Radio A16 (UK/PRC-316)

facture 1986, is an interesting miniature key. However, it is awkward to handle and not crafted well.

Fig. 69. USSR "universal" model Morse key, variation 1. Production date 9/85, manufactured by MPI (Mashpriborintorg). These keys have been offered brand-new boxed. The key is made of bakelite and brass, probably intended for replacement or as a general-purpose part.

Fig. 70. USSR "universal" Morse key, variation 2, marked 3TA (ZTA) on top of bakelite cover. This key is much better engineered than variation 1, e. g., having a tension screw similar to the Junker key system. It has an insulated lever. Two metal strips are fixed on the bottom of the key for sliding it on a table of the radio vehicle.

Fig. 71. USSR Morse key for radio type 10 RT, the standard tank and armored-vehicle HF set of the 1950s.

Fig. 72. USSR key used with vehicle-mounted high-power radio stations such as the R102M 900-watt system, made about 1985. The key has a dust-proof aluminum cover and a radio-interference filter in the base.

Fig. 73. Morse key for SSB transceiver SEG 15D. The key resembles the well known Junker key but lacks its typical numbered tension screw. Its case is dust-protective but by no means waterproof, as several rubber gaskets do not appear to seal well. The key is mounted on a heavy steel base-plate. Note the similarity of connector type to the one used with the British lightweight key (Fig. 62).

Fig. 74. The SEG 15D transceiver, made in the former German Democratic Republic by VEB "RFT" (VEB: *Volks Eigenes Betrieb*, or "People's Own Factory") of East Berlin. This 1970s fully transistorized, frequency-synthesized transceiver was exported to many countries, including North Vietnam.

Fig. 75. A fascinating key used with the Czech R4 HF field radio set. The transmit-receive switch is incorporated in the key lever. Transfer is effected by putting the lever down from the upper "receive" position to "stand-by." In that position the key operates as a normal Morse key. The key is well engineered, having a dust-proof cover with a properly closing gasket. Note a pair of safety contacts on front of the key protecting the operator from coming into contact with high voltage if opening the key cover.

Fig. 76. "Morsetaste K 64" (Morse key model K 64), used primarily with



Fig. 74. Transceiver SEG 15D



Fig. 64. Station Radio A16 in use



Fig. 65. "CONTROL REMOTE GROUND STATION TYPE D"

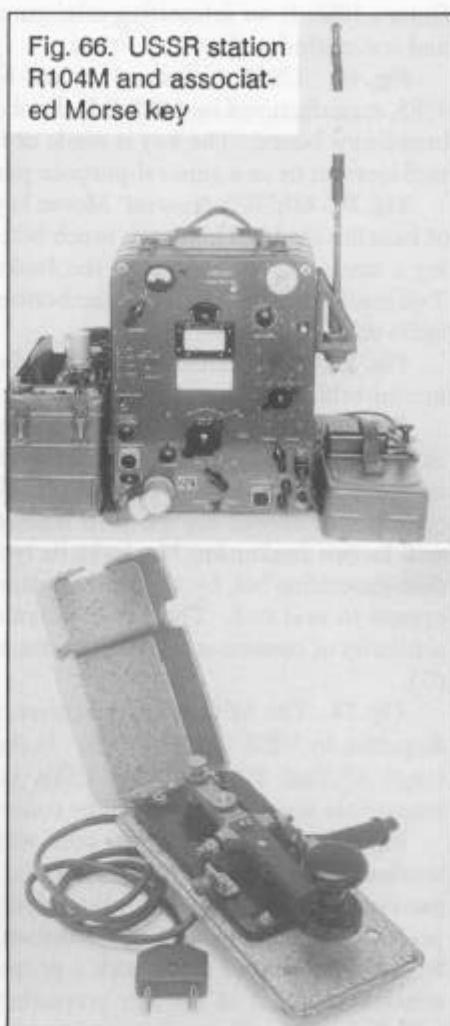


Fig. 66. USSR station R104M and associated Morse key



Figs. 67-68. Additional keys for the R104M



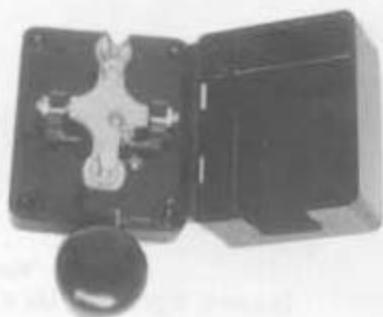


Fig. 69. USSR "universal" key, variation 1



Fig. 70. USSR "universal" key, variation 2



Fig. 71. USSR key for 10 RT radio



Fig. 72. USSR vehicular key



Fig. 73. Key for SEG 15D



Fig. 75. Key for Czech R4 field set



Fig. 76.
"Morsetaste K 64."



Fig. 77. "Key,
Dummy, Signallers, Mk II."



Fig. 78. Training
key, 1940

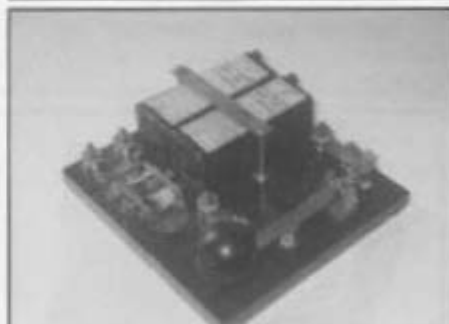


Fig. 79. "Buzzer Signal Training"



Fig. 80. RAF "BUZZER PRACTICE."



Fig. 81.
"Buzzer Sig-
nal Training," 1940



Fig. 82. "Buzzer
Signal Training," 1956



Fig. 83. RAF
10F/702 dummy key

GDR-manufactured radios Fu 1 and Fu 10, but also the R104M (fitted with the metal base plate as pictured). This key was made by VEB "KFZ-Bedarf," Leipzig, in the German Democratic Republic. It is not a masterpiece of craftsmanship - it appears rather fragile, with most of the parts molded in bakelite.

TRAINING KEYS

To instruct new radio operators and air crewmen in Morse techniques, training keys and associated equipment were naturally required.

Fig. 77. "Key, Dummy, Signallers, Mk II," made in 1939 by DOM Loose Leaf Co. Ltd. "A dummy key is issued for instructional purposes. In order that beginners may acquire the true rhythm of Morse signals from the start, the initial indoor instruction both in reading and sending should be concentrated on this instrument" (Signal Training, -All Arms-, 1932).

Fig. 78. Training Morse key, 1940, used by Air Training Corps for pre-entry training for the RAF during WW II.

Fig. 79. "Buzzer Signal Training." This is a self-contained Morse training unit comprising a key, buzzer, and battery, mounted on a wooden base. "Instruction in reading a buzzer should not be started until the beginners are proficient in all signals sent on the dummy key, at 4 words a minute" (Signal Training, -All Arms-, 1932).

Fig. 80. RAF "BUZZER PRACTICE," Air Ministry Ref No 10F/4067. It bears a remarkable resemblance to the Army "Buzzer Signal Training" in the previous figure. The Morse key, however, is slightly different, having a thicker lever and no knob guard.

Fig. 81. "Buzzer Signal Training," 1940. This buzzer has an unusual metal base. The Morse key is a KEY W/T 8 AMP, No. 2 Mk III (design 2C) molded of bakelite.

Fig. 82. "Buzzer Signal Training," 1956, YA 2588. The Morse key is a KEY W/T 8 AMP, No. 2, Mk II (design 2A) with metal lever.

Fig. 83. RAF, Air Ministry Ref. No. 10F/702 key assembly, was used for instructional purposes. The Morse code is molded into the bakelite key base. The key has obviously a civil background and reads MADE IN ENGLAND REG DESIGN on the base.

Fig. 84. "Operator Control Unit, Mk I" is part of the "Training Set, Universal, Wireless, No. 1." The set was developed for training operators in Morse sending and reading and in radiotelephone communication. It was used for teaching a class of up to 36 operators, arranged in six groups. Each operator has headphones and a microphone plugged into the Operator Control Unit. A KEY W.T. 8 AMP NO. 2 (design 1B in this drawing) is fitted in the Unit, which connects to the instructor's set by a cable. The difference between the Mk 1 and Mk 2 units is in the plugs and sockets used for interconnection.

THE KEY W.T. 8 AMP

This remarkable Morse key, easily recognized by its "mushroom" type knob, was employed as standard with numerous types of signalling equipment throughout the British and Commonwealth armies. Designed in the 1920s, its general construction was changed drastically prior to and during World War II into the

Mk II and Mk III models, having a simpler construction leading to ease production. The keys are recorded as having been manufactured by numerous manufacturers, including those in the USA and Commonwealth countries. Although the physical size remained virtually unaltered, allowing interchanging, its mechanical strength decreased, especially with the molded-bakelite models and those having a die-cast frame and lever.

The KEY W.T. 8 AMP can be classified into two basic designs and sub-divided into a number of principal variations. The classification of the variations is carried out in chronological order as far as could be traced. In the captions, the name or identification normally found on the key or KEY AND PLUG ASSEMBLY is printed in capitals between quotation marks.

Manufacturers made a large number of minor variations in the construction of the keys. As these did not lead to drastic changes, they were not considered for inclusion in this paper.

An additional feature was the addition of a bakelite cover over the key lever, protecting the operator from coming into contact with the high voltage.

Design No. 1

The initial and No. 2 prewar patterns had their contacts placed above the key lever. The marking (normally closed) contact is at the back and the spacing contact is the front stop. The key is made of brass, having an ebonite (later bakelite) base. The general construction is rather heavy, with three bridges bearing the fixed contacts.

DRAWING 1. Variations of Design No. 1, showing the initial "KEY W.T. 8 AMPS" (Variation A), used with radio sets A Mk I* and C Mk II about 1925-26. Note the different type of center bridge. The "KEY W.T. 8 AMP No. 2" (Variation B) is recorded as having been used as early as 1927, fitted in later-production radio sets of the A and C patterns. A 1930s version (Variation C), shown at the bottom, had a different and simpler spring-tension adjuster system.

Fig. 85. Design 1, variation B, "KEY W.T. 8 AMP No. 2," the early model.

Fig. 86. Design 1, variation C, "KEY W.T. 8 AMP No. 2," later model. The spring-tension adjuster is simplified. This type of spring adjuster was used on all the later design 1 variations and exclusively on design 2 variations.

USA

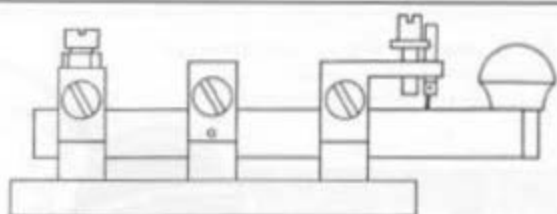
The KEY W.T. 8 AMP was made in the USA, primarily for issue with the US-produced Wireless Set No. 19 Mk II. The design of the key, made by Bunnell to specifications of the British No. 2 key, differed slightly. It is essentially a design 1, version C key, having a front bridge stop but no space contact. The key was mounted exclusively in a version of the "Key and Plug Assembly No. 9" (Fig. 100). Many of the lever covers were made of Ebonite.

Fig. 87. Design 1, variation D, "J. H. BUNNELL & CO. NEW YORK, U. S. A." Note the different style of key knob and the absence of a front (space) contact.

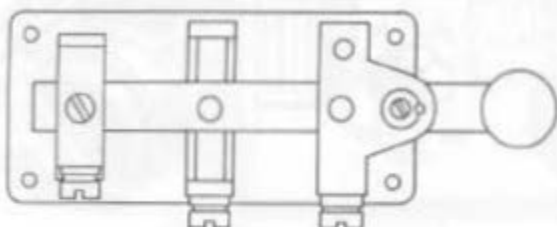
Canada

Signal equipment in Canada was, especially in the early war years, based on British designs manufactured locally (and sub-contracted in the USA). This resulted in interesting variations of the KEY W.T. 8 AMP No. 2.

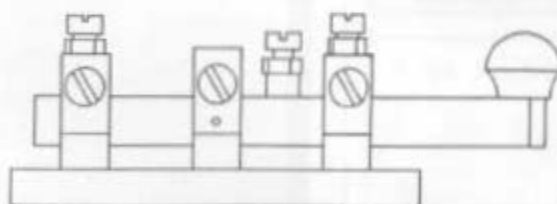
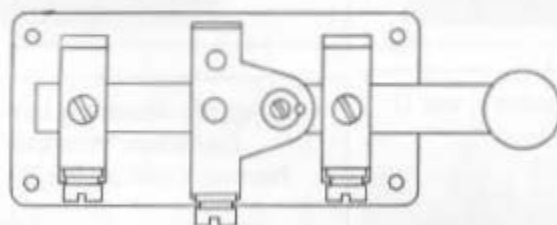
Fig. 88. Design 1, variation E, "KEY W.T. 8 AMP No. 2," made by Northern



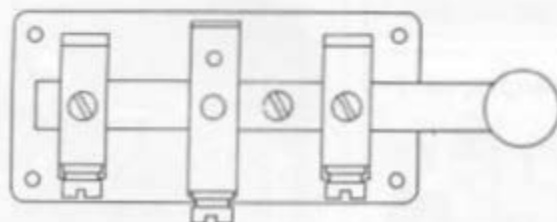
1A



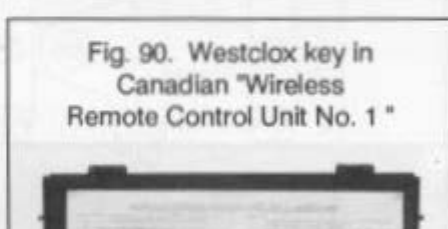
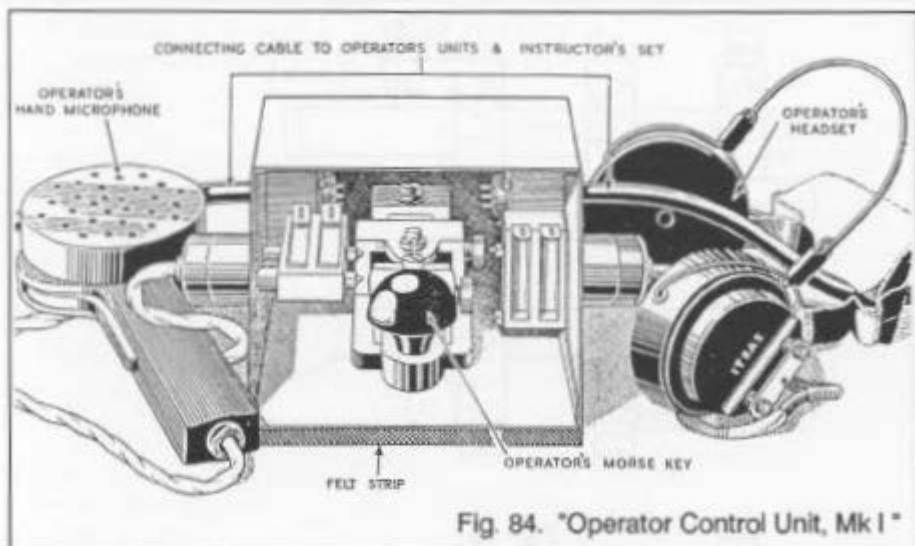
1B



1C



Drawing 1. Variations of Design No. 1



Electric Co. It was used exclusively in KEY AND PLUG ASSEMBLY NO. 9 (Fig. 95) issued with Canadian Wireless Set No. 19 Mk II. Note the absence of the front stop bridge. It had no braid connecting wire between the lever and bridge, which could eventually lead to poor contact.

Fig. 89. Design 1, variation F, Canadian "WESTCLOX" key. The Canadians used the Westclox key exclusively in many of their later WW II signal equipments, including a version of "Key and Plug Assembly No. 9" (Fig. 102). The key is made along the British design 1, variation C, but differs considerably, having a lever and general construction of pressed steel.

Fig. 90. "WESTCLOX" key mounted in Canadian "Wireless Remote Control Unit No. 1." The unit was used for remote control of Wireless Sets Nos. 9 (Can), 19 (Can), and 52 (Can). Note the absence of a cover for the lever.

Design No. 2

The KEY W.T. 8 AMP No. 2 Mk II model (variation A) is of a simpler construction, having the space contact in the front. The fixed contacts are embedded in the bakelite base. A later version (variation B) uses a molded bakelite lever. Its bakelite base is similar to that of earlier Variation A keys.

The No. 2 Mk III model (variation C) was, as far as can be traced, made only in an all-molded-bakelite construction. The bakelite levers of the Mk II and Mk III models are basically similar; the construction of the base was altered.

Fig. 91. Design 2, Variation A, "KEY W.T. 8 AMP No. 2 Mk II." Note the basic difference: design 1 had the space contact in the rear, using three brass bridges, while design 2 keys had the space contact in the front, with the fixed contacts fitted in the base.

Fig. 92. Design 2, Variation B, "KEY W.T. 8 AMP No. 2 Mk II" with molded bakelite lever. The bakelite base is similar to that of Variation A.

Fig. 93. Design 2, Variation C, "KEY W.T. 8 AMP No. 2 Mk III," in all-bakelite molding. Note that the bakelite lever is similar to variation B.

Key and Plug Assemblies

The KEY W.T. 8 AMP was normally fitted in an instrument or mounted on a metal or paxolin (phenolic) baseplate, providing a stable fixture. When used under field conditions, a cover was provided, protecting the operator from high voltage and the key from dust and rough handling. The key and cover, complete with lead and jack plug, was designated a KEY AND PLUG ASSEMBLY. A variety of KEY W.T. 8 AMP NO. 2 models can be found mounted in the British assemblies. The Canadian- and US-made assemblies, however, had an exclusive key for every variation. Canvas knee straps are provided on the later KEY AND PLUG ASSEMBLIES.

Fig. 94. "KEY AND PLUG ASSEMBLY NO. 2B" (ZA 4500) was used with Wireless Sets Nos. 11, 12, 22, 33 and 53. It consisted of a metal base-plate on which a KEY W.T. 8 AMP (here shown with design 2, version A) was mounted. It had a large round knob guard and a twin connecting cord ending in a tip-and-sleeve plug. The initial No. 2 assembly was used with Wireless Set No. 2, while No. 2C was used with WS No. 11 in tanks. The No. 2D version could be found in Wireless Remote Control Unit G. For mounting on a table the base-plate could be fixed on "Slide No. 1."

Fig. 91. Design 2, var. A

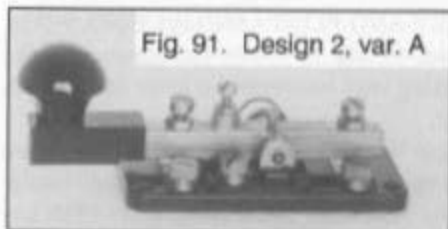


Fig. 92. Design 2, var. B

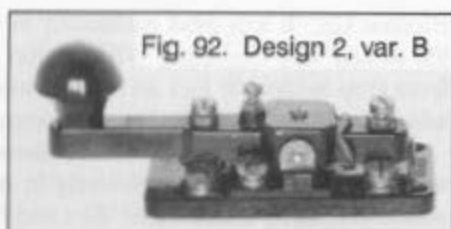


Fig. 93. Design 2, var. C

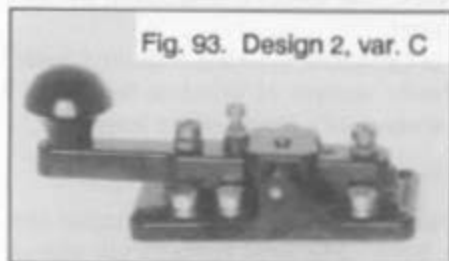


Fig. 94. *KEY AND PLUG ASSEMBLY NO. 2B *



Fig. 95. *KEY AND PLUG ASSEMBLY NO. 6 *

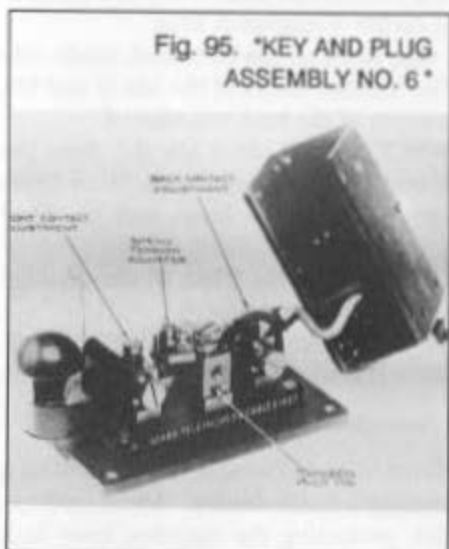


Fig. 96. *KEY AND PLUG ASSEMBLY NO. 8 *

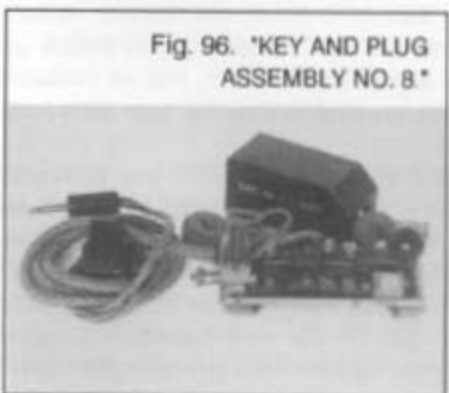


Fig. 97. Wireless Set No. 18

Fig. 95. "KEY AND PLUG ASSEMBLY No. 6" was used with Wireless Set No. 9. The key in the picture is a Design 1, variation B, on a paxolin base. The metal cover slides backward over the key. Note a different style of lever-protection cover having an additional guard.

Fig. 96. "KEY AND PLUG ASSEMBLY NO. 8" (ZA 4354), shown with design 2, version C key, was used with Wireless Sets Nos. 18 and 68. A send-receive switch is embodied in the assembly on the front below the key knob. A pin, fixed through a hole drilled in the base of the key, disables the key during receive. An aerial connector plug is normally stowed in a round spacing at the rear of the key. The assembly has a multi-wire cord ending in a two-point key plug and four-point connector to the transmit-receive circuit. A tropical version of the assembly is known as Key and Plug Assembly No. 8B (ZA 24790). This assembly can be recognized easily by its cover/metal baseplate of olive-drab color, a plug filled with moisture-resisting compound, and a rubber-covered cord. It was used with tropicalized versions of the No. 18 and 68 sets.

Fig. 97. Wireless Set No. 18. Developed in 1940, this was the standard British Army man-pack radio during WW II. It operated between 6 and 9 MHz with a range of 6 to 10 miles. The set was self-contained and comprised separate receiver (upper unit), transmitter (lower unit) and battery pack (in the bottom of the set). When operating CW, the transmit-receive switch (controlling the tube filaments of transmitter and receiver only) was part of the Key and Plug Assembly No. 8.

Fig. 98. "KEY AND PLUG ASSEMBLY NO. 9" (ZA 0937) was developed primarily for British Wireless Set No. 19 but later issued with other radios. The assembly shown in the picture has a design 2, version A key. Note the cardboard protection disk over the jack plug protecting the operator against contacting the high voltage when plugging into the set. (Canadian and some US-made sets had a cunningly devised protection flange mounted over the key socket.) Principally, No. 9 Key and Plug Assemblies were interchangeable. Careful study of wartime photographs shows a mixture in their use. Other British (tropicalized) No. 9 Assemblies are recorded, e. g., No. 9A (ZA 17693) and No. 9 Mk I/I (ZA 26291), differing very little from the initial No. 9.

Fig. 99. Early "KEY AND PLUG ASSEMBLY NO. 9," having a J-38 Morse key made in the US for Wireless Set No. 19 Mk II. The assembly has a very flat shape of the metal cover and uses an American PL-55 plug. Significant is the British mushroom-style knob and knob guard. A rubber sleeve over the key lever acts a protection cover. Compare this model with a standard J-38 and note the modification for reducing the size by having the hand-set lever screws replaced by the locking nuts inside.

Fig. 100. "KEY AND PLUG ASSEMBLY NO. 9" manufactured by Bunnell, issued with US-made Wireless Set No. 19 Mk II, uses exclusively the Design 1, Variation F key. The assembly name is printed on the side of the lever-protection cover. The metal protection cover has a black sprinkle finish; the connection cord is black, having a PL-55 plug.

Fig. 101. Northern Electric Co. "KEY AND PLUG ASSEMBLY R11950" was used with Canadian Wireless Set No. 19 Mk II and Mk III. (R11950 was the manufacturer's reference number; the unit was normally issued as "Key and Plug Assembly No. 9.") It has a Design 1, variation E key. The assembly name is

Fig. 98. "KEY
AND PLUG
ASSEMBLY
NO. 9"



Fig. 99. "KEY
AND PLUG
ASSEMBLY
NO. 9" (early
US-made)



Fig. 100. "KEY
AND PLUG
ASSEMBLY
NO. 9" (Bunnell).

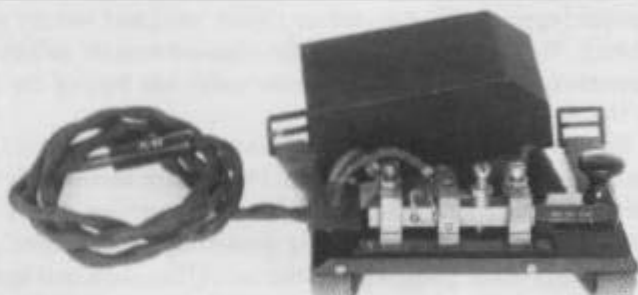


Fig. 101. "KEY
AND PLUG
ASSEMBLY
R11950"



Fig. 102. "KEY
AND PLUG
ASSEMBLY
NO. 9 CDN
WESTCLOX"



pressed into the front of the baseplate.

Fig. 102. Canadian "KEY AND PLUG ASSEMBLY NO. 9 CDN WESTCLOX" had a Design 1, Variation F key, made by Westclox. Note the round shape of the metal protection cover and PL-55 plug. The assembly name is pressed into the metal base plate. It was used primarily with Canadian Wireless Sets No. 19 Mk III and No. 52.

Fig. 103. Wireless Set No. 19 Mk III (Can). Developed for armored-vehicle communication early in WW II, the set was also used in other roles (here shown as a ground station mounted on a wooden base). The set consisted basically of a control unit (left), variometer for tuning the aerial (cylinder above control unit), power unit (center) and transmitter-receiver (right). It comprised three main functional units: the "A" set, operating from 2-8 MHz on radiotelephone, MCW or CW, and providing a range of about 10 miles; the "B" set, operating on 235 MHz with a very limited range; and an intercom set for crew communication. The Key and Plug Assembly No. 9 was made primarily for this set.

Fig. 104. Wireless Set No. 29 (Can), in ground-station configuration. The picture includes "KEY AND PLUG ASSEMBLY CDN NO. 9/2T" (ZA/Can 232). The assembly is very similar to the earlier Canadian Westclox No. 9 assembly, having a tropical finish.

Fig. 105. "KEY AND PLUG ASSEMBLY NO. 19" (ZA 28656). This unit was used with Wireless Sets Nos. 62 and C12. The assembly is provided with a "snatch" plug for inserting into one of the drop leads on the set. A snatch socket at the back of the assembly accommodates a second microphone and receiver headgear assembly in addition to the key. The key assembly is also known under "Key and Plug, Telegraph," NATO Stock No. Z1/5805-99-420-5943.

Fig. 106. Wireless Set No. 62, showing the connection of the KEY AND PLUG ASSEMBLY NO. 19. The No. 62 set was developed in 1944 and saw operational use at the end of WW II. The frequency range covered 1.6 to 10 MHz. It was built as a self-contained unit powered by a 12-volt battery. The set remained in use up to the 1960s.

100+ KEYS IN A BARN

Years ago, during a holiday vacation roaming around in Flanders, Belgium, in search of a town named Meulestede (obviously the place of one of the author's ancestors), we passed a war-surplus store (named "Stock Americain"). Stopping and making inquiries, it appeared that the owner had ceased trading. However, he invited me to have a look in his former storage barn on the other side of the road. Beside a load of rusty junk, I spotted a number of dusty crates filled with rusty Morse keys, apparently stored there a long time. A modest sum made me owner of the lot, not knowing that this included a nest of field-mice, hidden in the bottom of one of the crates. On return home, I dumped the crates in the garage and forgot the whole thing until the very next week my wife complained about mice . . . Eventually I got rid of the creatures and repacked the keys into cartons "for future use."

During preparation of this story, my wife reminded me of the tale. Opening the cartons after 16-odd years, they revealed a treasure of about 120 mainly British "KEY W.T. 8 AMP No. 2" Morse keys and "KEY AND PLUG ASSEMBLIES"

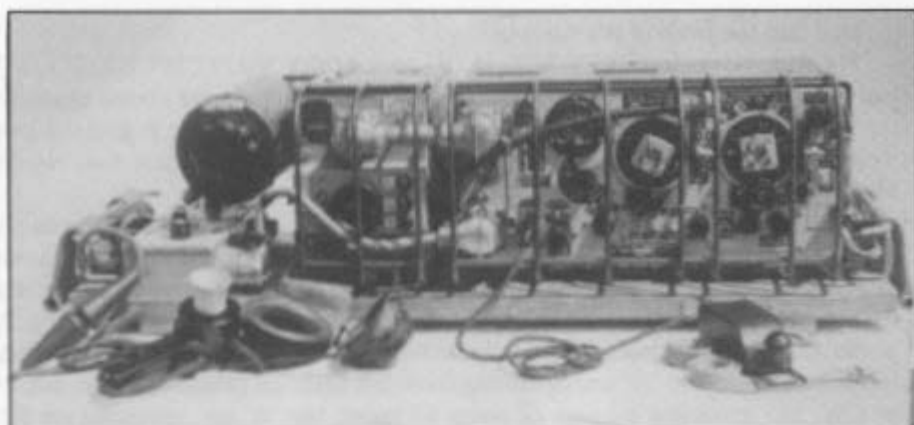


Fig. 103. Wireless Set No. 19 Mk III (Can)

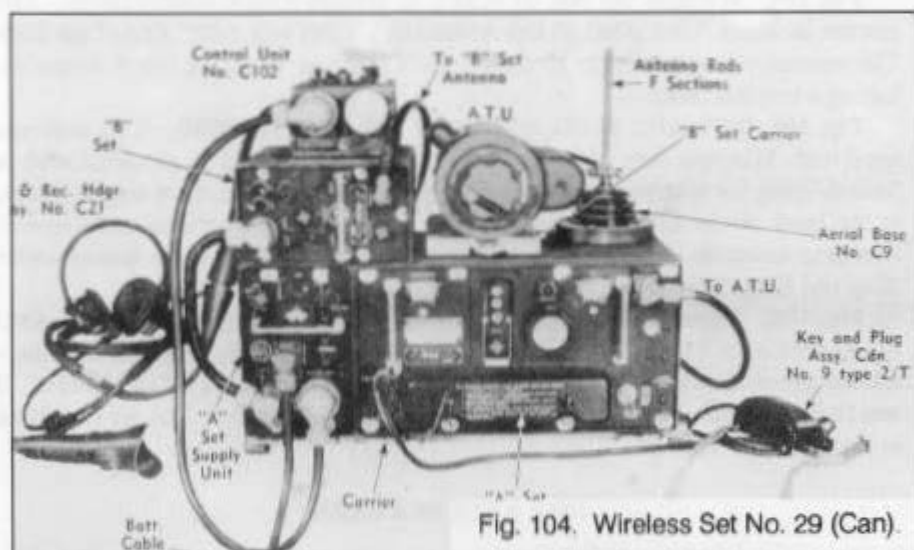


Fig. 104. Wireless Set No. 29 (Can).

Fig. 105. "KEY AND PLUG ASSEMBLY NO. 19"



in every design and variation. Some of the better specimens are pictured above. Fig. 107 illustrates the condition of some of the keys as obtained.

Fig. 107. Typical key and plug assemblies found by the author in Belgium. After long storage, fungus has grown all over the assembly. After cleaning it is remarkable to see how well the keys survived.

FINALLY

Incorporated in this paper are abstracts from various articles by the author, in which more detailed information about a particular subject can be found.

Many of the instruments or systems, e. g., the German "Sutel," Power Buzzer, and Eureka-Rebecca, are subjects for more detailed publication in future issues of the *Old Timer's Bulletin*.

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This paper could not have been produced without the help of my father, Anton Meulstee, who made most of the photographs, including difficult reproductions from technical manuals with the usual poor-quality pictures.

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Special thanks go to Murray D. Willer, VE3FRX, who made the author interested in the fascinating world of Morse keys.

SOURCES OF KEYS/PHOTOGRAPHS

Royal Signals Museum collection: Figs. 3, 6, 8, 12, 14, 15, 23, 28, 30-32, 34, 41, 42, 44, 47, 48, 76-78, 80, 81.

A. O. Bauer: Figs. 51, 53.

J. Bodiffee ("Signals Collection"): Figs. 43, 55, 58, 65, 79, 82.

J. Rijnders: Figs. 66-75.

L. A. Sibley: Figs. 20, 59.

R. Staritz: Figs. 5, 7, 16.

B. Warner ("2LO") collection: Figs. 11, 17, 26, 60, 62, 63.

REFERENCES

1. E. Niemann, *Funkentelegraphie für Flugzeuge* (Berlin, R. C. Schmidt, 1921).
2. L. R. Moreau and M. D. Willer, "Foreign and Military Telegraph Keys," *AWA Review*, Vol. 3 (Holcomb, NY: Antique Wireless Association, 1988), pp. 98-119.



Fig. 106. Wireless Set No. 62



Fig. 107. Key-and-plug assemblies "as found "

3. L. Meulstee, "Earth Current Signalling, the History of the Power Buzzer," *Journal Royal Signals Institution*, Vol. XVIII, No. 4, Spring 1988, pp. 228-235.
4. L. Meulstee, "Fullerphone," *Old Timer's Bulletin*, Vol. 30, No. 3, Nov. 1989, pp. 16-18.
5. L. Meulstee, "Saved by Radio: Evolution in Air-Sea Rescue Transmitters," *Radio Bygones*, No. 9, Christmas 1990, reprinted in the *Old Timer's Bulletin*, Vol. 31, No. 4, Feb. 1991, pp. 17-21.
6. L. Meulstee, "British Rear Link Radio Communication in World War II Pt. 1," *Hallo-Hallo, Periodical of the Norsk Radiohistorisk Forening*, Vol. 3/90, August 1990, pp. 29-34.
7. L. Meulstee, "Wireless on the Western Front, Pt. 1 to Pt. 6," *Newsletter of the Historical Radio Society of Australia*, 1986-1988.
8. L. Meulstee, "The Sutel 40," *Morsum Magnificat, Magazine for Morse-Telegraphy*, No. 15, Spring 1990, pp. 1-5.
9. L. Meulstee, "Larkspur," *Q-Five*, newsletter of the International Angry-Nine Association, Vol. 2, No. 1, Feb. 1993, pp. 9-16, and *Old Timer's Bulletin*, Vol. 34, No. 4, Nov. 1993, pp. 14-19.

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Born in 1942, Louis studied electrical engineering in Rotterdam. Before his national service in the Royal Netherlands Air Force, he was a service engineer in the field of maritime radio and radar. He joined the Dutch PTT in 1965 at the local mobile-radio branch at Rotterdam. In 1980 he was appointed supervising field engineer at the PTT GHQ Mobile Radio in the Hague. Presently he is at the privatized PTT Telecom, engaged in major mobile-radio projects including satellite communication. Louis lives in Schiedam with his wife and two daughters.

Always interested in the history and development of military (radio) communication, he started writing on this subject in the late 1970s and has published over 100 articles in various international magazines, newsletters, and



professional papers. He is presently working on a series of books depicting the technical development and history of British Army radio communication.