THE FUNDAMENTALS OF TELEGRAPHY FOR BEGINNERS

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INTRODUCTION

TELEGRAPHY is a system of communication unexcelled and unrivaled by any other method of transmitting intelligence. It employs a code of signals composed of dashes, dots and spaces transmitted over a wire through the use of a telegraph key and received by a telegraph sounder.

So marvelous has been the growth of Telegraphy that at present there are more than three hundred and fifty thousand telegraphers engaged in the various fields.

The purpose of this book is to give you the fundamentals of Telegraphy. It is not a finished course but after the code is mastered in both sending and receiving it will be an easy matter for the student to adapt himself quickly to the methods used by railroads or commercial telegraph companies.

The rules embodied herein, are standard as near as it is possible to make them and the student should remember that the rules of the various railroads differ and we suggest that the student secure a book of rules of the railroad or commercial telegraph company to acquaint himself with their particular requirements before accepting a position.

CHAPTER ONE

THE TELEGRAPH KEY

The Telegraph key is the first instrument that the student should acquaint himself with. It is a mechanical device for opening and closing the electric telegraph circuit and is used for the purpose of forming the characters composing the telegraph code.

The key consists of a lever mounted on trunnions and equipped with a composition knob. There are four adjustment screws and the various adjustments are shown in figure No. 1.

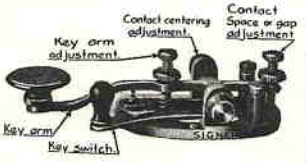

Fig. 1

The student should acquaint himself with the various adjustments and various parts of the key first, making sure that the contact points on the lever and base are in line; and before making any adjustments, see that the lock nuts are loosened, otherwise it is possible to strip the threads on the adjustment screws. The key switch (see Figure No. 1) is fastened to the frame and is equipped with a hard rubber knob. This switch should be closed when receiving a message and opened when sending, and when dry cells are used on a circuit the instrument should never be left with this switch closed as it will soon wear out the batteries. In actual operation with proper hook-up or circuit this switch is always closed when through sending as you will find explained later. The key as shown in Figure No. 1, has two binding posts on the top but there are some who prefer the leg key (see Figure No. 2) in which the leg screws are the terminals and are used in place of the binding posts.

All keys are adjusted and set properly before leaving the factory, however, it is possible that in shipment, a key will lose its adjustment; therefore, study your key closely and you will understand the reason for each adjustment and when sending try adjusting adjustment screws and set to the best adjustment for your hand. You should be able to make contact with a very light touch because a good operator sends with ease.

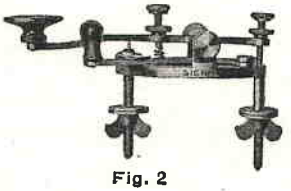
Fig. 2

THE SOUNDER

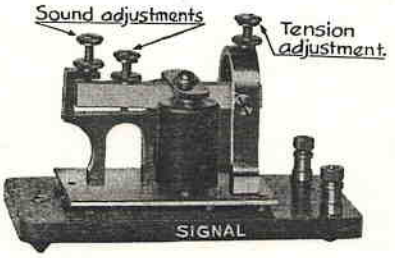

Fig. 3

The telegraph sounder is the receiving instrument from which the receiving operator reads the Morse characters made with the key, (see Figure No. 3). It consists of a bar and electro-magnets, movable lever with iron armature and a small coil spring, (see Figure No. 3). The sounding bar is pivoted in the bar frame and securely fastened to the armature of the electro-magnet. When current passes through the magnet core, the armature is attracted to the cores and the bar is pulled downward

against the bridge of the sounder frame. When the flow of current ceases, the cores no longer attract the armature and the bar is pushed upward to the upper stop on the sounder frame by the action of the spiral spring near the pivoted end of the bar. The movement of the bar should be about one-sixteenth of an inch and the distance can be regulated by means of adjusting adjustment screw (see Figure No. 3). After the proper adjustments are made it should never be tampered with.

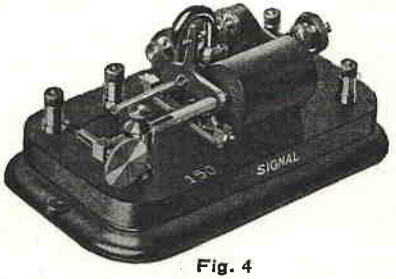

Fig. 4

THE RELAY

The relay is similar somewhat to the sounder although it is different in appearance and is not intended to produce a sound like the sounder. It is very sensitive to weak currents and weak signals and should always be used on circuits one mile or more in length. We recommend that the student use a relay in all circuits so that he can acquaint himself with the characteristics of this instrument. The relay being a very sensitive instrument and working in parallel with your sounder, the circuit current can be very low but your sounder will still produce the proper sound with a relay in the circuit; where no relay is used your voltage must always be kept at its highest peak.

The armature is mounted vertically and the coils horizontally.

The fine coil spring holds the armature away from the coils. The only practical work the electro-magnets have to perform is to overcome the tension of the spring because the armature is balanced. The relays cannot be used for receiving messages and great care should be taken in adjusting the relay. Remember that it is a very sensitive instrument and should be adjusted accurately. The armature when drawn towards the poles of the magnet should be parallel to the face of the poles and if not properly adjusted, loosen contact screws in the relay head and the base screws that hold the armature base, then place the armature firmly against the pole base and tighten the base screws and take care to maintain the wire connections which will be found in the base. The contact points must also be centered. The holes in the base are large enough to permit this adjustment.

Now, loosen the lock nuts and adjust contact screws in the relay head so that the armature will not touch the pole base and will give a movement of about 1/32". The clearance between the armature and the poles of the magnet should be about the thickness of an ordinary piece of writing paper when the armature is drawn towards the poles.

The tension of the armature spring should then be adjusted by turning the posts which wind up or let out the threads to which the spring is attached. The armature trunnion screws need not be reset until after long service and the armature should have plenty of play for free operation.

VARIOUS TYPES OF BATTERIES

There are three types of batteries that can be used in connection with Telegraphy; namely, dry cells, the sal-ammoniac cell and the gravity cell.

Fig. 5

The dry cell is the most used of the three types. It is intended for open circuit or intermittent duty only, and is the most practical type of battery for use with a learner set. There is no danger of spilling any solution; it is portable and very clean, but it should be remembered that when using a dry cell, it should always be disconnected when not actually in use. These dry cells are not re-chargeable.

The gravity cell, or wet battery, is considered best for service on lines in constant use. One unit is known as a cell and a number of cells comprise a set of batteries. It consists of a glass or glazed earthen jar, a piece each of copper and zinc (known as positive and negative poles, respectively), and a blue vitriol (copper sulphate), or bluestone solution.

After the materials have been procured, the jar should be thoroughly washed and the battery assembled in the following order: Spread out the leaves of the copper electrode and place in the bottom of the jar. A battery jar 5x7" requires 1¾ to 2 lbs., of copper sulphate and a jar 6x8" requires about 3 lbs., of copper sulphate. Place about one-third of the charge of copper sulphate between the leaves of the copper electrode. Dissolve the remainder in enough lukewarm water to fill the jar to within one inch of the zinc (crowfoot) when the latter is hung on the edge as shown in figure No. 6. Now connect the terminals of the cell together by means of a piece of wire and when the solution has cooled off to the room temperature, add water to it very carefully and slowly bringing the level of the water to about one-half or three-quarters of an inch above the zinc. Be very careful not to stir the solution and in pouring the water, it should never be poured directly into the jar; make a little trough of cardboard and pour the water on the cardboard allowing it to flow easily into the jar.

Fig. 6

The chemical action between the blue vitriol and the electrode produces the electric current as furnished by the battery. It requires approximately three days for this action to become effective although the time can be reduced if a little zinc sulphate (about three ounces) is dissolved in the water. It will be seen that the battery is short-circuited by the wires mentioned above and it should be left this way for six to twenty-four hours, depending upon whether or not zinc sulphate has been used. The action of the gravity cell depends upon the formation of a solution of zinc sulphate in the top of the jar. This solution is clear. The blue vitriol solution slowly diffuses through the white solution causing a chemical action to take place between the sulphate of copper and the zinc. When no zinc sulphate is used, there will be an almost black deposit formed on the zinc. This should be removed care being taken so as not to disturb the solution while removing the zinc for cleaning and replacing it.

As the battery is used, the line of demarcation between the two solutions will gradually recede towards the bottom of the jar and clear water should be added whenever necessary to bring the liquid in the jar to the proper level and a few crystals of copper sulphate should be gently dropped into the jar to keep the blue vitriol solution at the proper height and be sure to keep the same amount of crystals in the bottom of the jar at all times.

It will be necessary to clean the battery every eight weeks or three months.