"Service"

A DIGEST OF ELECTRONIC NEWS AND VIEWS

THIS magazine is designed to present students with current news and information affecting the field of Electronics. Articles dealing with general business subjects, which in many cases the student finds necessary for his complete success, will also be included. To enable readers to obtain original articles, details of the origin of any condensed matter will be quoted.

1948

No Luck Needed

A YEAR of promise, this! A year of grand opportunities to each and every one who will square up to it—us pummel it, mould it, coax it into giving him what he wants—and far-sighted and ambitious, guide his actions in the way that leads to success.

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On the crest of the wave?

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FEBRUARY, 1948

WHAT TO LOOK FOR IN THIS ISSUE

This monthly publication is produced by the
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HOME PRACTICAL INSTRUCTION LESSON No. 1

(Continued)

SOLDERING IRON.

The name soldering iron is not really a correct one for in practice the end of the soldering tool is always made of copper. For this reason a more correct name is "soldering bit". However, most people refer to the tool as a soldering iron.

A simple soldering iron, such as the one supplied with the kit of parts, may be heated by placing the copper portion over any flame. It is preferable to use a blue coloured flame such as that from a gas stove, blow lamp, or correctly adjusted kerosine burner rather than the yellow flame similar to that produced by an ordinary fire. A yellow flame will deposit a film of soot on the iron and this makes soldering difficult. Where electric power mains are available a far more convenient form of soldering iron is an electric one which will operate from the power. These are extremely handy and remain hot while ever power is switched on.

In the case of an ordinary soldering iron, care should be exercised not to heat it excessively. If it is made red hot the surface will become badly oxidised and it will be difficult to solder with. Before any soldering iron is used it must first be "tinned". This consists of heating the iron to a fairly high temperature, filing the pointed surface of it until it is thoroughly clean and then applying firstly some flux and then quickly some solder so that the solder spreads readily over the end of the iron leaving a silvery coating.

When large objects are to be soldered it is sometimes more convenient to employ a blow lamp operating from petrol, kerosine or gas, as a source of heat. After the surfaces are cleaned, flux is applied and heat from the lamp played on the surface until solder, touched to the surfaces, melts and flows over them. Of course, a flame of this nature cannot be used in the construction of a radio receiver as it would damage some of the radio parts.

INSTRUCTIONS FOR SOLDERING PRACTICE.

Having read the foregoing basic principles of soldering you are now in a position to carry out some experiments yourself by soldering various forms of wires together and onto solder lugs.

Supplied in the first kit of equipment you should find the following goods:

1 Soldering iron.
1 Coil of resin cored solder.
1 Tin of flux.
1 Coil of aerial wire.
1 Coil of insulated hook-up wire.
1 Coil of bare tinned copper wire.
1 Coil of heavily insulated lead-in wire.

1 Piece of sandpaper.
1 Length of resistor panel.
1 Reel of insulation tape.

As mentioned previously, the first step is to heat the soldering iron. This is done by heating it in a flame until it is hot enough for solder to run freely when applied to it. You will notice, however, that the solder instead of spreading smoothly over its surface merely drips off. This is because of the oxide film which is present. You then quickly take a file, and file the pointed surface of the copper until it is quite shiny and then, before it has cooled, plunge it quickly into a small amount of soldering flux and immediately apply some solder to the pointed end. Instead of the solder dripping off it will now spread in a film over the surface you have cleaned.

If you experience difficulty in getting a smooth film or surface on the pointed end of the copper the first time you try, then repeat the process again.

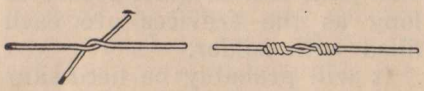
If you do not possess a file you will be able to clean the end of the iron by polishing it thoroughly first with sandpaper, before it is heated. You should then heat it in a flame and quickly polish it again with sandpaper before applying the flux and solder.

If you should ever overheat the iron, by making it red hot, you will burn off the film of solder and it will be necessary to repeat this process of tinning.

EXERCISE 1.

BARE TINNED COPPER WIRE.

Take two short pieces of the bare tinned copper wire and join them together mechanically by forming a splice as illustrated in Figures 3a and b. The splice is made by crossing the ends of the wires so that about an inch of each is protruding as shown in Figure 3a. The end of one is then twisted several times around the second and



a. b.

Fig 3.

then the end of the second is twisted several times around the first as illustrated in Figure 3b. Pulling the two wires will simply lock the joint tightly and it will be found quite strong mechanically. Before crossing and twisting the wires, the ends of each should be cleaned with the sandpaper for about two inches so that the wires are perfectly clean and shining.

A thin smear of soldering paste may now be spread evenly along the whole of the twisted portion of the wire. The best method of applying heat to a joint of this nature is to hold the hot soldering iron underneath the twisted portion of the wires until the flux melts and flows freely down through the wire. The flux will sizzle and smoke and then some solder can be applied on top of the twisted portion of the wires. After a

few moments the wires will become so hot that the solder resting on them will become molten and run down through all the crevices of the twisted wires, filling them with solder. After the solder has flowed down through the wire the soldering iron may be removed. It is not necessary to continue pasting a lot of solder on top of the wire so that all of the turns are completely hidden under a thick pasting of solder. The joint will be quite secure so long as the crevices are each filled with solder.

It will probably be necessary to start at one end of the twisted section of the wire and then, after the solder has run through this portion, to move the iron along a little further towards the other end, at the same time moving the solder along so that it spreads and eventually covers the whole length of the joint.

Repeat this exercise over several times until you feel quite confident that you can make a successful soldered connection.

EXERCISE 2.

JOINING INSULATED STRANDED WIRE.

Cut two short lengths of the insulated hook-up wire supplied. Before soldering, it is of course necessary to remove the insulation from the portions of the wire to be joined. One method of removing the insulation is to cut lightly around the outside of the wire with a razor blade or knife. Care must be exercised not to press so heavily as to cut the thin strands of wire inside. After making a circular cut right around the insulation the section to be removed may be pulled off with one's fingers. This method is not to be recommended because of the likelihood of cutting through the insulation and cutting off some of the strands of wire inside.

A far more effective method which can be used in the event of a pair of pliers with wire cutting jaws being available, or alternatively in the case of a pair of scissors being used is to grip the scissors, place the wire between the jaws and then squeeze just tightly enough to make an indentation in each side of the insulation with the jaws. Do not squeeze too hard or you will cut the insulation and wire right through. After making the indentation you should pull the scissors along the wire firmly and you will find that they strip off the insulation between the point where they are touching the wire and the end. In the case of a pair of pliers fitted with wire cutting jaws, they should be held as illustrated in Figure 4. It is most important to keep the little finger on the inside of one of the handles and not to place all of the fingers around the handle in the natural manner. By keeping the little finger inside the handle it is possible to hold the jaws slightly apart and prevent them cutting right through the wire when they are squeezed gently onto

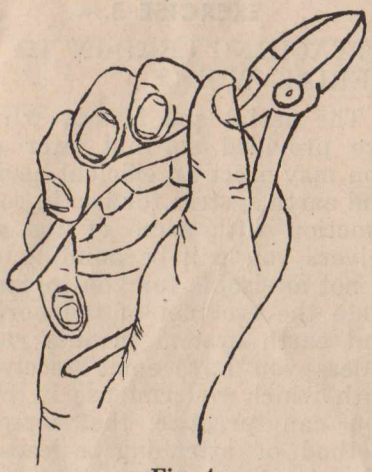


Fig. 4.

the insulation. When the pliers have been closed sufficiently for each jaw to bite gently into the insulation the pliers may be pulled firmly along the wire and they will strip off the insulation.

The natural tendency at first, is to close the pliers too firmly so that the jaws bite not only through the insulation but through the wires too and cut several or all of the strands. Several attempts may be necessary before you are successful in stripping off the insulation without damaging the wire but it is most important to practice this art so that you can strip wire cleanly and quickly.

Having bared about two inches of each of the wires to be joined, you will probably find the strands of wire inside are perfectly clean and bright because the surrounding insulation minimised the tendency to oxidise. In this case you can probably twist them without any further cleaning and proceed to carry out the soldering operation. The wire should be crossed and twisted as illustrated in Figures 3a and b, and then the soldering carried out as explained in the foregoing exercise. One point about which we must be particularly careful is not to apply the hot soldering iron for too long a period. The iron must be used cautiously so that it is applied long enough to allow the solder to run down through the wires but yet not long enough to melt off the insulation for a considerable distance back from the joint. The type of insulation used on hook-up wire will generally melt or soften under the influence of the heat of the soldering iron and will tend to peel back from the joint. If you are not fairly quick in carrying out the soldering operation you will find the insulation damaged for an inch or so back from the joint.

If you have used the right amount of soldering flux in the first place, no surplus will remain, but if you have used an excessive amount quite a lot will remain and this will have to be removed by means of a cloth dampened with methylated spirits or alcohol before any insulation is placed over the joint.

After joining insulated wire it is generally necessary to replace some form of insulation to prevent a short circuit where the wire has been bared for purposes of making the joint. Enclosed with your kit you will

find a reel of insulation tape which you should use to wind carefully around the joint to restore the insulating quality of the wire.

When using insulation tape it should not be peeled back off the reel until you are ready to use it. You then peel it off the reel and commence winding a length of it around and around the wire starting about half or three-quarters of an inch along the insulated part of the wire and working towards the joint, across the joint and for about another three-quarters of an inch on the other side. Each time you wind the tape around the wire you should move the tape along a distance about equal to half of the width of the tape so that the insulated joint is covered everywhere with at least two thicknesses of insulation tape. The final joint will appear somewhat as illustrated in Figure 5.

Fig. 5.

Practice stripping the insulation off the wire until you can do this without damaging the wire and practice soldering the spliced joint till you can carry out the soldering without damaging the insulation on each side of the joint.

EXERCISE 3.

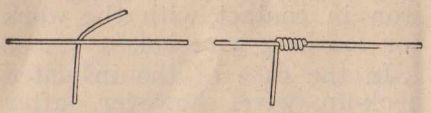
ATTACHING LEAD-IN TO AERIAL WIRE.*

The aerial and lead-in wires are provided so that later on you may erect an efficient aerial and earth system for use in conjunction with some of the receivers you will be building. It is not advisable for you to complete the erection of the aerial and earth system in this case unless you have some receiver with which you can use it, but you can practice the correct method of attaching a lead-in wire to an aerial so that you will be proficient when the time comes to erect your aerial and earth system.

The wire normally used for an outdoor aerial consists of three strands of fairly thick gauge copper wire. This wire is normally bare but the lead-in wire has to be insulated. Consequently, because of the necessity for using two different types of wire a soldered connection is necessary where they join.

One method of attaching a lead-in wire to the aerial wire is to carefully scrape the aerial wire so that it is quite clean for a length of about two inches at a point a distance of about 6 inches or so in from one end. You should then remove the outside braiding and rubber insulation from the thick lead-in wire provided. It will be found difficult to remove two or three

* See A.R.C. Service Engineering Course. Lesson 4.



a. b.

Fig. 6.

inches of this insulation in one attempt so it is generally necessary to remove about an inch of insulation at a time and make two or three attempts to bare the necessary length of lead-in wire. Even after this process it will probably be found that particles of the rubber insulation are adhering to the wire and these must be very thoroughly removed by scraping the wire with a knife or alternatively, cleaning it properly with the sandpaper provided. When the wire is perfectly clean it may be wrapped around the aerial wire itself as shown in Figure 6a and b. After it has been twisted around the aerial wire five or more times you may apply flux to the joint and carry out the soldering operation as explained in Exercise 1.

Because of the difficulty of procuring 3/.036 bare copper wire which is the type normally used for outdoor aerials, a special stranded copper wire covered with special insulation to withstand outdoor climatic conditions has been supplied in the kit. This wire should not be mixed with the ordinary hook-up wire because it is especially suitable for aerial construction, and you will need it for this purpose later on. However, you may practice with a few short lengths cut from one end of it at this stage, to become proficient in making a joint.

Because the thin strands of copper wire used in this form of aerial wire are not very strong it is not advisable to remove the insulation at a point somewhere along the length of the aerial and attach the lead-in. With this type of wire, it is desirable to thread the aerial wire through or around the insulator and then to knot the end of the aerial wire around the aerial itself as shown in Figure 7. The end of the knot may then be bared of insulation, a length of lead-in wire formed into a right angle to lie parallel with the aerial wire and the end. The stranded wire is then wound around the bared end of the lead-in wire and solder applied. After the soldering is completed a heavy binding of insulation tape should be used to bind the lead-in wire, aerial itself and the end of the aerial wire, all into one solid mass. The tape should be extended over the soldered joint so as to minimise corrosion at the point where the insulation is removed from the thin aerial wire. This is illustrated in Figure 7.

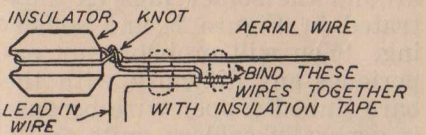


Fig. 7.

EXERCISE 4.

RESISTOR PANEL WIRING.

Before attempting to solder any wires to solder lugs attached to a length of resistor panel, it is desirable to tin the solder lugs. This is accomplished by applying a very small dab of flux to each lug and then picking up a drop of solder on the end of the soldering iron and carrying it across to deposit it upon the lug. The iron of course should be left in contact with the solder lug long enough for the lug to be heated and for the solder to flow freely from the hot iron and spread over the lug. If any difficulty is experienced in making the solder flow over the lug it will be necessary to sandpaper the surface of the solder lugs until they are perfectly clean and bright. However, in the case of new resistor panels the lugs are usually clean enough to enable the soldering operation to be carried out without any necessity for cleaning the lugs with sandpaper.

After you have tinned the solder lugs, cut several short lengths of bare tinned copper wire and several short lengths of insulated hook-up wire. You can then practice twisting these around the solder lugs as illustrated in Figure 2, and soldering. You will probably not experience any difficulty with the bare tinned copper wire because it generally solders quite easily and there is no insulation on it to be damaged by leaving the iron in contact with the work for too long a period.

In the case of the insulated hook-up wire, however, after baring the wire and twisting the end around the lug you should carry out the soldering operation fairly quickly so that the heat of the iron does not damage the remaining insulation on the wires. At the same time, the iron must be left in contact with the work long enough to heat both the wire and the solder lug up to such a temperature that the solder will run freely onto both.

After carrying out the exercises described you should be fairly proficient in soldering lengths of wire. It is still desirable, however, for you to obtain additional practice by soldering small pieces of metal to one another. You will doubtless be able to find several small pieces of metal with which you can practice soldering. Easiest metals to solder together are pieces of clean shining tin plate. Do not attempt to solder very large pieces of metal with the small soldering iron supplied with this kit. Cut the pieces of metal up into strips about half an inch wide and practice on these. If you can obtain any brass, copper and other metals, practice with these also because unless you are very thorough in cleaning these metals, you will find them difficult to manage and consequently some practice is desirable. As mentioned earlier, it is not an easy task to solder aluminium and conse-

quently it is unlikely that you will meet with any success should you try.

The soldering flux provided will be sufficiently effective on all metals excepting aluminium so that it will not be necessary for you to worry about trying any other special form of soldering flux.

RULES FOR SUCCESSFUL SOLDERING.

In conclusion, I will again list briefly the important points which must be observed before you can solder successfully.

(1) The iron must be clean and well tinned.

(2) The two surfaces to be joined must be thoroughly cleaned of all forms of oxide film so that both surfaces of metal are bright and shining.

(3) The correct amount of flux is that which will completely evaporate during the soldering operation without leaving any surplus remaining.

(4) The soldering iron must be left in contact with the work long enough to enable both surfaces to be joined, to be heated to a temperature higher than the melting point of solder, about 450 or 460 degrees F., so that the solder flows readily from the iron and spreads evenly over both surfaces. If the iron is not left in contact with the work long enough to heat each surface sufficiently, the solder may be pasted onto the work but it will be found later that the solder will peel off easily when given a slight pull. This is known as a "dry joint".

(5) When the solder has run freely onto the work and the soldering iron is removed, care should be taken not to shake or disturb the work or the solder until it has had time to cool and solidify. If the work is shaken when the solder is in the plastic state, before it finally sets hard, a bad connection will often result as the solder will not effectively grip the wire it surrounds.

Good soldering is quite an art and is only learnt through a considerable amount of practice. Therefore, repeat the various exercises outlined over and over again until you feel quite confident and efficient at soldering.

TELEVISION PSYCHOLOGY

IS THE LARGE SCREEN ESSENTIAL?

By PAUL BELLAC (Engineer, Swiss Broadcasting Service)

(From "WIRELESS WORLD", England.)

It is extremely interesting to follow in the British and American technical periodicals the debate on the improvements of television reception. This fundamental problem has a direct and wide effect on the construction of television receivers. The question is: Ought we to keep on building receivers for the direct vision of the image on the screen of the cathode-ray tube, or should we go over to the intricate projection apparatus?

It is obvious that viewers are not satisfied with the size of the picture given by pre-war receivers; they insist upon seeing bigger images. For some people, the future of television depends upon the solution of this important question. It is a fact that the present 7½in. × 10in. picture or even the 9in. × 12in. image of the more expensive receivers is quite unsatisfactory. The mind of the viewer cannot free itself from the impression of midgets given by seeing the tiny figures moving on the screen.

On the other hand, many manufacturers take the point of view—which physically is unquestionable—that a small object seen from near appears just as big as a big one seen at a distance, providing both are observed from the same angle. To the spectator sitting in the back row of a cinema the big projection screen may well appear smaller than the screen of his home receiver. Therefore, the small screens should be sufficient, so far as the home television receiver is concerned.

However, this conclusion does not take into account the phyio-psychological problems connected with the human eye which, as far as we know, have never been pointed out yet, though the part they play is an extremely important one.

When looking at a near-by object, the axes of the eyes strongly converge, contrary to their position when looking from a much greater distance. This convergency is brought about by a special tension of the optic muscles, and gives our consciousness the signal "near". Therefore everything we observe from a short distance gives us the impression "near". But we can receive the impression "big" only if we are involuntarily obliged to move our eyes or even our head in order to see the whole of it. The eye constantly sweeps the field of vision and the operating process of the eye combines the whole of the image by means of the impressions received. There

are many examples of this. For instance, every photographer knows the advantages of enlargements even when they do not reveal new details. The effect of the Tanagra Theatre—in which, through the action of mirrors, living actors appear as small as dolls—is also based on this physio-psychological principle.

Further, we notice in television a marked discrepancy between the smallness of the image and the intensity of the sound. To see small figures move and to hear them speak or sing with the whole strength of the human voice produces an unpleasant impression. The combination of all these elements makes it desirable to give to the home television set a size approaching that of the home moving pictures. As long as this condition is not fulfilled, the reception of television will never be satisfactory, even when reproducing the transmitted image with all its details.

It is evident that there is a future only for the projection television receiver which meets the public's wishes.

ELECTRIC FISH SCREEN

Rows of energized and grounded electrodes 18 in. apart are immersed in the water intake at Michigan City Generating Station. Impulses impressed on these at 300 to 600 volts by an electronic generator (5 per sec. when many small fish are running, 1 per sec. otherwise) produce a field in the water which scares, but does not harm, the fish. A 120-mf. condenser is charged with d-c through an adjustable (for timing) series resistance and discharged through the electrodes by a thyratron tube.

—Electrical World

If you must kill time, why not try working it to death?

Not only strike while the iron is hot but make it hot by striking.

—Cromwell.

ELECTRONIC BEARING SORTER

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—Business Week

They stumble that run fast.

—Shakespeare.

A fellow may be a fool for gambling and a fool for women, but if he's a fool for work, he's no fool.

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