UNIT THREE

FASTENING DEVICES

LESSON A

1. BOLTS

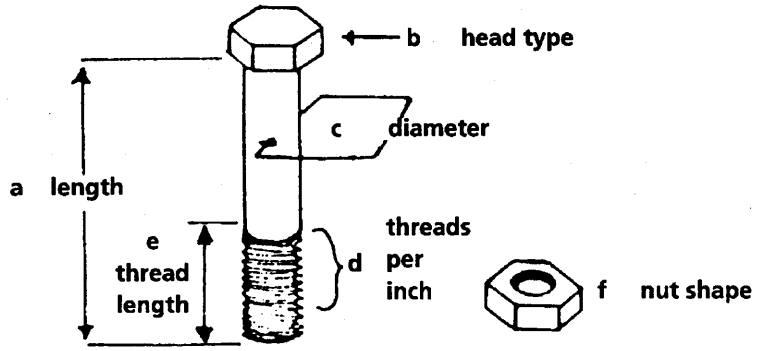


Figure 1.- Bolt features

Figure 1 illustrates a typical bolt. Bolts are straight rods that are threaded on one end and have a head on the other end. Bolts are usually secured by a nut. Bolts are described by their *length* (figure 1a), *head type* (figure 1b), *diameter* (figure 1c), the number of *threads per inch* (figure 1d), *the length of the thread* (figure 1e), and the *nut type* (figure 1f).

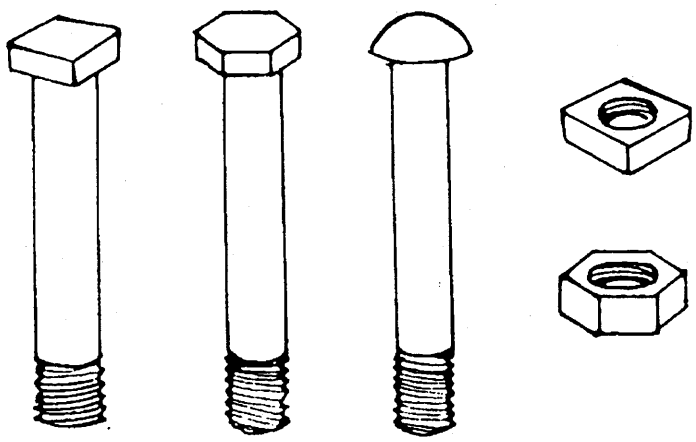


Figure 2.- Machine bolts

Figure 2 shows three *machine bolts*. One has a square head, one a hex head, and one a round head. They could be used with a square nut or a hex nut. But note that all of them have a simple straight shank and a relatively short thread. These last two features are characteristic of machine bolts. Machine bolts are inserted into drilled holes and locked with a nut from the opposite side.

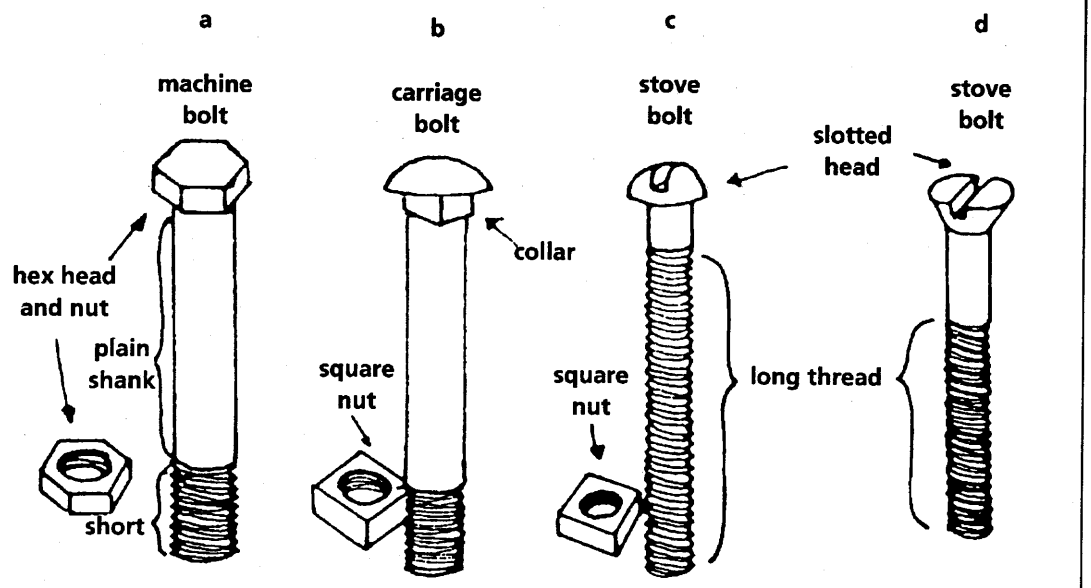


Figure 3.- Comparison of bolts

Figure 3 compares a typical *machine bolt* (figure 3a) with a *carriage bolt* (figure 3b) and a *stove bolt* (figure 3c). The machine bolt has the straight plain shank and short thread that was described. The *carriage bolt* (figure 13b) has a locking collar on the shank. The square locking collar wedges into the round hole and prevents the bolt from rotating when the nut is tightened. Square nuts are usually used when working with wooden pieces. The *stove bolt* (figure 3c) has a slotted head and a relatively long thread and is usually used with a square nut. The stove bolt is a general purpose bolt and is used with either wood or metal. The stove bolt may be made in different head types. See figure 3d.

2. NUTS AND WASHERS

Nuts are used to secure bolts. They may be any of several shapes such as square, hex, etc. Washers are often put on the bolt between the nut and the surface of the material. In general, a washer is a flat, round disc of metal with a bolt-size hole in the center. Washers are used for many purposes.

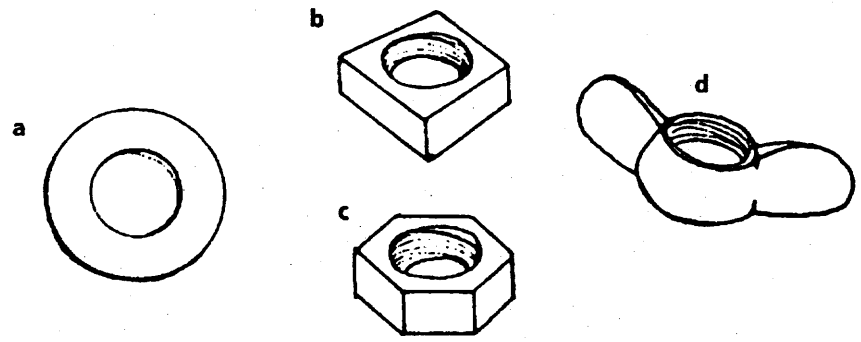


Figure 4.- Flat washer and nuts

Figure 4a shows a plain *flat washer.* It is usually put on the bolt under the nut. When it is used on bolts in wood, it performs three functions; it protects the surface from damage by the nut; it provides a smooth surface for the nut to turn on; and it distributes the pressure of the nut over a larger area. Sometimes washers are also put under the head of a bolt for the same reasons.

Figure 4b and 4c are nuts; b is a *square nut* and c is a *hex nut.* Hex nuts and square nuts are tightened with wrenches.

Figure 4d shows a *wing nut.* A wing nut has a flat projection on each side so it can be tightened and loosened easily with the fingers. Wing nuts are used when it is necessary to remove the nut frequently and when it is not necessary to apply a large amount of pressure to the nut.

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CLASSWORK ASSIGMENT : LESSON A

The following exercises should be completed in class with the instructor´s assistance

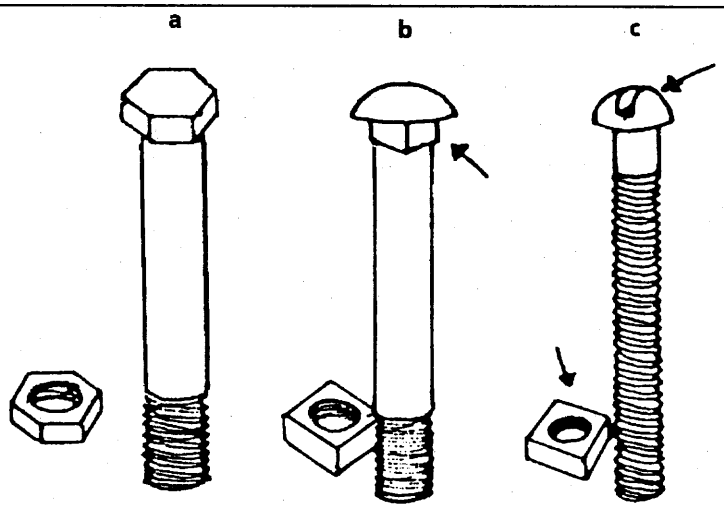


Figure 1

1. Look at figure 1. Write the names of the fasteners in the spaces below.

a is a _____ _____

b is a _____ _____

c is a _____ _____

All of the fasteners in figure 1 are _____. They are inserted in _____ through the material and locked with a _____.

Bolt a, the _____, can be used with wood or _____. Bolt b, the _____, is made especially for use with _____. The carriage _____ has a square _____ under the head. The _____ collar wedges in the hole so that the bolt won´t _____ when the nut is tightened. Bolt c is called a _____ bolt. It is a _____ purpose bolt; it can be used in wood or _____. It has a _____ head.

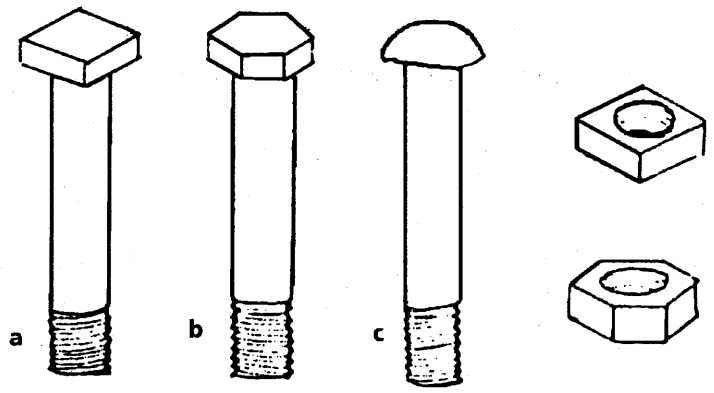


Figure 2

2. Look at figure 2. Write the names of the fasteners in the spaces below.

All trhee bolts are _____ bolts.

a is a _____.

b is a _____.

c is a _____ .

Bolt _____ Is the most common type

A _____ nut or a _____ nut may be used

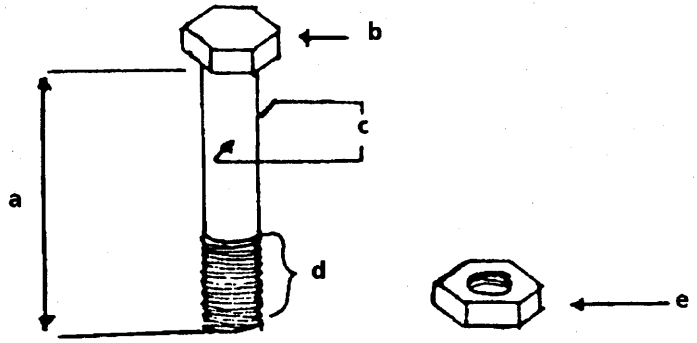


Figure 3

3. Look at figure 3. If showx the measurements used tio describe bolts. write the measurements n the spaces bellow.

a. refers to _____

b. refers to _____

c refers to _____.

d refers to _____.

e refers to _____.

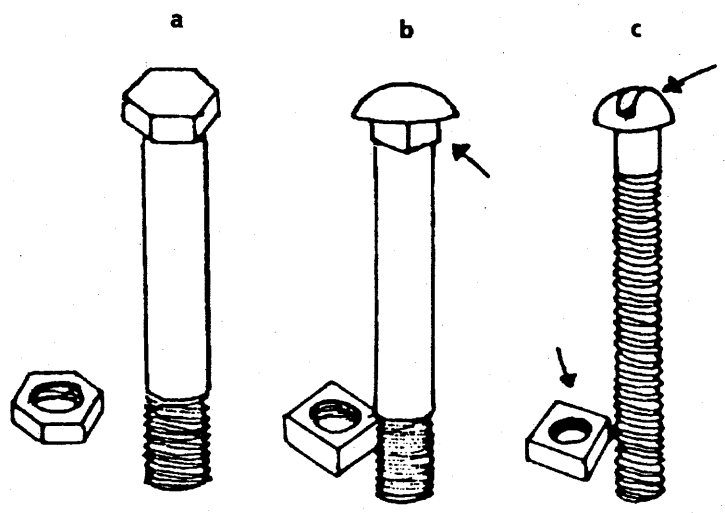


Figure 4

4. Look at figure 4. Write the missing words in the space below.

a is a _____. It has a _____ head and a _____ nut, it has a plain round _____ and a relatively _____ thread length.

b is a _____. It normally has a _____ head. Below the head is a _____ that wedges it in the hole. It has a relatively _____ thread length and usually has a _____ nut.

c is a _____. It has several types of heads but they are all _____ to engage a screwdriver. The thread. length is relatively _____.

They normally use a _____ nut.

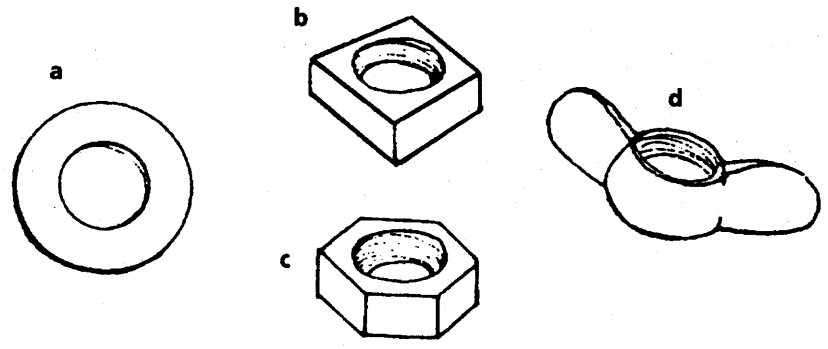


Figure 5

5. Look at figure 5. Write the names of the objects in the spaces below.

a is a _____.
b is a _____.
c is a _____.
d is a _____.

The _____ washer is put on the bolt between the material and the _____. The _____ nut and the _____ nut are tightened with wrenches but the _____ nut is turned with your fingers.

UNIT THREE

FASTENING DEVICES

LESSON B

1. COMMON SAFETYING METHODS

It is often necessary to secure a bolt or cap screw so that it cannot turn or become loose. Yet, the method used must be simple enough that the bolt or screw can be removed when it is necessary. These methods of semi-permanently securing nuts and bolts are called *safetying methods*. The three most common methods are the use of a *cotter pin, safety wire*, or a setscrew.

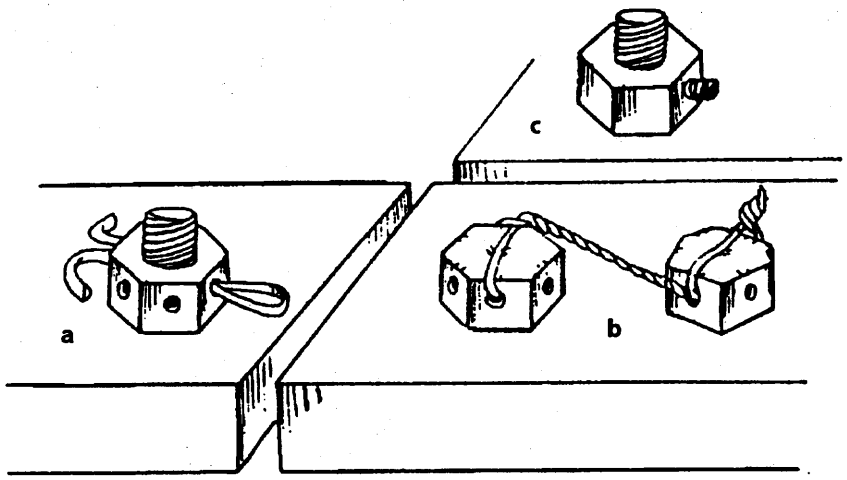


Figure 1.- Safetying methods

Figure 1a shows the use of a *cotter pin* to secure or safety a nut. The pin is inserted through the hole in the nut and bolt, then the ends are bent to hold it in place.

Figure 1b shows the use of *safety wire*. Safety wire is a strong wire that is inserted through holes in nuts and bolts and then twisted so the nut or bolt cannot turn.

Figure 1c shows the use of a *setscrew* to secure a nut. A setscrew may engage a slot in the bolt, as in figure 1c, it may be used to force a lead (Pb) ball into the bolt threads, or it may be a pointed end setscrew that locks the nut by pressure.

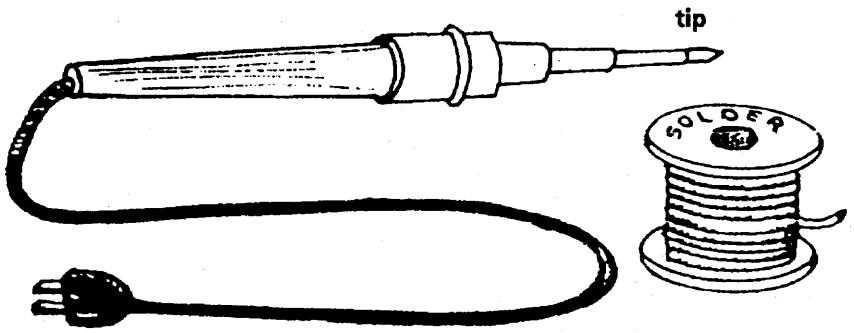


Figure 2.- Soldering iron and solder

2. ELECTRIC SOLDERING

Figure 2 shows a *soldering iron* and a roll of *solder*. Metals are soldered together much in the same way that pieces of wood are glued together. The soldering iron is heated by electricity, if it is an electric soldering iron as in figure 2, or by a flame, if it is a simple soldering iron. The hot *tip* of the soldering iron is used to melt the solder so that it covers or joins the pieces that are to be fastened together. When the solder cools it becomes hard. If the soldering has been done correctly, the hard solder will hold the pieces together. Solder does not make a strong connection, but it is a rapid, simple way to join metals. Solder is often used to join together electrical parts the wires in radios, televisions and other electrical equipment. The solder is a good conductor of electricity. Figure 4 shows a soldering gun. Soldering guns are a form of soldering irons. They are more convenient to use when a large number of small soldering jobs are to be done. See figures 3 and 4.

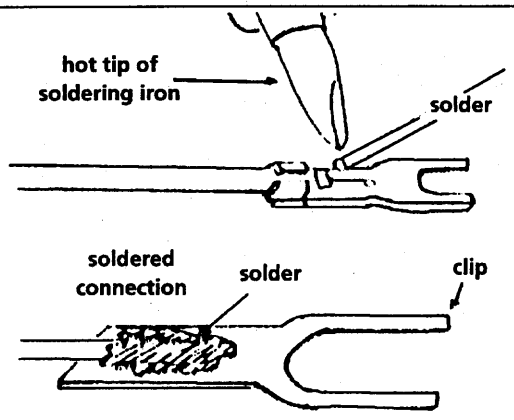


Figure 3.- Soldered connection

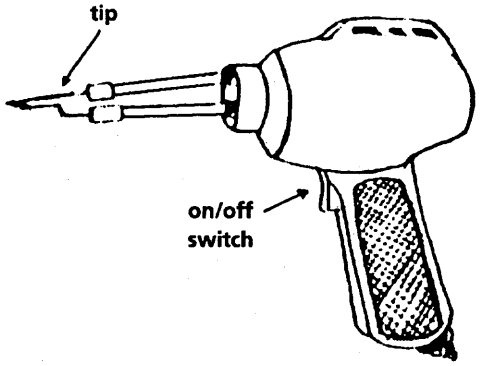


Figure 4.- Soldering gun

3. WELDING

Welding is completely different from any of the metal fastening methods we have discussed so far. In all of the other systems, the two pieces are held together by a fastening method but they still remain as two pieces. Welding uses an extremely hot flame to melt the pieces together so that when they cool they are one piece at that place; they are no longer two separate pieces of metal. The high temperature required by welding are produced by burning the gases, and directing the flame at the parts to be welded. The gases are stored in metal tanks. A regulator is attached to the tanks to control the flow of gas. The gas moves through hoses to the torch unit. The gases are combined at the torch unit and burned at the tip. See figure 5.

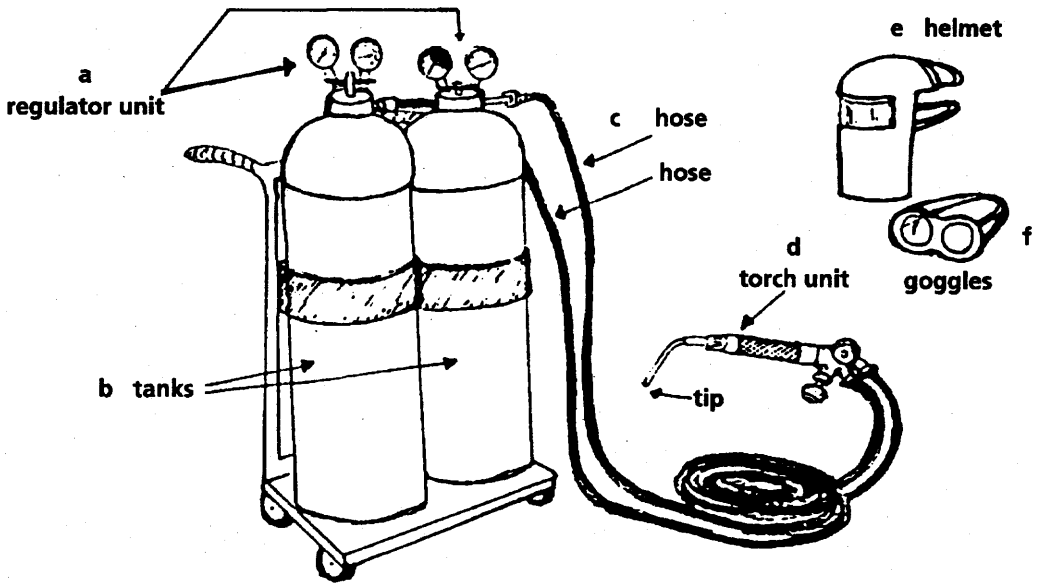


Figure 5

Welding is a dangerous process due to the hot, bright flame and the high temperature used. The welder and all people around can not look at the flame unless their eyes are protected by very dark glasses, either in the form of *goggles* or in a *welding helmet* or face shield. The bright flame of the welding torch will produce permanent damage to the eyes unless they are protected. In addition, the metal pieces and sparks from the flame are very hot and can produce bad burns unless gloves and protective clothing are worn.

There is another system of welding called *arc welding* that uses electrical current to produce the heat for welding. It produces the same dangers as a hot, bright flame, very high temperatures, and the additional dangers associated with electrical equipment.

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CLASSWORK ASSIGMENT : LESSON B

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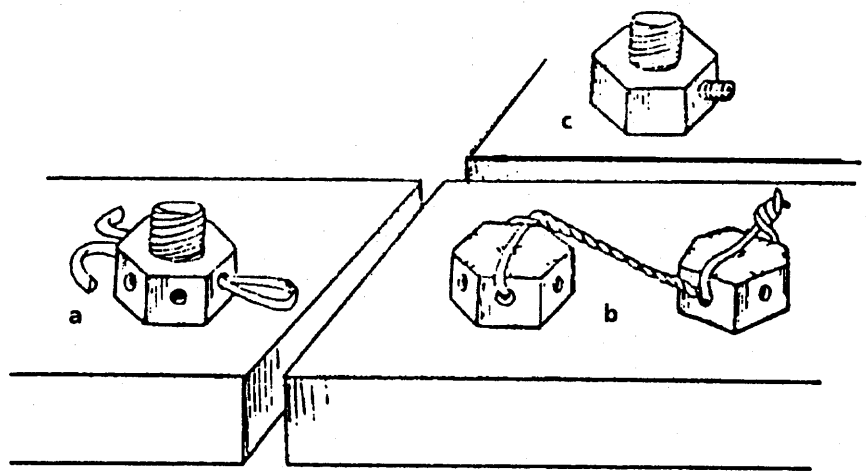


Figure 1

1. Look at figure 1. Write your answer in the space below.

Bolt a is secured by a _____.

Bolt b is secured by _____.

Bolt c is secured by a _____.

These bolts are _____. When a bolt is safetied, it is _____ so it can not turn or become loose. One method of _____ a bolt, as in figure 1a, is to use a _____ pin. Another way to secure or _____ a bolts is to use safety _____, as in figure 1b. The wire is _____ through the bolts and _____ so that the bolts can´t turn. In figure 1c the bolt is _____ by a _____ _____. All of these methods are considered semi _____. They secure the bolt or nut, but they can be _____ if it is necessary to turn the nut or bolt.

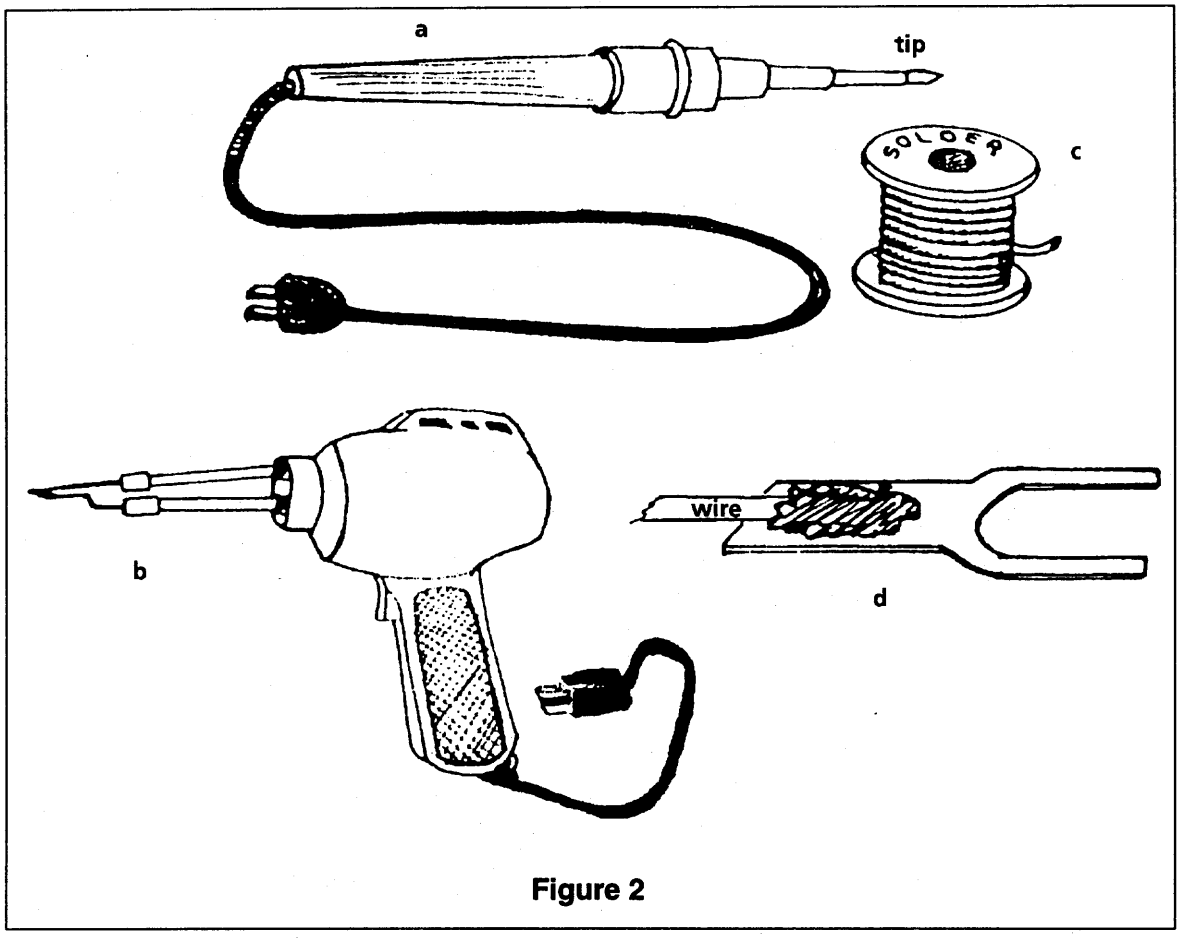


Figure 2

2. Look at figure 2. Write your answer in the spaces below.

a shows an electric _____ _____

b shows an electric _____ _____

c shows a roll of _____

The connection in d is fastened by _____.

It is a _____ connection.

The soldering _____ or _____ is used to melt the _____ so it covers or _____ the pieces. When the solder _____ and becomes hard, the pieces are held together. Soldering _____ is very similar to _____ wood. A soldered _____ is not very _____, but it does make a good electrical _____, Many _____ parts are soldered in Tvs, radios, and other electronic equipment.

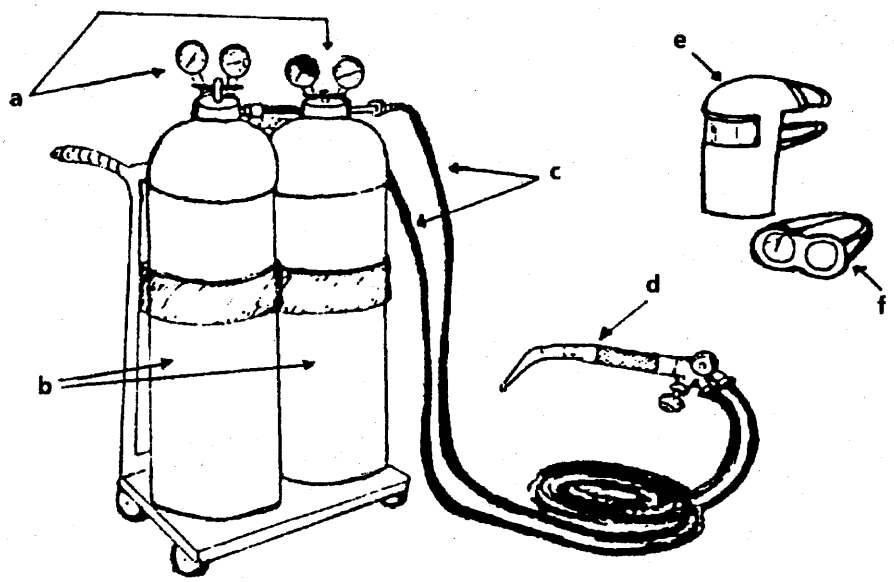


Figure 3

3. Look at figure 3 and write your answer in the spaces below.

Figure 3 shows typical equipment used for _____.

a indicates the _____.

b indicates the _____ _____.

c indicates the _____.

d indicates the _____ _____.

e indicates the _____ _____.

f indicates the _____ _____.

Welding is somewhat _____. The hot _____ flame can permanently damage your _____ unless your wear a welding _____ or a pair of welding _____ _____.

No one should ever look at a _____ flame unless his _____ are protected by dark glasses. Because the _____ are high, you can receive bad burns from the sparks or the hot _____.