Tap wrenches, removal of broken tap, studs

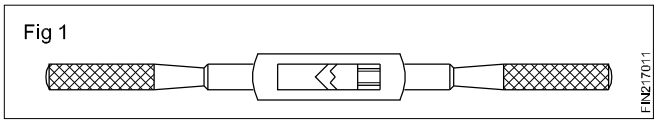
Objectives : At the end of this lesson you shall be able to
- **name the different types of tap wrenches**
- **state the uses of the different types of wrenches.**

Tap wrenches

Tap wrenches are used to align and drive the hand taps correctly into the hole to be threaded.

Tap wrenches are of different types, such as double-ended adjustable wrench, T- handle tap wrench, solid type tap wrench etc.

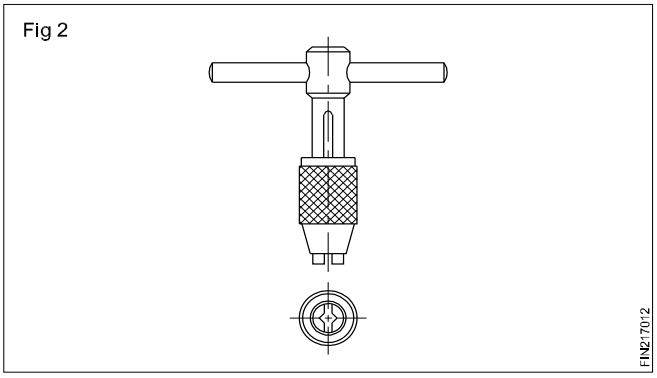
Double - ended adjustable tap wrench or bar type tap wrench (Fig 1)



This is the most commonly used type of tap wrench. It is available in various sizes- 175, 250,350mm long. These tap wrenches are more suitable for large diameter taps, and can be used in open places where there is no obstruction to turn the tap.

It is important to select the correct size of wrench.

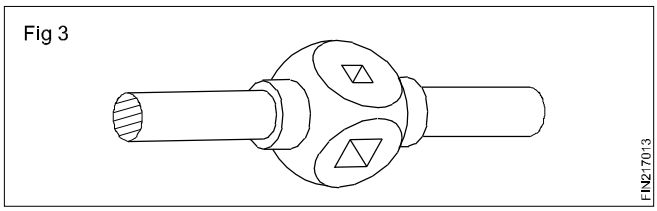
T- handle tap wrench (Fig 2)



These are small, adjustable chucks with two jaws and a handle to turn the wrench.

This tap wrench is useful to work in restricted places, and is turned with one hand only. Most suitable for smaller sizes of taps.

Solid type tap wrench (Fig 3)



These wrenches are not adjustable.

They can take only certain sizes of taps. This eliminates the use of wrong length of the tap wrenches, and thus prevents damage to the taps.

Material

Made from a single piece of solid Cast iron (or) steel. Cast iron and steel are used because of strong, durable and unlikely to deform under pressure.

Removing broken taps

Objectives: At the end of this lesson you shall be able to
- **name the different methods of removing broken taps**
- **state the methods of removing broken taps.**

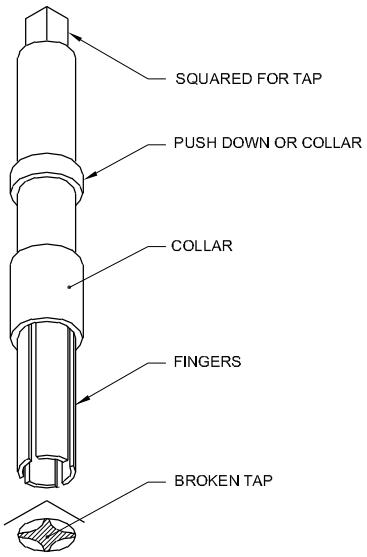
A tap broken above the surface of the workpiece can be removed using using gripping tools like pliers.

Taps broken below the surface pose a problem for removing. Any one of the several methods given below can be used.

Use of tap extractor (Fig 1)

This is a very delicate tool and need very careful handling.

Fig 1



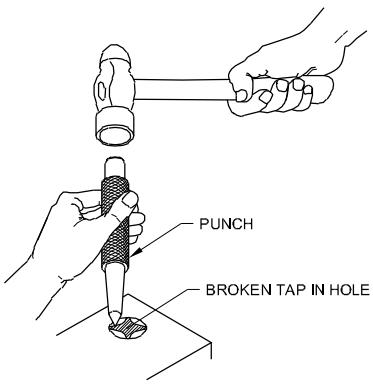
This extractor has fingers which can be inserted on the flutes of the broken tap. The sliding collar is then brought to the surface of the work and the extractor turned anticlockwise to take out the broken tap.

A light blow on the broken tap with a punch will help to relieve the tap if it is jammed inside the hole.

Use of punch (Fig 2)

In this method the point of the punch is placed in the flute of the broken tap in an inclination and struck with a hammer the positioning of the punch should be such that the broken tap is rotated anticlockwise when struck.

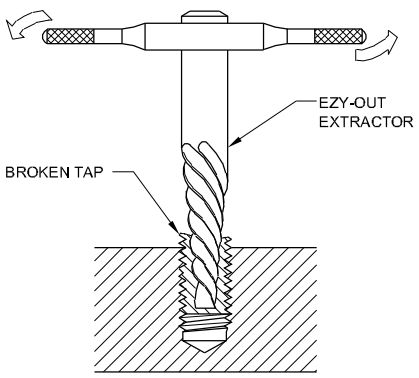
Fig 2



Annealing and drilling the tap

This is a method adopted when other method fail. In the process the broken tap is heated by flame or by other methods for annealing. A hole is then drilled on the annealed tap. The remaining piece can be removed either by using a drift or using an EZY - OUT (extractor). This method is not suitable for workpieces with low melting temperatures such as aluminium, copper etc. (Fig 3)

Fig 3



Use of arc welding

This is a suitable method when a small tap is broken at the bottom of materials like copper, aluminium etc. In this method the electrode is brought in contact with the broken tap and stuck so that it is attached with the broken tap. The tap may be removed by rotating the electrode.

Use of nitric acid

In this method nitric acid is diluted in a proportion of about one part acid to five parts of water is injected inside. The action of the acid loosens the tap and then it is removed with an extractor or with a nose plier. The workpiece should be thoroughly cleaned for preventing further action of the acid.

While diluting acid mix acid to water.

Use of spark erosion

For salvaging certain precision components damaged due to breakage of taps, spark erosion can be used. In this process, the metal (broken tap) is removed by means of repetitive spark discharges. The electrical discharge occurs between an electrode and the electro - conductive workpiece (tap) and the minute particles are eroded both from the electrode and the workpiece. In many cases it may not be necessary to remove the broken tap completely. (After a small portion has been eroded, a screw- driver or punch can be used to remove the remaining portion of the tap.) The shape of the electrode also need not be round. It can be for assisting the tools for rotaing the broken tap.

Removing broken stud

Objectives: At the end of this lesson you shall be able to
- **state the reasons for breakage of stud**
- **state different methods for removing broken stud.**

The stud is used in place of a bolt ,when there is insufficient space to accomodate the bolt head or to avoid use of an unnecessarily long bolt. Studs are generally used to fix up cover plates or to connect cylinder covers to engine cylinders.

Reasons for breakage of stud/bolt.

Excessive torque is applied while screwing the stud into the hole.

Corrosive attack on the thread.

Matching threads are not of proper formation.

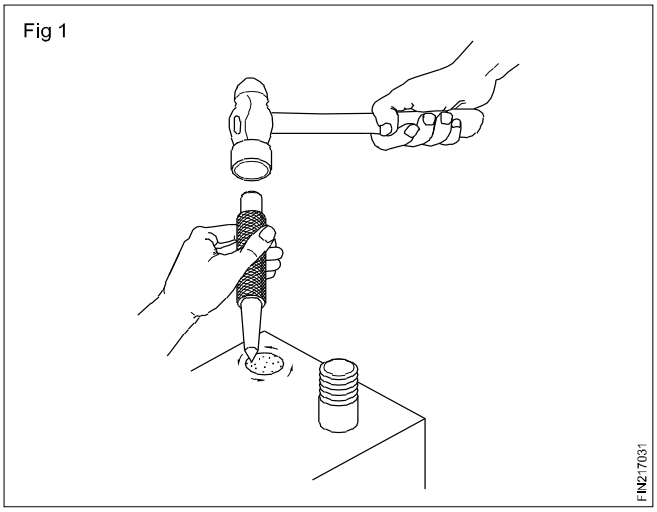
Threads are seized.

Methods of removing broken studs

Prick punch method

If the stud is broken very near to the surface, drive it in an anticlockwise direction, using a prick punch and hammer to remove it. (Fig 1)

Fig 1



Filing square form

When the stud is broken a lilttle above the surface form a square on the projecting portion to suit a standard spanner. Then turn it anticlockwise using a spanner to remove it. (Fig 2)

Using square taper punch

Broken stud can also be removed by drilling a blind hole (hole diameter equals to half of stud diameter) and driving a square taper punch into the hole as shown in Fig 3. Turn the punch using a suitable spanner in an anti - clock- wise direction to unscrew the stud.

Fig 2

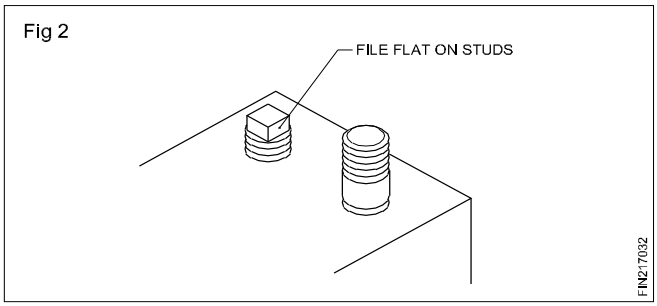
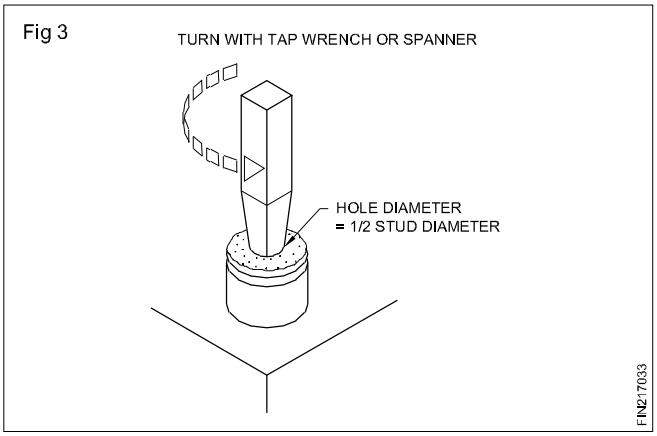


Fig 3

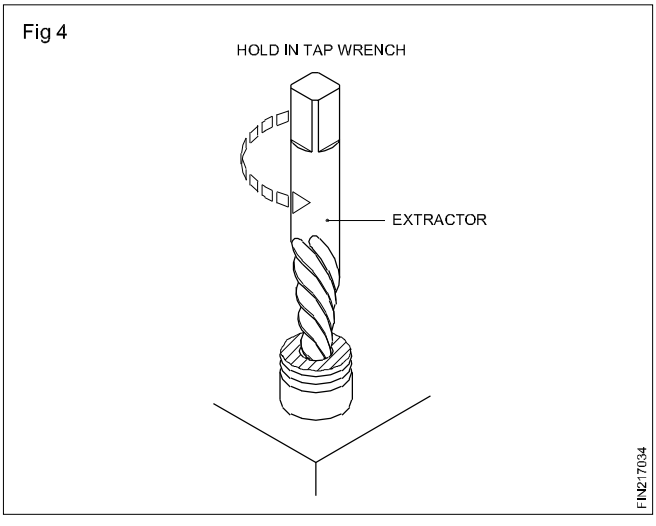


EZY - out method (Fig 4)

Ezy - out or a stud extactor is a hand tool, somewhat similar to the form of a taper reamer but has left hand spiral. It is available in a set of 5 pieces. The recommended drill size is punched on each ezy - out .

After drilling the hole recommended ezy - out is set on it and turned in an anti - clockwise direction by a tap wrench. As it is rotated it penetrates into the hole increasing its grip and in the process the broken stud gets unscrewed. (Fig 4)

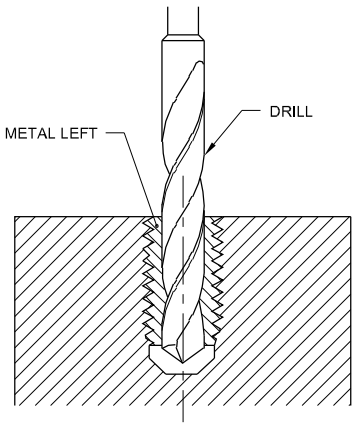
Fig 4



Making drill hole

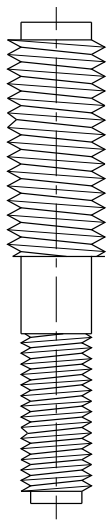
Correctly find out the centre of the broken stud and drill hole nearly equal to the core diameter of the stud down the centre so that the threads only remain. Remove the thread portion by the point of a scriber in the form of broken chips. Re - tap the drill the hole to clear the threads. (Fig 5)

Fig 5



If all other method fail, drill a hole equal to the size of the stud size or a little over and tap the hole with an oversize tap.Now a special over size stud as shown in Fig 6 is to be made and fitted in position.

Fig 6



OVERSIZE SPECIAL STUD TO SUIT THE TAPPED HOLE

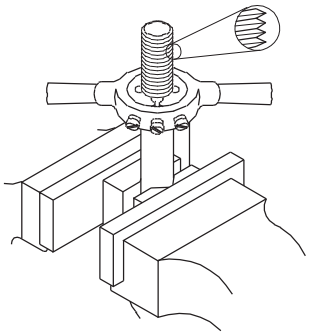
Dies and die stock

Objectives: At the end of this lesson you shall be able to
- **identify the different types of dies**
- **state the features of each type of die**
- **state the use of each type of die**
- **name the type of diestock for each type of die.**

Uses of dies

Threading dies are used to cut external threads on cylindrical workpieces. (Fig 1)

Fig 1



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Types of dies

The folowing are the different types of dies.

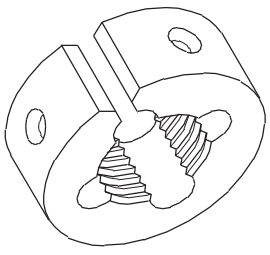
Circular split die (Button die)

Half die

Adjustable screw plate die

Circular split die/button die (Fig 2)

Fig 2



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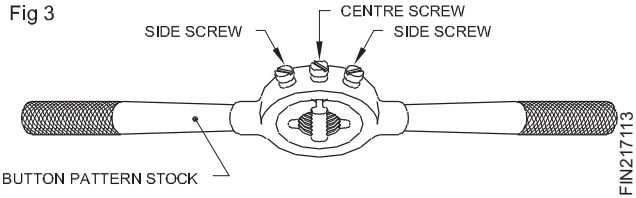
This has a slot cut to permit slight variation in size.

Dies are made of high speed steel

When held in the diestock, variation in the size can be made by using the adjusting screws. This permits increasing or decreasing of the depth of cut. When the side screws are tightened the die will close slightly. (Fig 3) For adjusting the depth of the cut, the centre screw is advanced and locked in the groove. T his type or die stock is called button pattern stock

Fig 3



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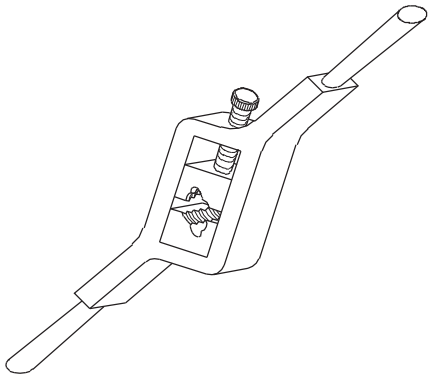
Half die (Fig 4)

Fig 4



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Half dies are stronger in construction.

Adjustments can be made easily to increase or decrease the depth of cut.

These dies are available in matching pairs and should be used together.

By adjusting the screw of the diestock, the die pieces can be brought closer together or can be moved apart.

They need a special die holder.

Adjustable screw plate die (Fig 5)

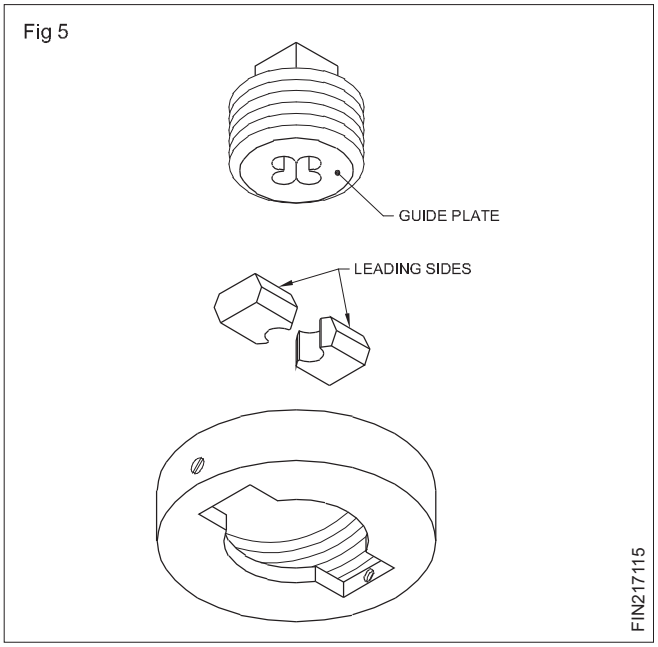
This is another type of a two piece die similar to the half die.

This provides greater adjustment than the split die.

The two die halves are held securely in a collar by means of a threaded plate (guide plate) which also acts as a guide while threading.

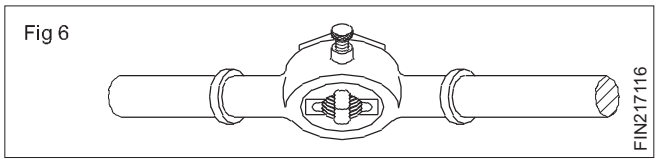
When the guide plate is tightened after placing the die pieces in the collar, the die pieces are correctly located and rigidly held.

Fig 5



The die pieces can be adjusted, using the adjusting screws on the collar. This type of die stock used is called quick cut diestock. (Fig 6)

Fig 6

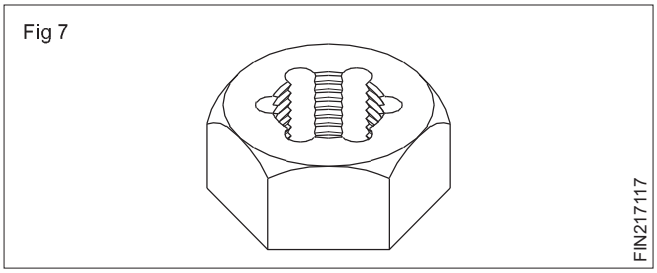


The bottom of the die halves is tapered to provide the lead for starting the thread. On one side of each die head, the serial number is stamped.

Both pieces should have the same serial numbers.

Die Nut (Solid Die) (Fig 7)

Fig 7



The die nut is used for chasing or reconditioning the damged threads.

Die nuts are not to be used for cutting new threads.

The die nuts are available for different standards and sizes of threads.

The die nut is turned with a spanner.

Blank size for external threading

Objective: At the end of this lesson you shall be able to
• determine the diameter of blank size for external thread cutting.

Why should the blank size be less?

It has been observed from practice that the threaded diameters of steel blank**s** show a slight increase in diameter. such increase in the diameter will make assembly of external and internal threaded components very difficult. To overcome this, the diameter of the blank is slightly reduced before commencing the threading.

What should be the blank size?

The diameter of the blank should be less by 1/10th of the pitch of the thread.

Example

For cutting the thread of M12 with 1.75mm pitch the diameter of the blank is 11.80.

Formula, D = d - p/10

= 12mm - 0.175mm

= 11.825 or 11.8 mm.

d = diameter of bolt

D = the blank diameter

p = pitch of thread

Calculate the blank size for preparing a bolt of M16 x1.5?

Answer

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External threading using dies

Objective: At the end of this lesson you shall be able to
- **cut external threads using dies.**

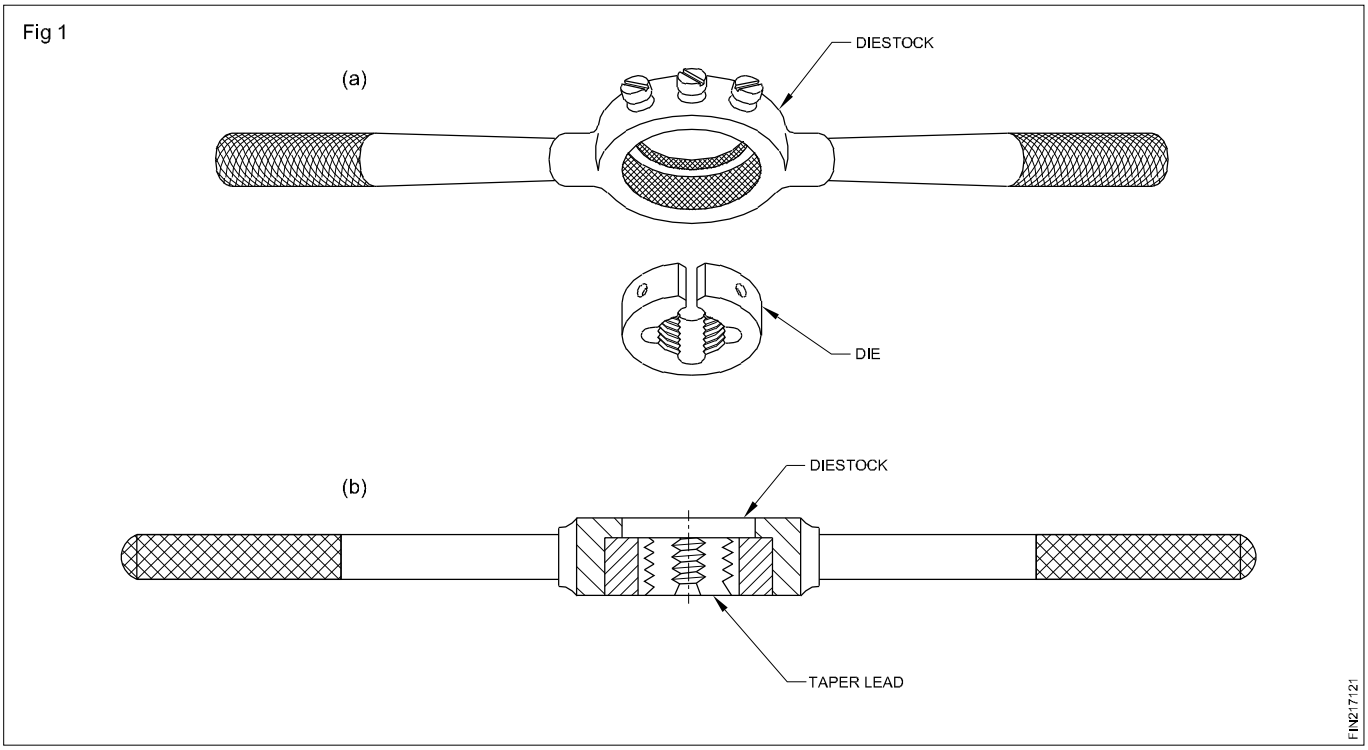
Check blank size.

Blank size = Threads size -0.1 $\times$ pitch of thread

Procedure

Fix the die in the diestock and place the leading side of the die opposite to the step of the diestock. (Figs 1a & 1b)

Fig 1

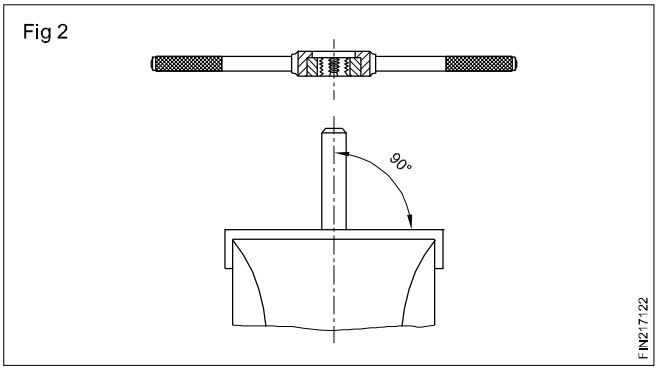


Use false jaws for ensuring a good grip in the vice.

Project the blank above the vice - just the required thread length only.

Place the leading side of the die on the chamfer of the work (Fig 2)

Fig 2



Make sure that the die is fully open by tightening the centre screw of the diestock. (Fig 3)

Start the die, square to the bolt centre line. (Fig 4)

Fig 3

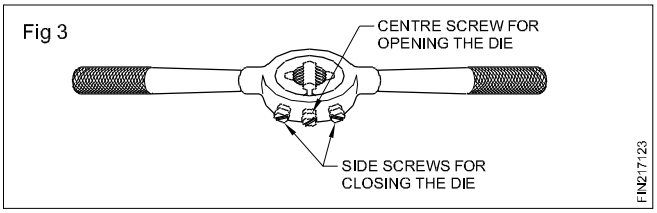
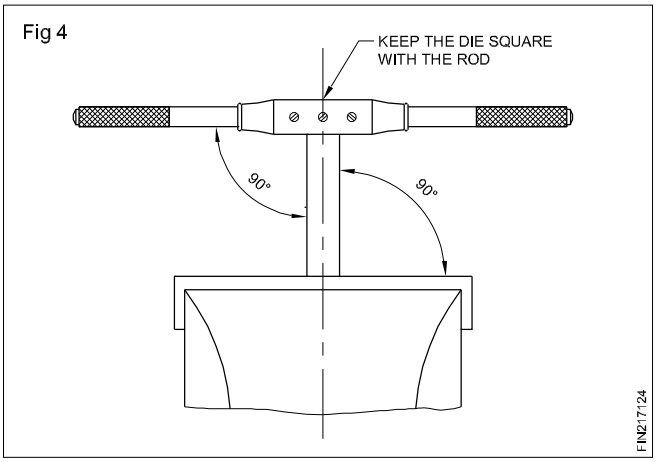
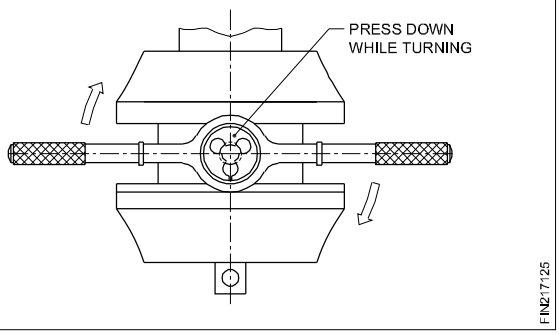


Fig 4



Apply pressure on the diestock evenly and turn clockwise direction to advance the die on the bolt blank. (Fig 5)

Fig 5



Cut slowly and reverse the die for a short distance in order to break the chips

Use a cutting lubricant.

Increase the depth of the cut gradually by adjusting the outer screws.

Check the thread with a matching nut.

Repeat the cutting until the nut matches.

Too much depth of cut at one time will spoil the threads. It can also spoil the die.

Clean the die frequently to prevent the chips from clogging and spoiling the thread.

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