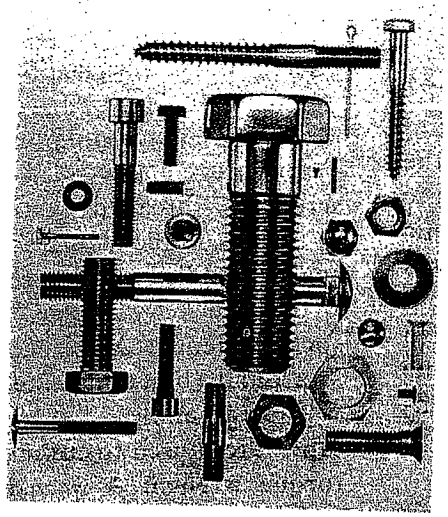

unit 3
using fasteners

A small engine is assembled and held toge with a number of small devices such as bolts, and screws. These parts are called faste because they are used to fasten or hold p together. Every repair job involves the us fasteners. In this unit we will study the m common fasteners you will be using.

LET'S FIND OUT: **When you finish reading and studying this unit, you should be able to:**

1. **Define the term *fastener*.**
2. **Explain the purpose of fasteners.**
3. **Identify the common threaded fasteners.**
4. **Explain how threads are described or designated.**
5. **Identify the common non-threaded fasteners.**

THREADED FASTENERS

Threaded fasteners use the wedging action of a spiral groove or thread to clamp two parts together. The common types of threaded fasteners are screws, bolts, studs and nuts.

Screw

A screw fits into a threaded hole in an automotive component. The screw is turned or driven into the threaded hole to hold or clamp two parts together. The cap or hex-head screw, shown in Figure 3-1, is the most common screw used in small-engine work. The cap screw is driven or turned with a common wrench such as the box, open-end, combination or socket wrench.

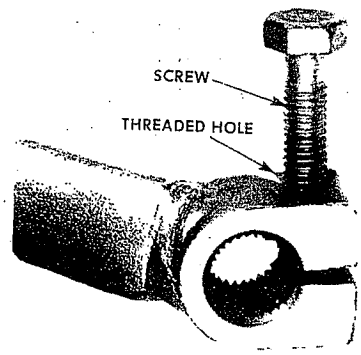

Figure 3-1. A hex-head or cap screw fits into a threaded hole.

Bolt

A bolt is used with a nut instead of a threaded hole, Figure 3-2. The only difference between a bolt and a screw is in their use: a screw is used in a threaded hole, and a bolt is used with a nut. Many bolts look like the cap screw shown earlier. When bolts are tightened or loosened, two wrenches normally are required, one to drive the bolt and one to keep the nut from turning.

Figure 3-2. A bolt is used with a nut to clamp parts together.

Stud

A stud has threads at both ends, Figure 3-3. One end of the stud fits into a threaded hole in a part. Another part fits over the stud, and the two parts are clamped together using a nut. Studs often are used where the positioning of a part is important. A stud may be threaded all along its length, but it is more common to find threads only on the ends.

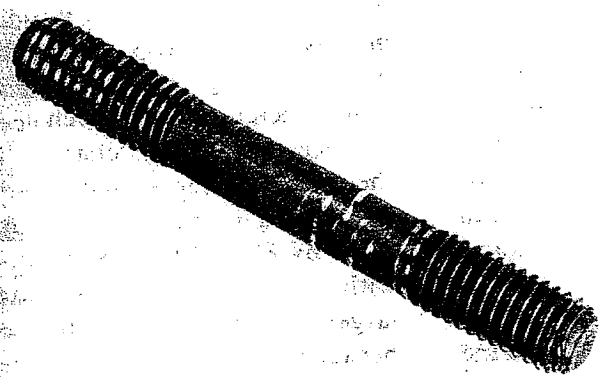

Figure 3-3. A stud has threads at both ends.

Nut

Nuts have an internal thread and are used with bolts and studs. Most small-engine nuts are hex-shaped like that shown in Figure 3-4. They may be driven with box-end, open-end or socket wrenches.

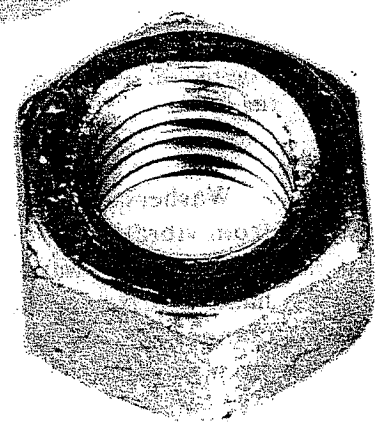

Figure 3-4. A hex nut is used with bolts and studs.

WASHERS

Washers are used with bolts, screws, studs and nuts. A flat washer, shown in Figure 3-5, often is used between a nut and an automotive component, or under the head of a screw or bolt, to spread the clamping force over a wider area. It also prevents a machined surface from being scratched as the bolt head or nut is tightened.

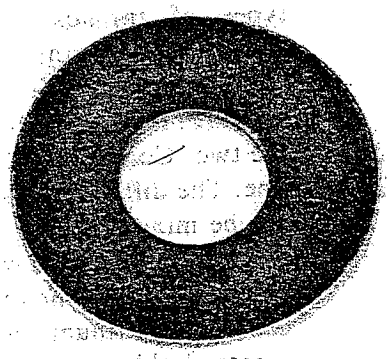

Figure 3-5. A flat washer is used with a nut, screw or bolt.

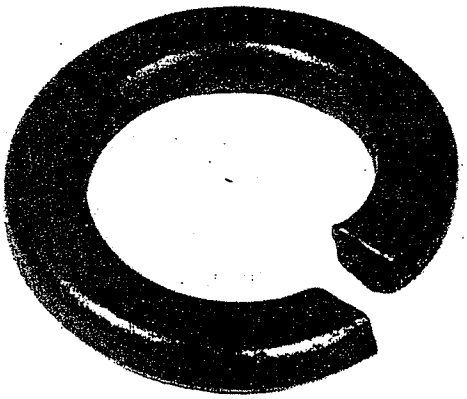

Figure 3-6. A lock washer prevents parts from working loose.

Washers also may be used to prevent fasteners from vibrating or working loose. These washers are called lock washers, Figure 3-6. A lock washer has a sharp edge that will dig into a fastener or component surface. This prevents the fastener from working loose.

THREAD SIZES AND DESIGNATIONS

Several types of threads are used in threaded fasteners. Since one kind of thread cannot be used with another, the mechanic must understand the different thread systems. In this section we will present the types of threads used in small-engine work.

Unified System Thread Designation

Small engines manufactured in the United States have, until very recently, used only the Unified System threads. This system includes two types of threads, coarse and fine. Unified National Coarse threads are designated by UNC, and Unified National Fine threads are designated by UNF. Figure 3-7 shows the difference between the two. Coarse has fewer threads per inch than fine. The difference is easily seen, and they must not be mixed. Trying to tighten a coarse-thread cap screw into a hole with fine threads, for example, will damage the threads. Coarse threads are used in aluminum parts because they provide greater holding strength in soft materials. Fine

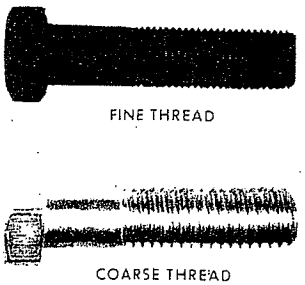

Figure 3-7. Fine- and coarse-threaded fasteners mu not be used together.

threads are used in many harder materials such cast iron and steel.

Unified threaded fasteners are designated size also. The sizes of most bolts, screws, stu and nuts are based upon fractions of an inch. typical designation is 1/2-20UNF. The 1/2 repre ents a bolt, screw or stud thread diameter of inch. When used with a nut, the fraction refers the bolt size it fits. The 20 refers to the number threads per inch, and the UNF stands for Unifi National Fine threads. All 1/2-inch National Fi fasteners have 20 threads per inch. A coars thread fastener 1/2 inch in diameter is designate 1/2-13UNC and has 13 threads per inch.

Metric System Thread Designation

Small engines manufactured using the meti system have fasteners with metric threads. Met and Unified National fasteners cannot be mixe An example of a designation for metric threads M12 x 1.75. The M indicates that the fastener h metric threads. The number following the M re ers to the outside diameter of a bolt, screw or stu or to the inside diameter of a nut. This measur ment is in millimeters. The last number, separate by the sign x, gives the pitch, that is, the distan in millimeters between each of the threads.

There are fine and coarse metric threads, an the pitch number is used to distinguish them. fine-thread metric bolt, for example, may be ind cated by M8 x 1.0. A bolt of the same diamet with a coarse thread is designated M8 x 1.25. Th larger pitch number indicates a wider spac between threads.

NON-THREADED FASTENERS

Besides threaded fasteners, there are other devices for holding small engine parts together. The most common non-threaded fasteners are dowel pins and keys.

Dowel Pin

A dowel pin is a round pin that fits into a drilled hole to position two parts that fit together. It is usually quite small and requires special pliers or a punch and hammer for removal. Dowel pins may be straight or tapered, solid or split.

Key

A key is a small hardened piece of metal used with a gear or pulley to lock it to a shaft. One half of the key fits into a keyseat on the shaft, while the other half fits into a slot called a keyway on the pulley or gear. The keyseat, keyway and key are shown in Figure 3-8. Gears and pulleys are held on an engine crankshaft with keys.

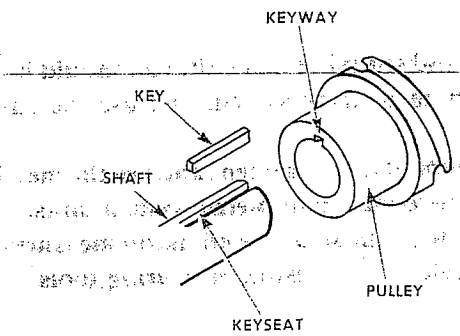

Figure 3-8. A key is used to lock a pulley to a shaft.

NEW TERMS

bolt: A threaded fastener used with a nut to hold small engine parts together.
dowel pin: A round metal pin that fits into drilled holes to position two mating parts.
hammer: A tool used to drive or pound on an object. Hammers for automotive use may have hard or soft heads.
keys: A small hardened piece of metal used with a gear or pulley to lock it to a shaft.
non-threaded fastener: A device used to hold small engine components together without the use of threads.
nut: A small fastener having internal threads, used with bolts and screws.
stud: A fastener with threads at both ends.
thread designation: A system used to indicate the size of the threads on threaded fasteners.
threaded fasteners: A device that uses threads to hold automotive components together.
washer: Used with bolts, screws, studs and nuts to distribute the clamping force and to prevent fasteners from vibrating loose.

SELF CHECK

1. Define the term *fastener*.
2. What is the purpose of fasteners?
3. How does a threaded fastener work?
4. Describe the difference between a bolt and a screw.
5. Where are studs used?
6. What is the purpose of a washer?
7. What does the *UNC* in a thread designation mean?
8. What does *UNF* mean in a thread designation?
9. What does the *M* mean in a metric thread designation?
10. Describe two types of non-threaded fasteners.

DISCUSSION TOPICS AND ACTIVITIES

1. Make a list of all the fasteners you can find in the shop.
2. Design and build a storage tray for the fasteners you have in your home garage.