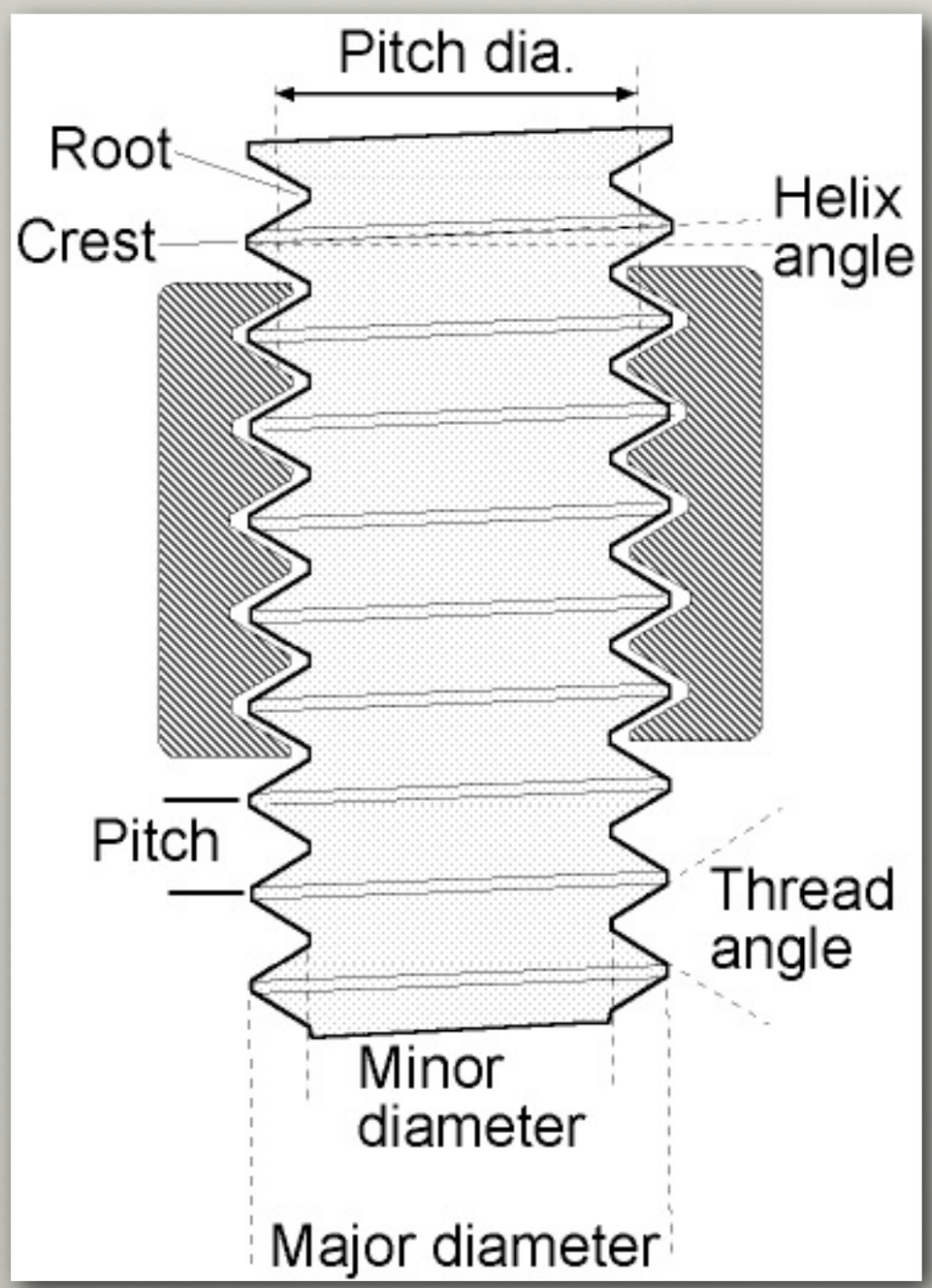
MECHANICAL ASSEMBLY

THREADED FASTENERS

THREADS



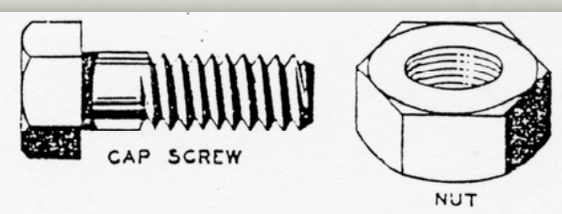


Fig. 471. Threads on Screw and Nut

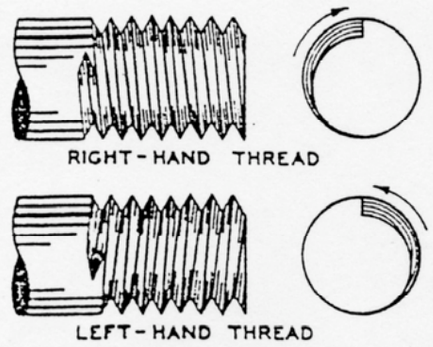


Fig. 472. Right-Hand and Left-Hand Threads

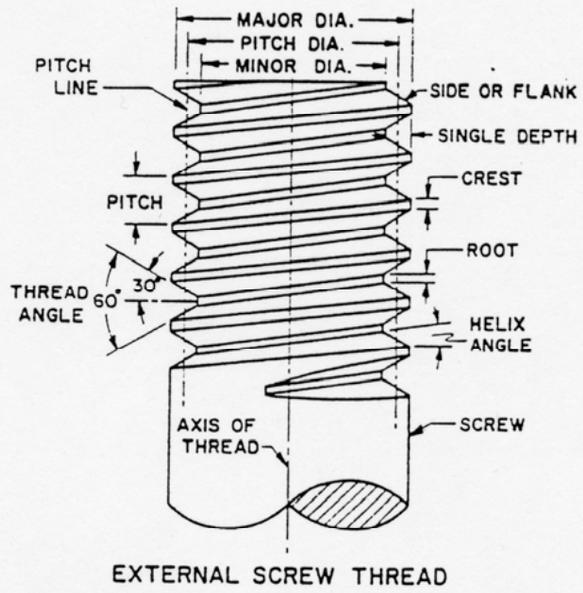


Fig. 474. Principal Parts of a Screw Thread

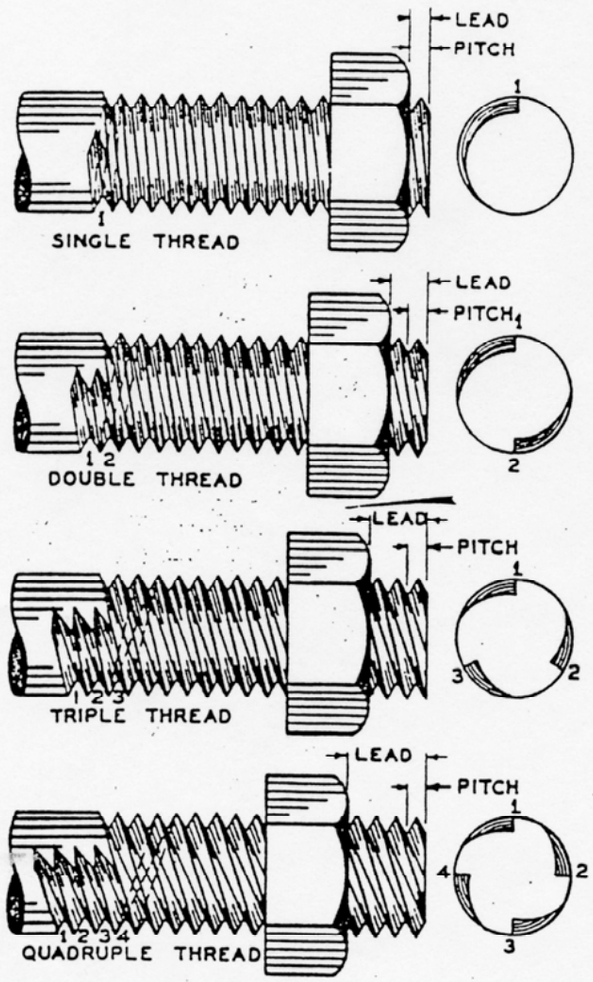


Fig. 473. Single, Double, Triple, and Quadruple Threads

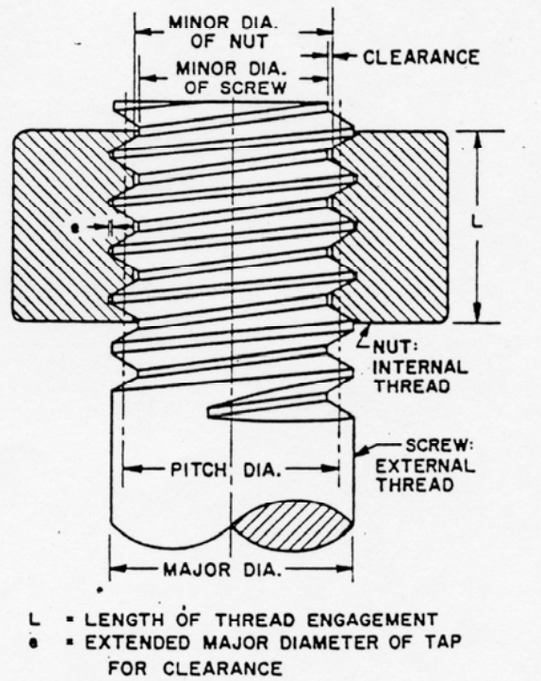


Fig. 475. Comparison Between the Minor Diameters of a Screw and a Nut, Showing Clearance

External threads and internal threads have the same basic pitch diameters.

MACHINE SCREWS

Pan

Button

Large Diameter (Truss)

Round

Extra-Wide Low Profile Head

Binding

Fillister

Cheese

Hex

Flat

Oval

Phillips

Slotted

Combination (Phillips/Slotted)

Slotted with Vent

Torx

Hex

Pozidriv

Tamper-Resistant Pin-in-Torx

Tamper-Resistant Tri-Groove

Tamper-Resistant One-Way

Tamper-Resistant Drilled Spanner

SOCKET CAP SCREWS

Standard

Button

Flat

Drilled Head
Wire screws together to prevent loosening from vibration.

Flange Socket

Flange Button

Low

Vented
Vented hole is drilled through entire length.

Hex Socket

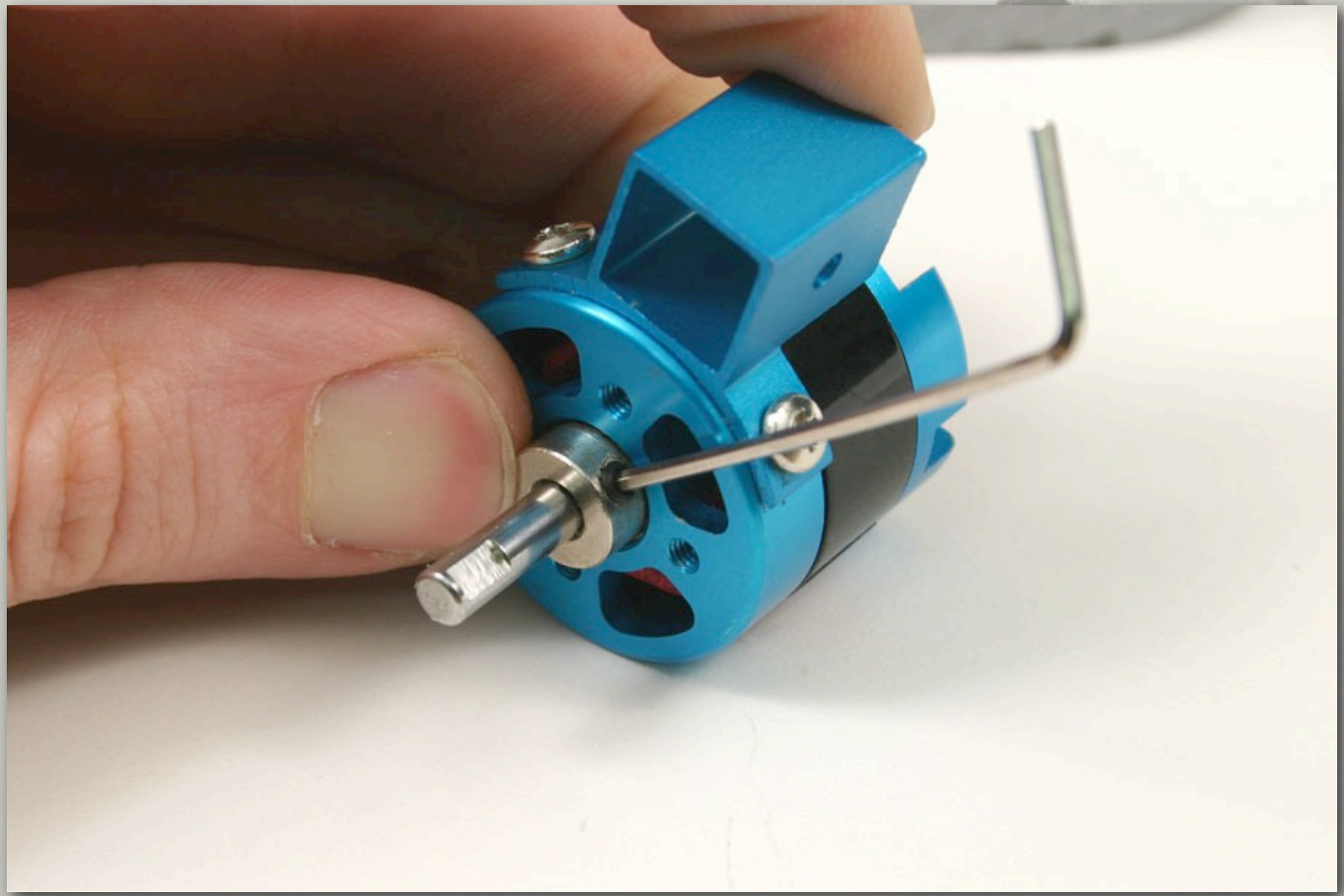
Torx

Tamper Resistant Pin-in-Hex Socket

Tamper Resistant Pin-in-Torx

Tamper Resistant High Security
Screws are unique configuration from McMaster-Carr.

SET SCREWS



SET SCREWS

Standard Socket
The most common screw style.

Self-Locking Socket
Locking element increases holding power. Perfect for tough jobs.

Hollow-Lock Socket
Often used to lock other set screws in place, to hold pins, and to adjust spring tension.

Slotted
Install with a standard slotted screwdriver.

Square Head
Easy to access by hand or with a wrench when you need more torque.

Swivel Pad Socket
Pad swivels to make maximum contact against angled surfaces.

Cup
Most popular style. Thin edge digs into contact surface for high holding power.

Knurled Cup
Knurls improve grip and prevent backing out or loosening.

Vented Cup
Vent fluids and gases while holding parts securely in place.

Cone
Highest holding power of any point style. Sharp tip wedges into surface.

Flat
Best for making frequent adjustments. Tip won't mar contact surface.

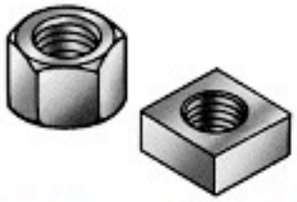
Oval
Ideal for making frequent adjustments. Tip has small contact area causing little damage.

Extended Point
Also known as dog point and pilot point set screws. Often used in place of dowel pin.

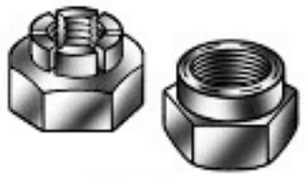
Soft Tip
Rigid yet soft tip conforms to texture and curves of surface without marring.

Swivel Ball Bearing
Also known as ball-ended thrust screws. Ball bearings swivel in all directions.

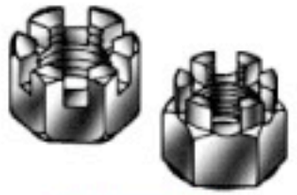
NUTS



Machine Screw and Hex Nuts

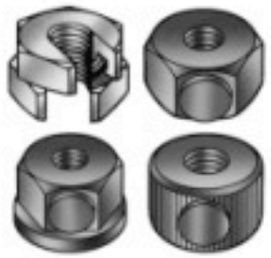


Locknuts



Slotted Nuts

Barrel Nuts (Binding Barrels)



Quick-Threading Nuts

Flange Nuts

Coupling Nuts

T-Slot Nuts

Acorn Nuts

Wing Nuts

Thumb Nuts

Tamper-Resistant Nuts

Push Nuts and Retainers

Weld Nuts

Allen Nuts

General Purpose Acme Nuts

Strut Channel Nuts

Slip Joint Nuts

Handle Nuts

Binding Nuts

Regulator and Welding Hose Fitting Nuts

Speed Nuts

Captive Nuts

Thin Nuts with Specialty Threads

WASHERS

Round Hole

Square Hole

Slotted

D (Clipped)

Spherical

Laminated

Notched

Tag Hole

Spring Lock

Tooth Lock

Belleville

Retaining

Wave

Finger Spring

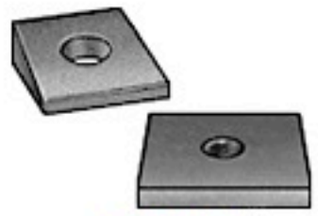
Wedge Lock

Countersunk

Bonded

Waffle

Pressure-Sealing

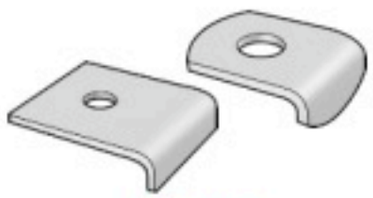


Square

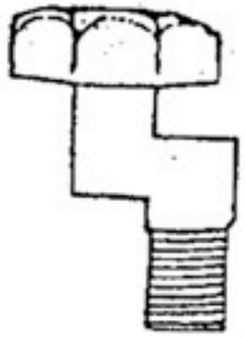
Shoulder

Cup

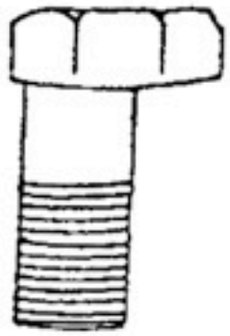
Structural



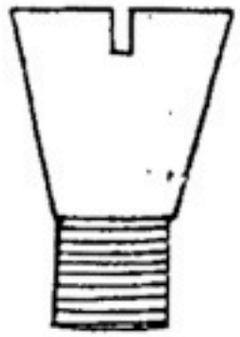
Flange



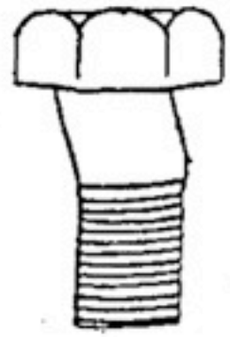
FOR MISMATCHED HOLES



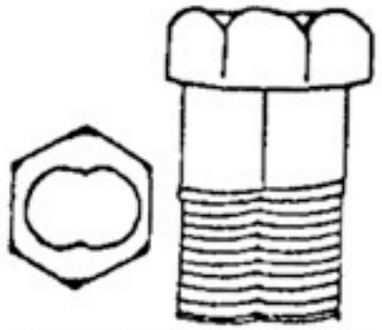
FOR HOLES TOO NEAR THE EDGE



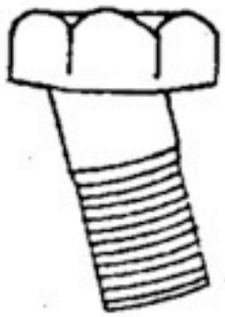
FOR HOLES COUNTER-SUNK TOO DEEP



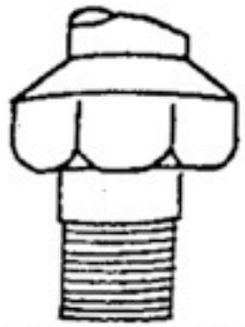
FOR HOLES DRILLED CROOKED, THEN — STRAIGHT



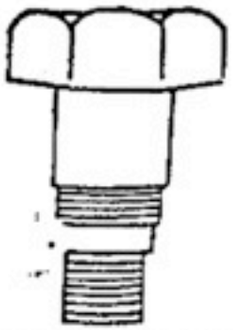
BINOCULAR BOLT - FOR DOUBLE DRILLED HOLES



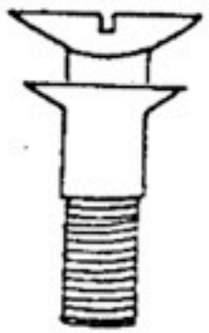
FOR HOLES NOT DRILLED STRAIGHT



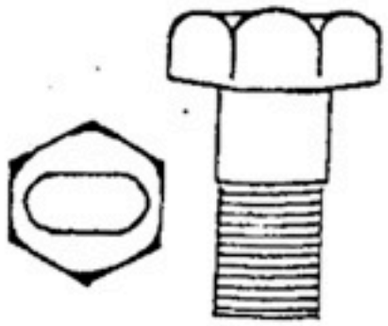
FOR HOLES WITH COUNTER-SINK ON WRONG SIDE



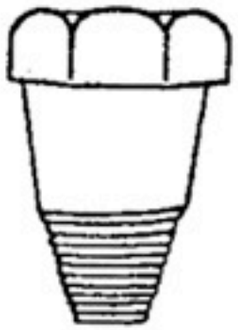
FOR HOLES DRILLED TOO BIG, THEN — RIGHT SIZE



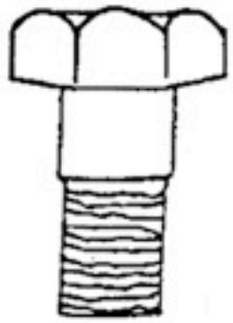
FOR DOUBLE COUNTER-SUNK HOLES



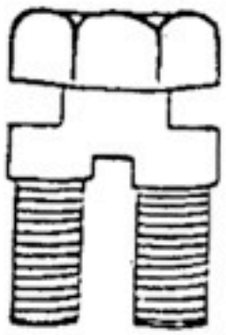
FOR OUT-OF-ROUND HOLES



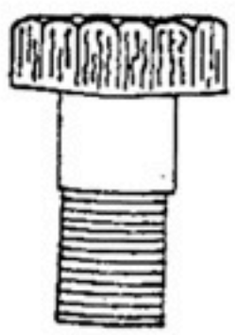
FOR TAPERED HOLES



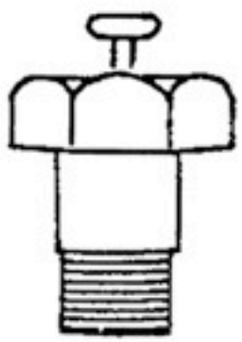
PRE-STRIPPED FOR EASY OVERTORQUING



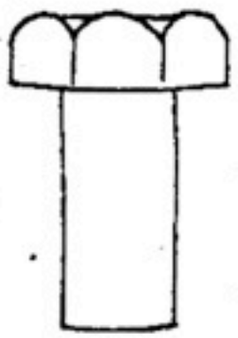
FOR REDRILLED HOLES THAT STILL DON'T MATCH



SERRATED HEAD FOR VISE GRIP TORQUING



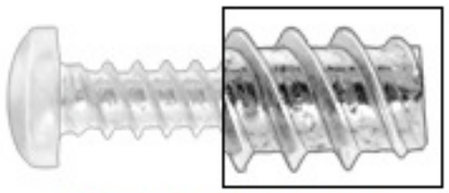
HAMMER HEAD BOLT - FOR HARD TO START HOLES



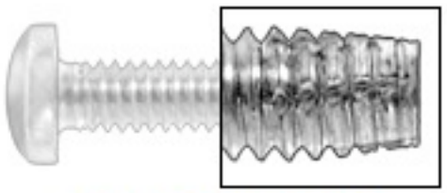
FOR THREAD-LESS BOLT HOLES

SELF-TAPPING

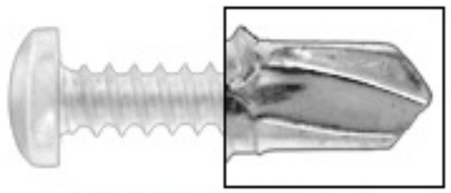
Sheet Metal Screws
Have a pointed end and widely spaced threads. Self-starting in thin sheet metal. In thicker materials, a drilled hole is recommended.



Thread-Forming Screws
Have a blunt point and fine threads. Form threads in metal, plastic, and plywood. A drilled hole is required.



Thread-Cutting Screws
Have blunt, tapered, tap-fluted end that cuts machine screw threads and ejects material as it turns. Use in metal, plastic, and plywood. A drilled hole is required.



Self-Drilling Screws
Drill their own hole, tap a thread, and fasten material in a single operation. Excellent for use in sheet metal.

WOOD

Flat

Ribbed Flat Head

Self-Sinking Flat Head

Self-Sinking Flat Head with Washer

Self-Sinking Ribbed Flat Head

Pan

Oval

Round

Large Diameter Round Head (Timber Screws)

Round Head Square Neck (Carriage Screws)

Round Head Ribbed Neck (Carriage Screws)

Hex Head (Lag Screws)

Hex Flange Head (Lag Screws)

Phillips

Slotted

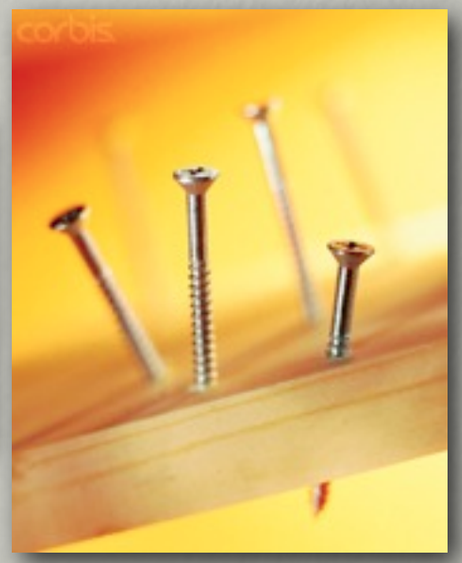
Square

Combination (Phillips/Square)

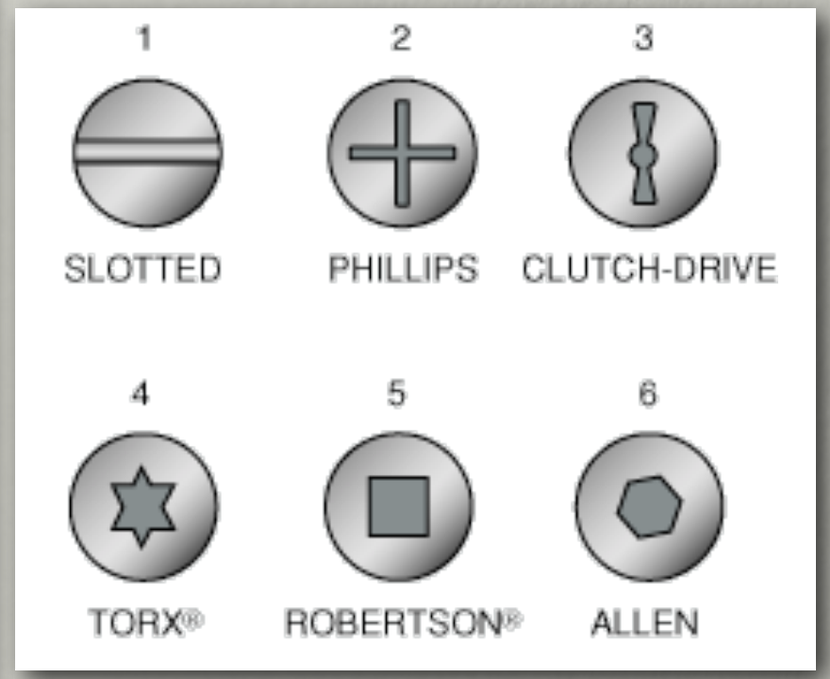
Hex

Torx

Uni-Drive



DRIVES


1
2
3
SLOTTED
PHILLIPS
CLUTCH-DRIVE
4
5
6
TORX®
ROBERTSON®
ALLEN

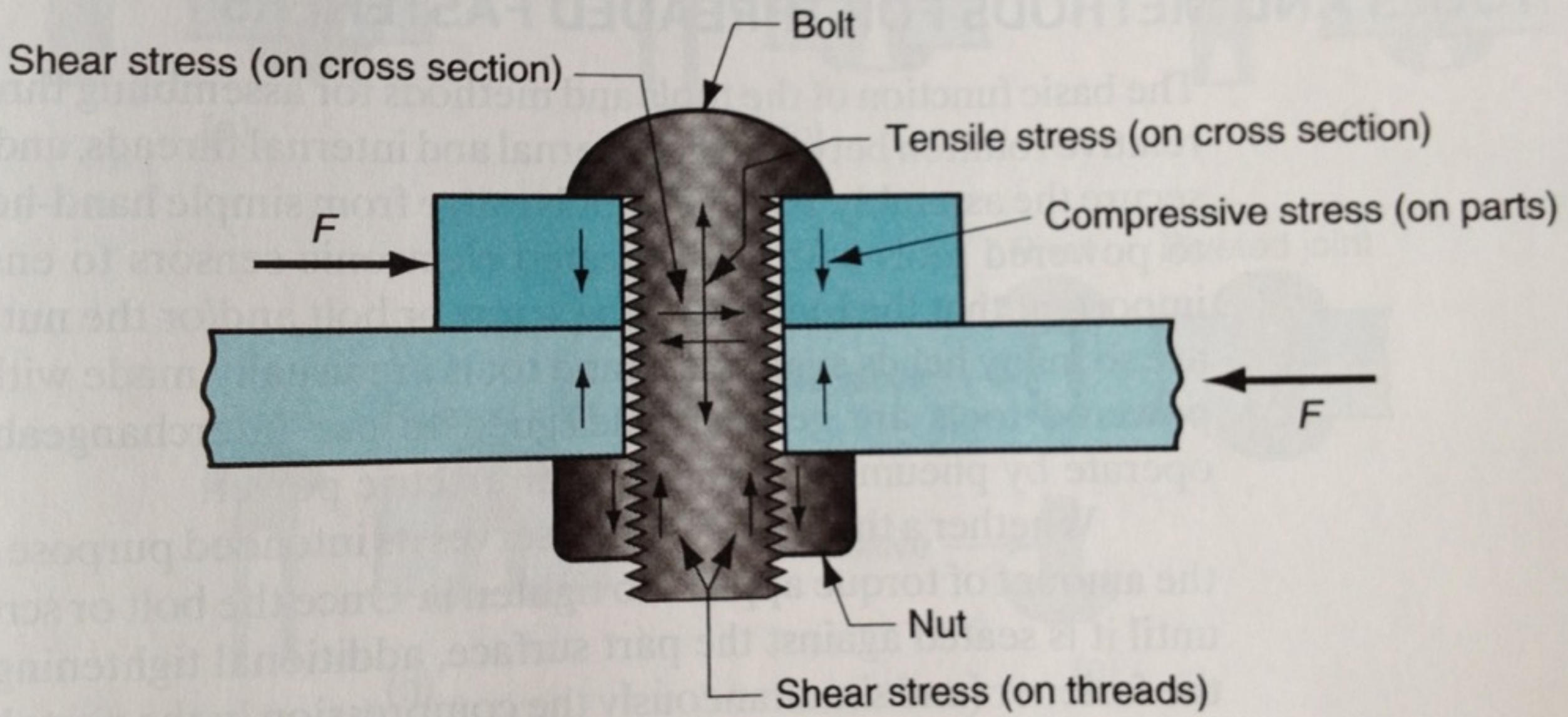
COMMON MATERIALS:

PLATED STEEL

STAINLESS STEEL

BRASS

PLASTICS


Bolt
Shear stress (on cross section)
Tensile stress (on cross section)
Compressive stress (on parts)
F
F
Nut
Shear stress (on threads)

INTERFERENCE FITS

PRESS FITS

YOUNG'S

MODULUS INTERFERENCE

$$\sigma_e = \frac{Ei}{D_p}$$

INTERFERENCE STRESS

HOLE DIAMETER