ATTACHMENTS AND FASTENERS

CONTENTS PAGE

1.00 INTRODUCTION

1.01 This section identifies fastening devices and attachments generally employed in the installation and maintenance of wire, cable, and telephone apparatus.

1.02 This section is reissued to:

- Change title and contents of practice.
- Add index.
- Add information on new fasteners.

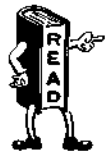
1.03 Due to extensive changes marginal arrows have been omitted.

2.00 GENERAL

2.01 Fasteners or attachments required for each operation will be specified in the appropriate sections pertaining to these items.

2.02 Use galvanized fasteners and attachments outdoors. Use enameled and nongalvanized fasteners or attachments indoors and where appearance is important.

2.03 When selecting types of fasteners and attachments, select a fastener that will adequately hold the weight of the apparatus.



Use fasteners that can be installed readily and easily to reduce time.

3.00 CLEARANCE AND LEAD HOLES

Clearance holes for fasteners or screw-type fixtures which pass entirely through surfaces such as the seams of bricks, stucco, hollow tile, and rigid composition shingles, and lead holes in wood shall be provided in accordance with the information in Table A.

TABLE A

CLEARANCE AND LEAD HOLES FOR FASTENERS AND SCREW-TYPE FIXTURES

Fastener or Fixture	Clearance Hole			Lead Hole		
	Size and Type of Drill					
	Installer	Point	Carbon Steel Twist	Installer	Point	Carbon Steel Twist
	in.					
Toggle Bolt 3/16	Clearance Hole 1/2 or 5/8					
1/4	5/8 or 3/4					
5/16	5/8 or 7/8					
S and L Insulated Screw Eyes	3/16 by 5-1/2		No. 12 or 3/16		3/32	No. 42 or 3/32
Bridle Rings A and C					1/8	No. 30 or 1/8
E					3/32	No. 42 or 3/32
Drive Rings 5/8 and 7/8					3/32	No. 42 or 3/32*
1-1/4					11/64	
Angle Screw 5/16	5/16 by 7-1/2		5/16		11/64	No. 18 or 11/64
3/8	3/8 by 8		3/8	1/4 × 6-1/2		1/4
Wood Screw No. 4		No. 33			1/16	
No. 6		5/32	No. 22		1/16	
No. 8		No. 13	11/64		3/32 or No. 33	
No. 10	3/16 by 5-1/2		No. 12 or 3/16		3/32	No. 42 or 3/32
No. 14	1/4 by 6-1/2		1/4		1/8	No. 30 or 1/8
No. 18	5/16 by 7-1/2		5/16		11/64	No. 18 or 11/64

Note 1: Installer drills are bit stock twist drills and are used in the ratchet brace.

Note 2: Carbon steel twist drills are straight shank drills and are used in the hand drill.

Note 3: Drill points are used in the automatic drill and will drill lead holes approximately 1-1/2 inches deep. Where deeper holes are required use twist drills in the hand drill.

Note 4: Use L masonry drills for drilling the seam between bricks.

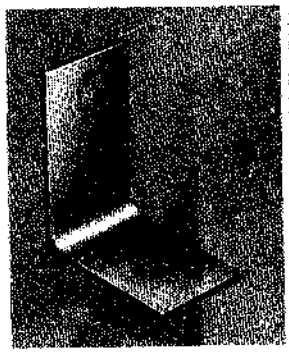
Note 5: Use L masonry drills or star faced stone drills in drilling holes for toggle bolts. Two sizes of holes are listed to cover the different types of approved toggle bolts. Drill the smaller hole if it will accommodate the toggle bolt.

Note 6: Apply paraffin wax or soap to the threads of wood screws or screw-type fixtures to facilitate turning them into wood.

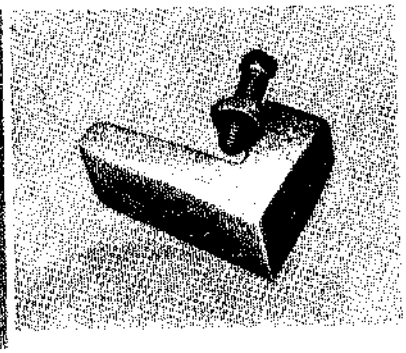
* Do not drill lead hole in poles.

4.00 DROP OR BLOCK WIRE ATTACHMENTS

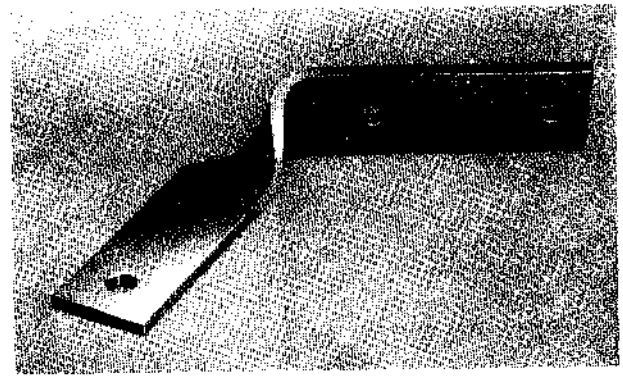
This section identifies the first, intermediate, and last attachments generally employed in the installation of drop or block wire in or on buildings. See Fig. 1, 2, and 3.



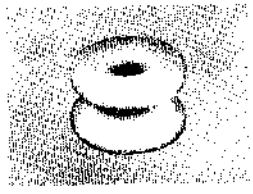
House Bracket



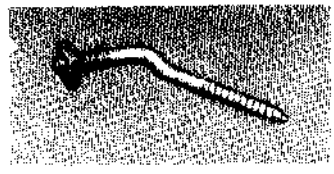
C or D
Insulator Support



Corner Bracket

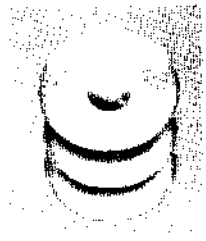


S Knob

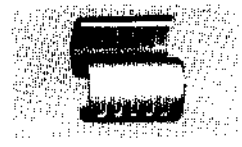


Angle Screw

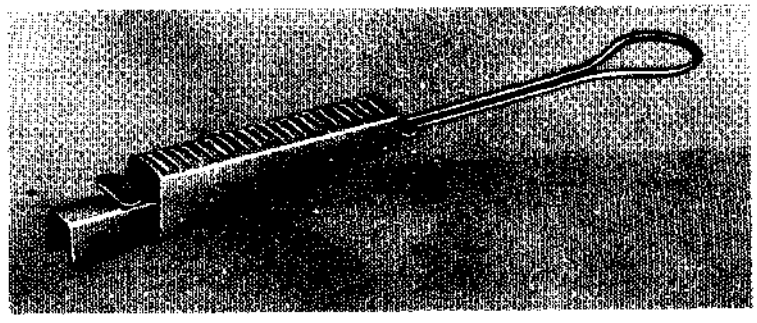
Drop Wire Hook



T Knob

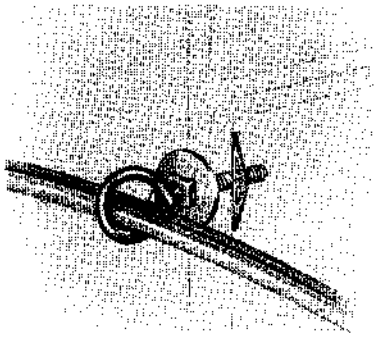


SC Wire Clip



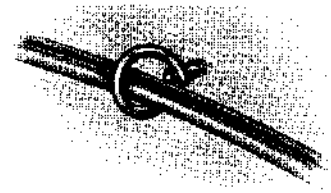
C Drop Wire Clamp

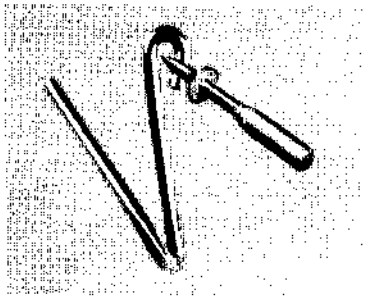
Fig. 1 — First Attachments



Toggle
Bridle Ring

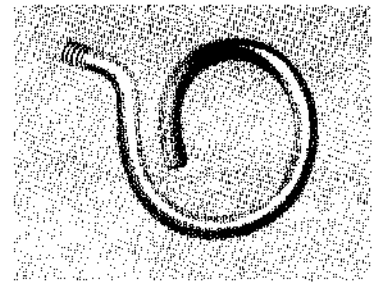
B
Bridle Ring

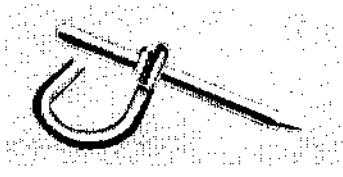




B
Wire Loop
with
D
Masonry Fastener

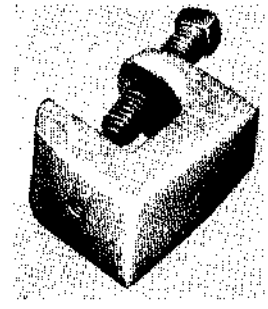
M
Bridle Ring

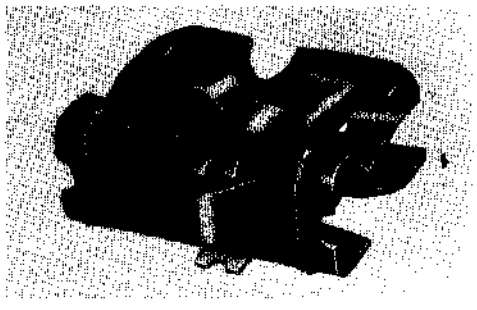




Drive
Ring

B
Insulator
Support





B
Beam Clip

Insulated
Screw Eye

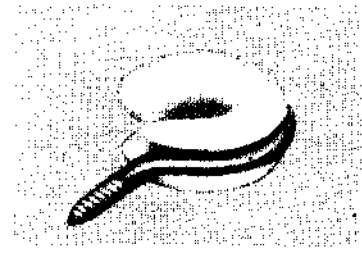
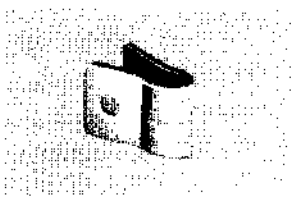


Fig. 2 — Intermediate Attachments



E Drop Wire Clamp

C Knob

Fig. 3 — Last Attachments

5.00 INSIDE WIRE AND CABLE ATTACHMENTS

Inside Wiring Nail (Fig. 4)

- The inside wiring nail is used generally to fasten GS-type and other types of twisted wire.
- It is available in ivory or light olive gray.
- It is available in 1/2- and 7/8-inch sizes (use nail of sufficient length to fasten wire securely).

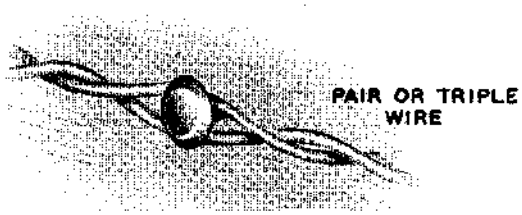


Fig. 4 — Inside Wiring Nail

B Station Wiring Nail (Fig. 5)

- This nail is used to fasten jacketed station wire to plaster or wood surfaces.
- It is available in ivory or light olive gray.
- It comes in 1/2- and 7/8-inch lengths.

Fig. 5 — B Station Wiring Nail

Bridle Ring and Toggle Bridle Ring (Fig. 2)

- Bridle rings are installed on brick or masonry surfaces with wood screw anchors.
- Toggle bridle rings are used to fasten station wire and cable to hollow surfaces.
- These fasteners are galvanized and can be used either indoors or out.

B Station Wiring Clamp (Fig. 6)

- Table B indicates the fasteners to be used to attach these clamps to various surfaces.

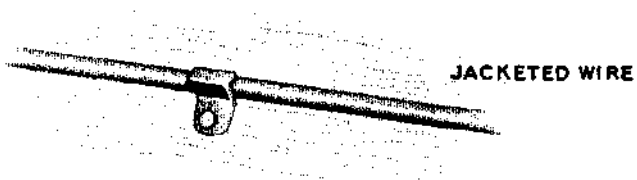


Fig. 6 — B Station Wiring Clamp

TABLE B

FASTENERS FOR B STATION WIRING CLAMP

Surface	Color	Fastener
Metal or Asbestos Siding	Light Olive Gray, Ivory, or Galvanized	5/8-in. No. 6 self-tapping screw
		5/8-in. No. 6 RH galvanized wood screw. C plastic anchor, 3/16 x 1 in.
Wood, Indoors		5/8-in. No. 6 RH blued wood screw or inside wiring nail
Wood, Outdoors		5/8-in. No. 6 RH galvanized wood screw
Stucco (Wire and Paper Backing)		1-in. No. 6 self-tapping screw (cadmium plated) or wall screw anchor (correct size)

Staples

- Staples used for fastening jacketed wire do not have rust- and corrosion-resistant properties and are not to be used outside (see Fig. 7 and Table C).

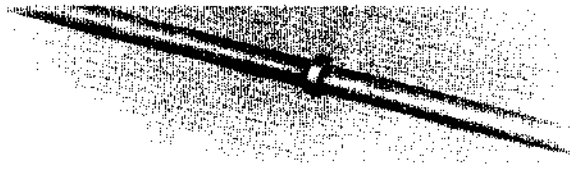


Fig. 7 – Staple

TABLE C

SELECTION OF STAPLES

Staple	Color	Stapler		Remarks
LP	Light Olive Gray or Ivory	HELLER	T2	TM staples can be used in the M stapler.
M			M	
TM	Copper Oxide		TM	
L3B	Tin Finish	MARKWELL L3T		For use in hardwood.
L3M				
L3D				For use in softwood.
L3DTC				
3/8 in.	Zinc-Tin Finish	ARROW T-25		For use in hardwood.
7/16 in.				
9/16 in.				For use in softwood.

Note: **Staples are not recommended for use in plaster.**

B Beam Clip (Fig. 8)

- This support is used at indoor locations to fasten station wire and/or cable on metal structures. The B beam clip may be installed on I beams, angle irons, etc, on beam thicknesses of from 1/8 inch to 1/2 inch, inclusive. *It is an intermediate attachment and is not to be used as a first attachment for drop and block wire.*

- Two holes are provided on one side of clip (Fig. 9). One hole accepts a 10-24 machine thread and the other a 1/4-20 machine thread. Clip may be equipped with B or M bridle ring, backboard, cable terminal box, etc (Fig. 9, 10, and 11).

Fig. 8 — B Beam Clip

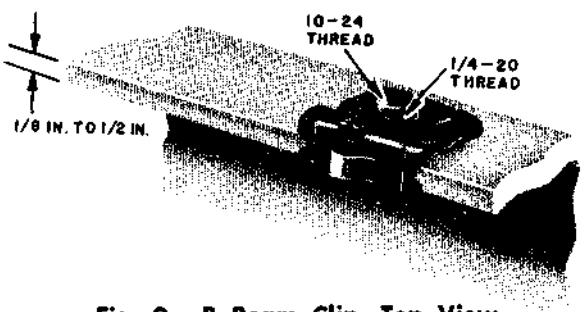


Fig. 9 — B Beam Clip, Top View

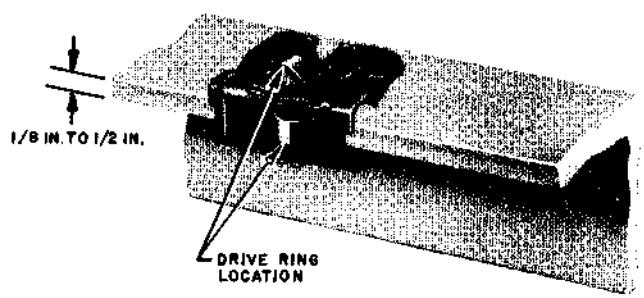


Fig. 10 — B Beam Clip, Bottom View

- A projection is provided on the opposite side and base of clip to accommodate all sizes of drive rings except the 1/2-inch (Fig. 10).

THINK ***Avoid personal injury by protecting eyes and hands when installing clip.***

THINK ***Ascertain that fastener mounted less than 8 feet above floor level does not present a hazard.***

- To install, place open end of clip against flange and tap opposite corners of clip until seated firmly.

- Various installation arrangements for the B beam clip are shown in Fig. 11.

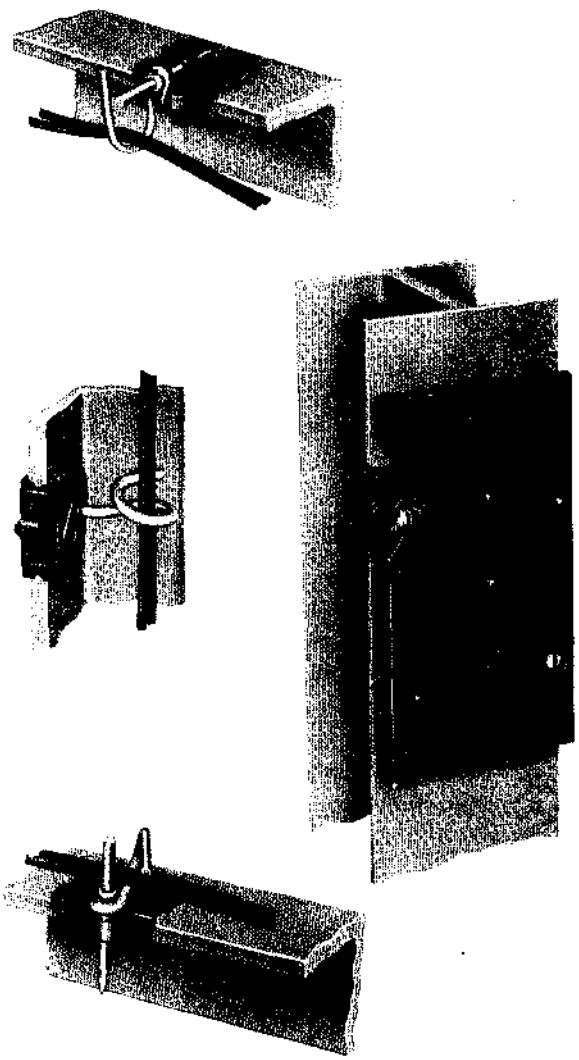


Fig. 11 — B Beam Clip, Installations

B Insulator Support (Fig. 12)

- This support is used to fasten station wire and cable on metal structures.
- It may be equipped with M bridle rings.

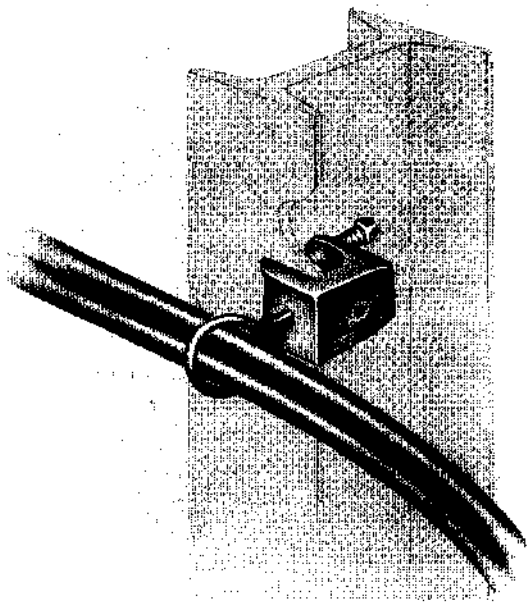


Fig. 12 — B Insulator Support

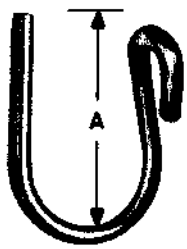


Fig. 13 — B Wire Loop

B Wire Loop (Fig. 13)

- Install the B wire loop on masonry surfaces with the D masonry fastener using the hand-type drive tool. See section entitled Drive Tools, Hand Type for Masonry Fasteners.
- Wire loops with the D masonry fasteners have the advantage over drive rings because the fasteners are driven directly into the masonry surface without a pre-drilled hole.

Drive Rings (Fig. 14)

- Install drive rings on brick or masonry surfaces with hammer drive anchors.

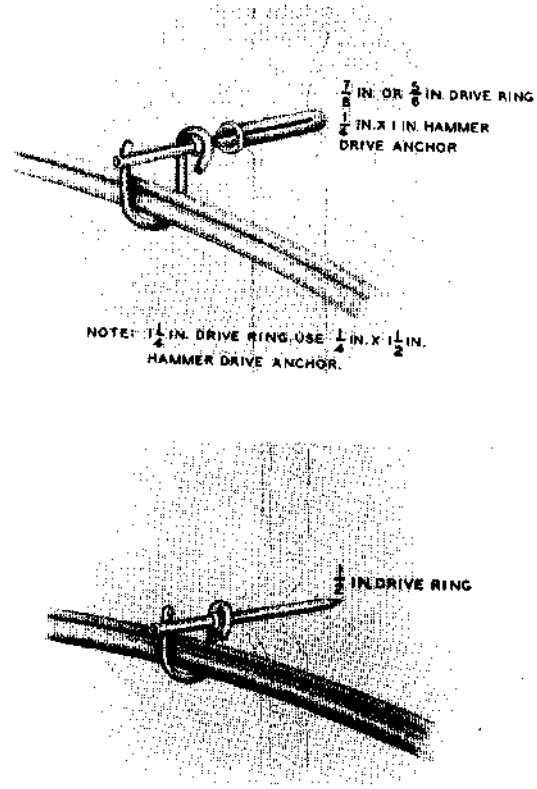


Fig. 14 — Drive Rings

B Adhesive Clip (Fig. 15)

- The B adhesive clip is used to fasten station wiring where it is undesirable to mar surfaces.
- It is available in ivory or light olive gray.
- Best adhesion is obtained on a clean, smooth surface.

- High temperatures may deteriorate B adhesive clips during storage; therefore, those not used before date on container should be tested for tackiness.

- Install B adhesive clip as follows:

1. Thoroughly moisten adhesive surface with trichloroethylene.
2. Allow sufficient time for adhesive to become tacky, about the consistency of fly paper.
3. Press clip to bonding surface for about 5 seconds.
4. Allow clip to set for 15 minutes.
5. Place station wire in clip and form tabs over wire.

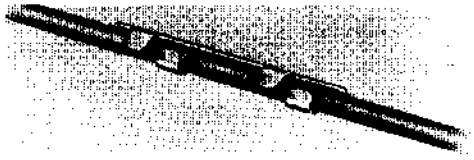


Fig. 15 — B Adhesive Clip

Capacity

- Capacity of fasteners for cable and station wire is indicated in Tables D and E.

TABLE D

CAPACITY OF FASTENERS FOR CABLE

Size of Cable Pair	Clamp No.		Clasp No.
	Galvanized Cable Clamps for Lead-Covered Cable	Light Olive Gray or Ivory	Light Olive Gray or Ivory
6	6	5	7
11	7		
12		6	7
16	8	8	9
21	10	8	9
25		8	9
26	10		
31	10		
41	13		
50		10	14
51	13		
75		12	14
76	13		
100		12	14
101	17		

TABLE E

CAPACITY OF FASTENERS FOR STATION WIRE

Type of Wire		Capacity (quantity of station wires held)							
		Clamp No.					Clasp No.		B Wire Loops and 1/2-in. Drive Rings
		5	6	7	8	10	7	9	
JK (Jacketed)	Paired	3	4	5	6	6	2	4	6
	Triple	2	3	4	5	6	2	3	5
	Quad		3	3	4	5	2	3	5
GS	Paired	4	6	8	9	10	3	6	10
	Triple	3	4	5	6	7	2	4	7
	Quad		3	4	4	5	2	3	5
D Block	Paired			3	4	5			4
	Triple				3	4			3

Cable Clamp and Cable Clasp (Fig. 16)

- Table F indicates the fasteners to be used to attach cable clamps and cable clasps to various surfaces.
- Cable clamps and cable clasps are used for fastening cable or more than one station wire.

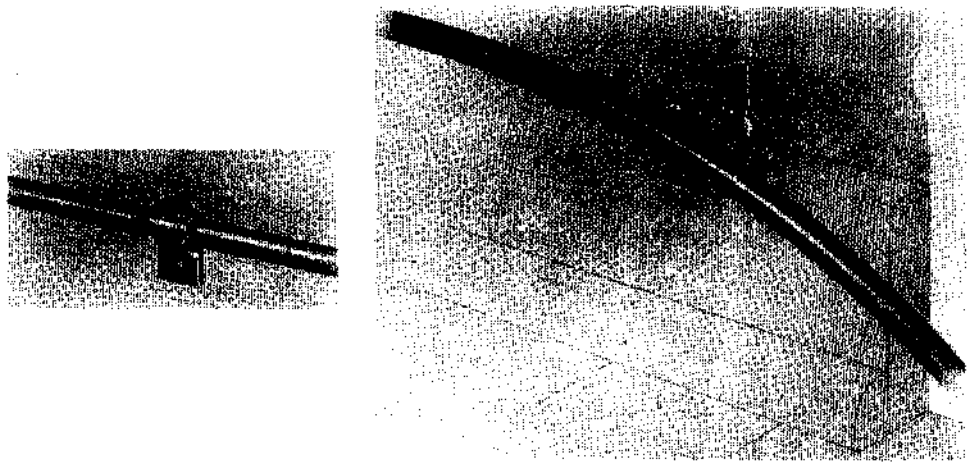


Fig. 16 — Cable Clamp and Cable Clasp

TABLE F

FASTENERS FOR CABLE CLAMPS AND CABLE CLASPS

Surface	Clamp No. / Color: Light Olive Gray, Ivory, Galvanized	Clasp No. / Color: Light Olive Gray, Ivory	Fastener	Remarks
Woodwork	3 and 5	7	1-1/2 in. No. 6 RH blued wood screw or 1/2-in. inside wiring nail in hardwood or 7/8-in. inside wiring nail in softwood	No. 8 RH blued wood screws cannot be used without reaming the screw hole.
Woodwork, Plaster on Wood Lath, Plasterboard	6, 7, 8, 10, 12, 13, and 17*	9 and 14	1-1/2 in. No. 8 RH blued wood screw†	Inside wiring nail may be used to attach No. 9 clasp to wood.
Plaster on Wood Lath, Metal Lath, Plasterboard, Metal Sheathing	3 and 5	7	7/8-in. inside wiring nail or 3/8- or 5/8-in. No. 6 self-tapping screw or C plastic anchor 3/16 in. x 1 in. in metal	Place fasteners at stud locations or in solid wood backing.

TABLE F (Cont)

FASTENERS FOR CABLE CLAMPS AND CABLE CLASPS

Surface	Clamp No. Color: Light Olive Gray, Ivory, Galvanized	Clasp No. Color: Light Olive Gray, Ivory	Fastener	Remarks
Metal Sheathing	6, 7, 8, 10, 12, 13, and 17*	9 and 14	3/8- or 5/8-in. No. 8 self-tapping screw in metal or C plastic anchor (3/16 in. x 1 in.) or 1-in. roofing nail	No. 8 RH blued wood screws cannot be used without reaming the screw hole. No. 6-D slating nail may be used to attach No. 9 and 14 clasps to studding if baseboard is not wood.
Plaster on Masonry, Plaster Block	3 and 5	7	No. 5B masonry fastener or 1-1/2 in. No. 6 RH blued wood screw in 1-1/2 in. No. 6-8 screw anchor or C plastic anchor (3/16-in. x 1-1/2 in.)	
	6, 7, 8, 10, 12, 13, and 17*	9 and 14	No. 5B masonry fastener or 2 in. No. 8 RH blued wood screw† in 1-1/2 in. No. 6-8 screw anchor or C plastic anchor (3/16-in. x 1-1/2 in.)	
Masonry	3 and 5	7	No. 3B masonry fastener or 1-in. No. 6 RH blued wood screw in 3/4-in. No. 6-8 screw anchor	No. 8 RH blued wood screws cannot be used without reaming the screw hole.
	6, 7, 8, 10, 12, 13, and 17*	9 and 14	No. 3B masonry fastener or 1-in. No. 8 RH blued wood screw† in 3/4-in. No. 6-8 screw anchor or C plastic anchor (3/16-in. x 1-in.)	A 3/16- by 7/8-in. hammer drive anchor may be used with No. 6, 7, 8, and 10 cable clamps.

* Washers are required under head of screw when No. 13 and 17 cable clamps are used.

† Use galvanized screws for galvanized clamps. For No. 13 and 17 clamps use No. 10 RH galvanized wood screws and No. 10-14 screw anchors.

Fasteners for Ground Wire (Fig. 17)

- Space 24 inches apart on ordinary ground wire runs.
- Space 16 inches apart when wire is subject to displacement.
- Place on every beam when spanning beams.
- Place within 3 inches of wall when run parallel to wall on beams.

6.00 MASONRY FASTENERS

6.01 The maximum holding power for the anchoring devices covered in these instructions in any given quality of masonry depends upon obtaining a drilled hole corresponding to the outside diameter of the unexpanded anchor and of sufficient depth to allow the nail to be driven its full length. The diameter and length are generally indicated on the anchor. The depth of hole required varies with the thickness of the fixture to be installed at the point of support. In all installations the minimum depth of hole required is equivalent to the length of the anchor plus the distance the nail or screw will extend beyond the anchor (approximately 3/16 inch). In the case of hammer drive anchors remember to deduct the thickness of the fixture at the point of support.

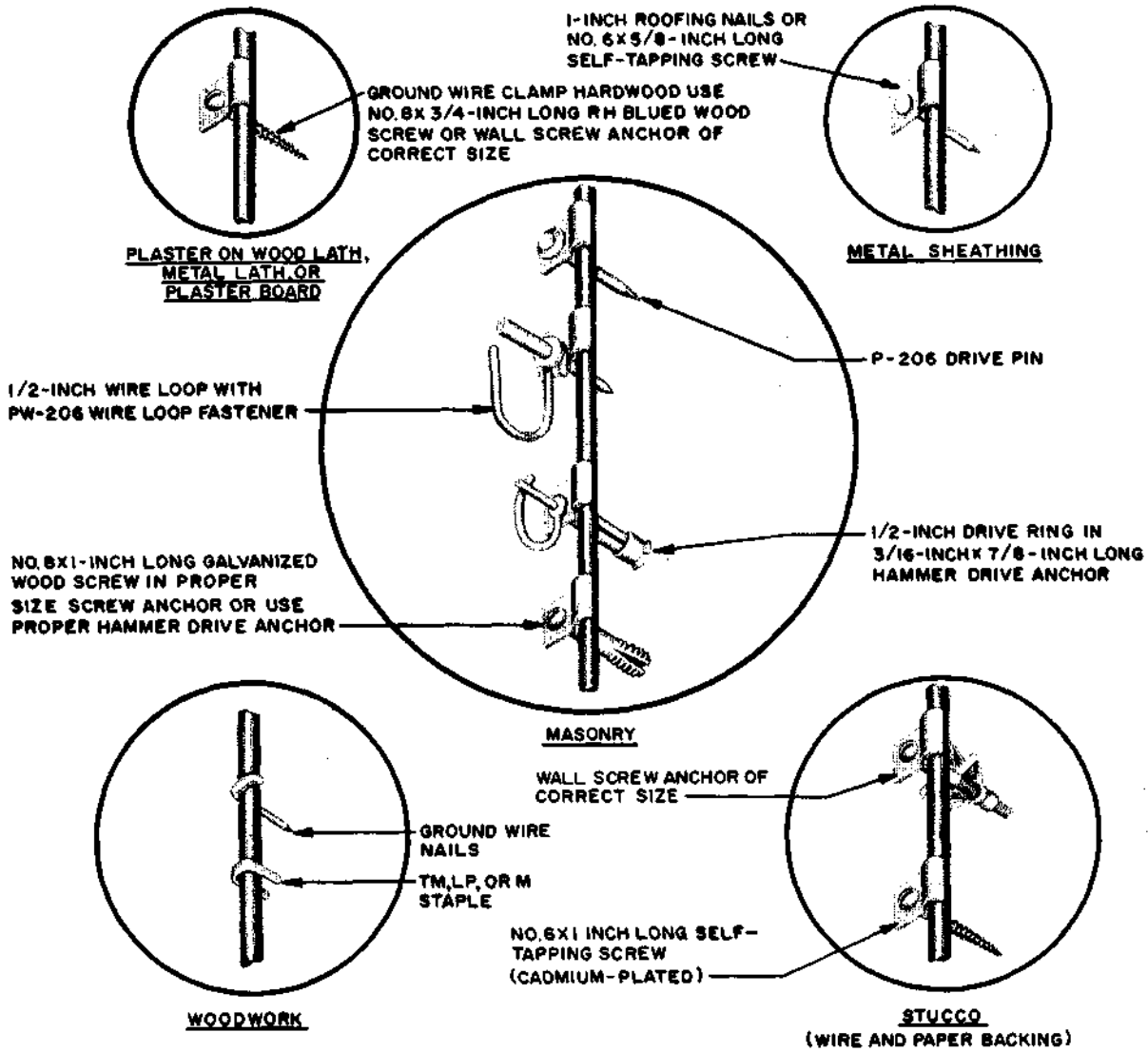


Fig. 17 — Fasteners for Ground Wire

6.02 The following points should be observed in using an anchoring device:

- Select type and size of anchoring device specified.
- Select the proper size of drill. The diameter is indicated on the anchor shield.
- Drill masonry to required depth with light taps of hammer. Do not rock drill, but turn it slightly after each blow to prevent binding.
- The expansion shield should fit snugly for best results. Tap it lightly in place.

6.03 Several types of anchors in general use are: machine bolt anchors, hammer drive anchors, wood screw anchors, and B plastic anchors.

Machine Bolt Anchors (Fig. 18)

6.04 These are intended for use when substantial holding is required.

Size	Hole
Star 1/2-in. Loxin	7/8 in. x 2-1/2 in.
Star 5/16-in. Loxin	5/8 in. x 2 in.
Keystone 1/4-in.	1/2 in. x 1-3/8 in.

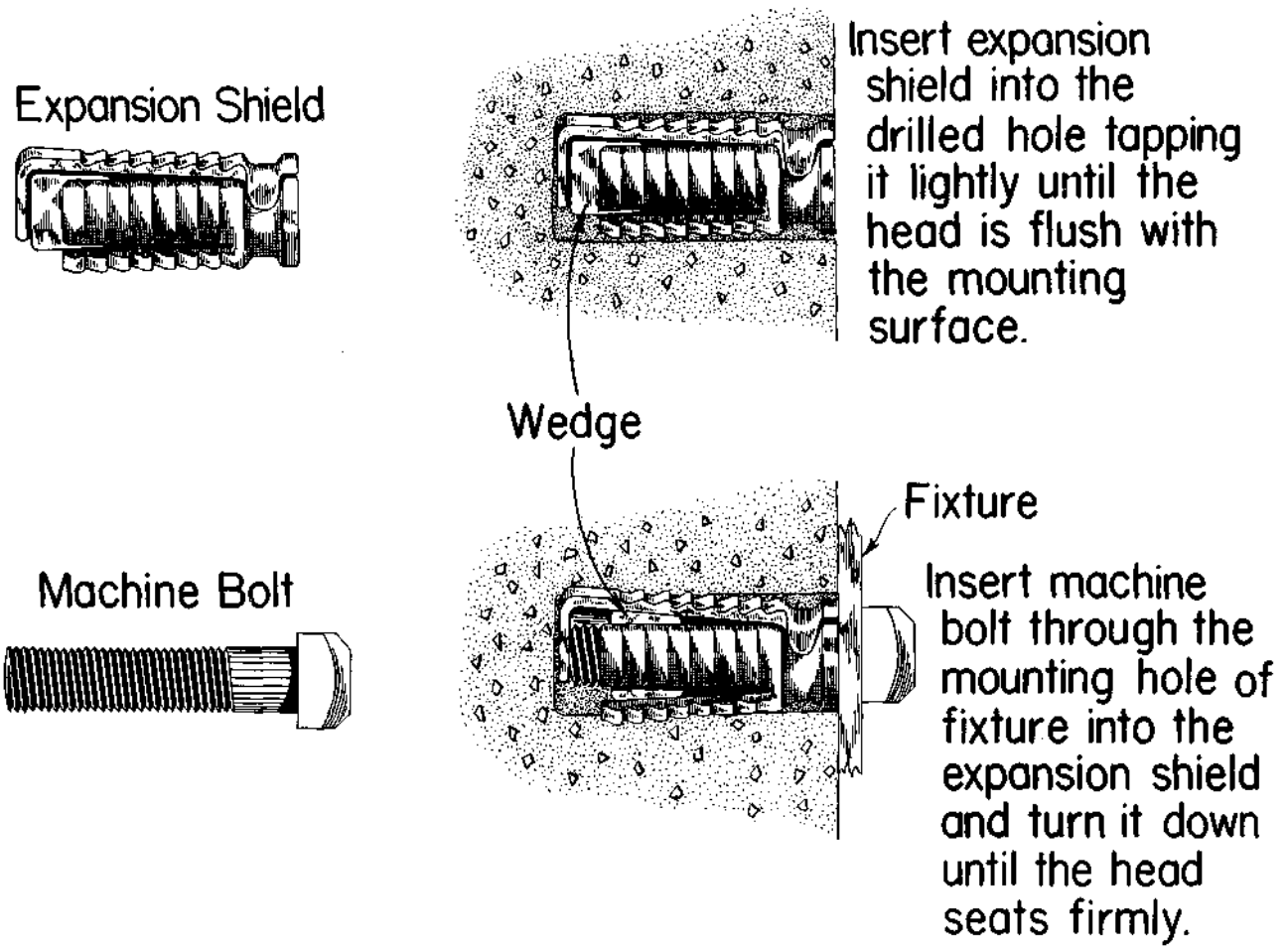
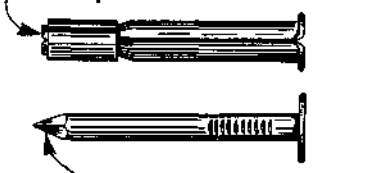


Fig. 18 — Machine Bolt Anchor

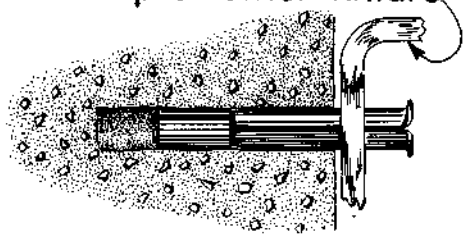
Dryvin Anchor

Expansion Shield



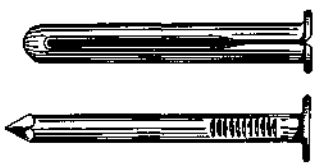
Nail
(Wedging Element)

Cable Clamp or other fixture

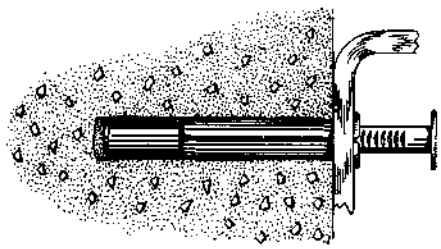


Insert expansion shield through the mounting hole of fixture and into drilled hole.

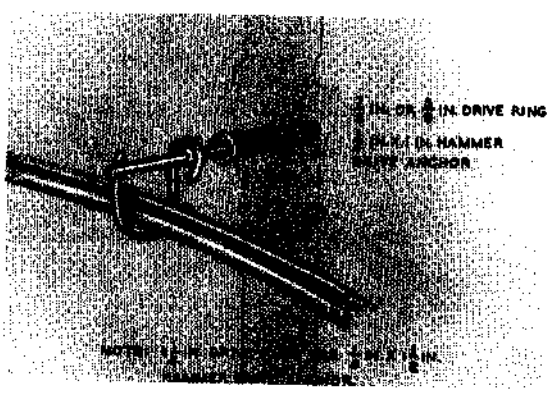
Diamond Hammer Drive Anchor

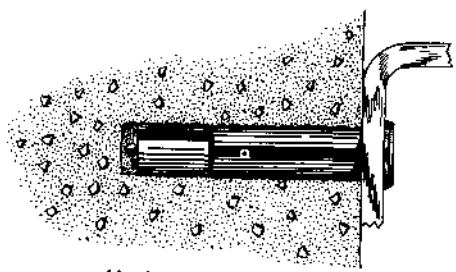


Brush Nail Expansion Bolt



Tap expansion shield lightly until the flange rests against the fixture, then insert nail into the expansion shield.





Drive nail in until the head seats firmly.

Fig. 19 — Hammer Drive Anchors

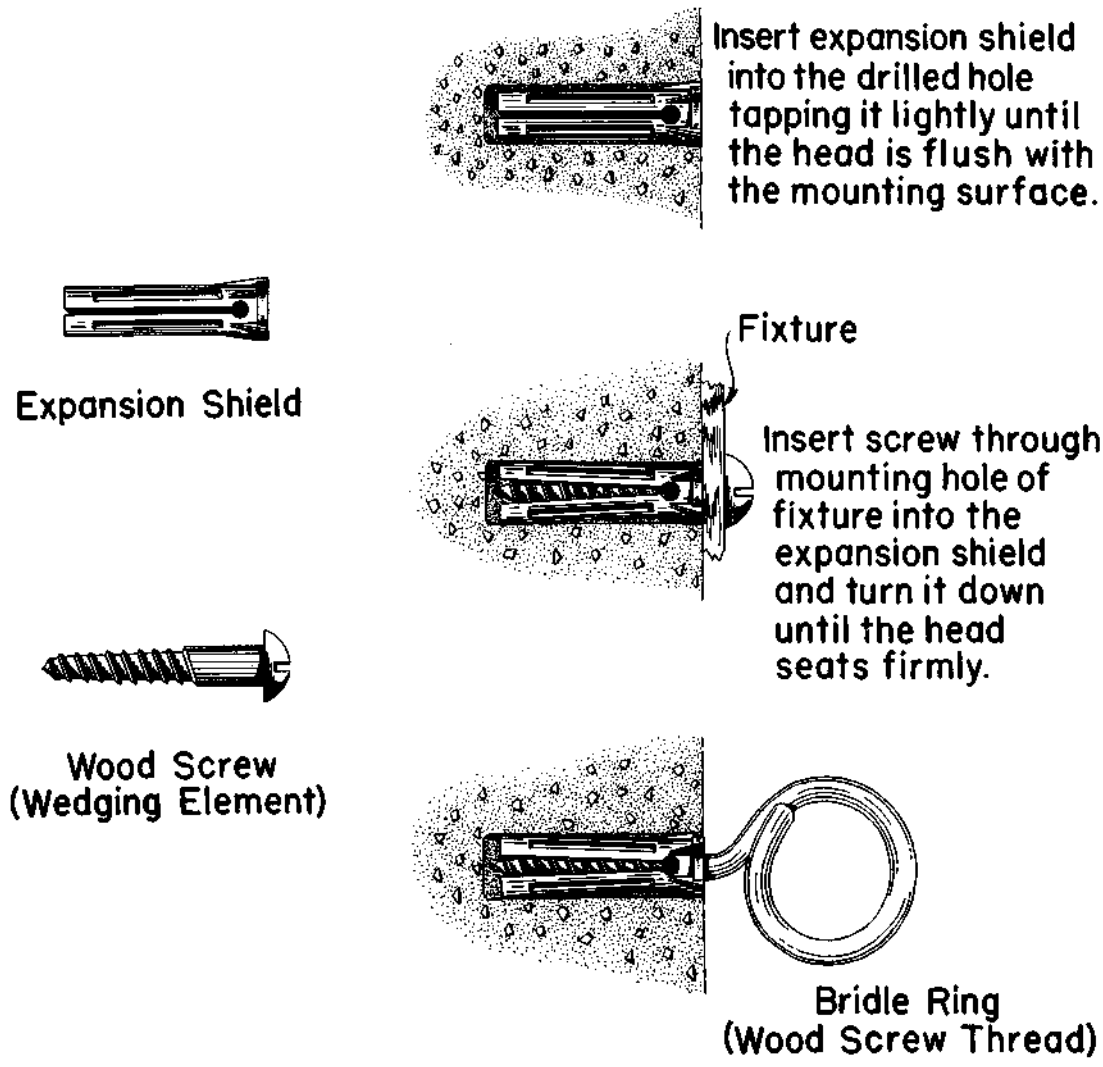


Fig. 20 — Wood Screw Anchors

Hammer Drive Anchors (Fig. 19)

6.05 These anchors require a predrilled hole. They are available in the following sizes:

Size in.	For Use with
3/16 x 7/8	1/2-in. Drive Rings
1/4 x 1	5/8- and 7/8-in. Drive Rings
1/4 x 1-1/4	
1/4 x 1-1/2	
5/16 x 1-1/4	1-1/4 in. Drive Rings
5/16 x 1-3/4	Drop Wire Hook
5/16 x 2-1/4	
5/16 x 2-3/4	
3/8 x 2	

Wood Screw Anchors (Fig. 20)

6.06 These are lead anchors requiring a predrilled hole. They can be used on all substantial masonry and are available in the following sizes:

Size in.	Use
6-8 x 3/4	No. 6 and 8 wood screws
6-8 x 1-1/2	No. 6 and 8 wood screws
10-14 x 1 10-14 x 1-1/2	Types A, C, and E bridle rings and No. 10 and 14 wood screws

B, C, and D Masonry Fasteners and Wire Loops

6.07 This section covers the B, C, and D masonry fasteners and B wire loops which replace drive pins, threaded studs, wire loop fasteners, and wire loops, respectively.

- Masonry fasteners are installed by means of hand-operated drive tools.
- Fasteners are zinc-coated, heat-treated steel and are for use in making attachments to masonry. They are driven directly into masonry by means of a hand-operated drive tool. Fasteners are equipped with flat steel washers and are designated as B, C, and D. They are furnished in several lengths by size number. See Fig. 21 through 23.

6.08 The B wire loop is available in four sizes corresponding to those of the standard drive rings (Fig. 24). D masonry fasteners are used to support B wire loops and any size combination of both may be used.

6.09 The B, C, and D fasteners and B wire loop size numbers and dimensions are as shown in Fig. 21 through 24.

Size No.	Length	
	Shank (S)	Nominal (L)
	in.	
2	1/2	9/16
3	3/4	13/16
4	1	1-1/16
5	1-1/4	1-5/16
6	1-1/2	1-9/16
8	2	2-1/16
10	2-1/2	2-9/16
12	3	3-1/16

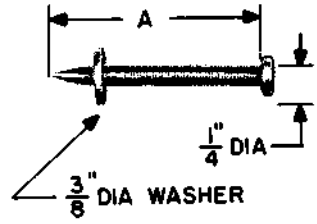


Fig. 21 — B Masonry Fastener

Size No.	Length		
	Shank (S)	Nominal (L)	Threaded (T)
	in.		
31	3/4	1	1/4
32	3/4	1-1/4	1/2
35	3/4	2	1-1/4
41	1	1-1/4	1/4
42	1	1-1/2	1/2
45	1	2-1/4	1-1/4
51	1-1/4	1-1/2	1/4
52	1-1/4	1-3/4	1/2
55	1-1/4	2-1/2	1-1/4

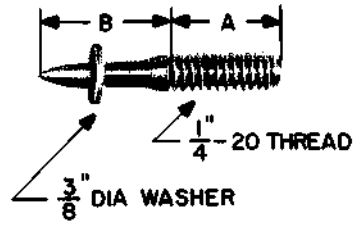


Fig. 22 — C Masonry Fastener

Size No.	Length	
	Shank (S)	Nominal (L)
	in.	
3	3/4	1-1/2
4	1	1-3/4
5	1-1/4	2

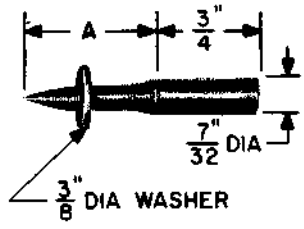


Fig. 23 — D Masonry Fastener

Size No.	Width of Opening (W)	Length of Loop (inside) (L)
	in.	
1/2	1/4	3/4
5/8	1/2	1-1/8
7/8	5/8	2-1/16
1-1/4	5/8	2-3/4

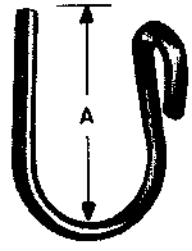


Fig. 24 — B Wire Loop

Fastener and Wire Loop Selection

6.10 Threaded fasteners are used for temporary installation or where equipment is to be removed. Nail and wire loop type fasteners are used for permanent installation.

6.11 To select proper fasteners see Table G.

6.12 Table G is for materials of average hardness; for soft materials a longer fastener is used and for harder materials a shorter fastener.

- If less than three hammer blows are required on drive tool to drive in fastener, use a longer fastener.
- If more than six blows are required, use a shorter fastener.
- For plaster over masonry walls add thickness of plaster for proper penetration.
- Do not place fastener in brittle material, such as glazed tile or brick.

6.13 To remove fasteners, it is necessary to break the compression bond of the fastener by hitting it lightly on opposite sides with a hammer. Then remove it with a nail puller.

TABLE G

FASTENER AND WIRE LOOP SELECTION

Equipment to Be Anchored	Mounting Surface		Masonry Fastener		
			B	C	D
			No.		
Metal Molding*	Concrete		3		
IW Cable Clamps and Cable Clamps	Mortar		4		
Metal Boxes, Light Gauge	Cement	Block	5		
	Cinder				
Wood, 3/4-inch thick Example: 82-Type Backboard	Concrete		5		
	Mortar		6		
	Cement	Block	8		
	Cinder				
Backboards with Predrilled Holes†	Concrete			32	
	Mortar			35	
	Cement	Block		55	
	Cinder				
B Wire Loops‡ Size No. 1/2, 5/8, 7/8, and 1-1/4 in.	Concrete				3
	Mortar				4
	Cement	Block			5
	Cinder				

* Drive fastener through metal molding.
† Hold in place by securing with 1/4-20 hexagon nuts on threaded fasteners.
‡ Selection is dependent upon the wire-carrying capacity required.

AT-7794X Plastic Anchor

6.14 The AT-7794X plastic anchor is intended for use with wood screws when making attachments to masonry (Fig. 25). Table H gives the sizes.

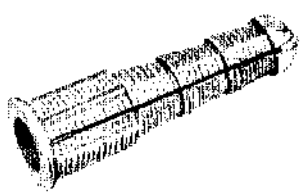


Fig. 25 — AT-7794X Plastic Anchor

TABLE H

SELECTION OF AT-7794X PLASTIC ANCHORS

Anchor Size	Wood Screw No.	Drill Size in.
10	8 or 10	3/16
12	10 or 12	1/4
16	14 or 16	5/16

B and C Plastic Anchors

6.15 These anchors are used for making attachments to masonry, metal, plywood, masonite, etc. They are to be used indoors only. They consist of a molded nylon body and a zinc-coated steel nail which has a slotted head and a

threaded shank to aid in removal. The B anchor has a flat-head body and the C anchor has a round-head body.

6.16 A 3/16- or 1/4-inch hole must be drilled to use the nylon anchor. After inserting the anchor into the hole and driving the nail it must be counterset with a pin that is contained in each package of 15.

6.17 The following sizes are available.

- B Plastic Anchor

  3/16 × 1 inch

  1/4 × 1 inch

  1/4 × 1-1/2 inch

- C Plastic Anchor (Fig. 27 and 29)

  3/16 × 1 inch*

  3/16 × 1-1/2 inch

  1/4 × 1 inch

  1/4 × 1-1/2 inch

* Small head to fit 168 backboard or 42A connecting block (Fig. 26 and 28).

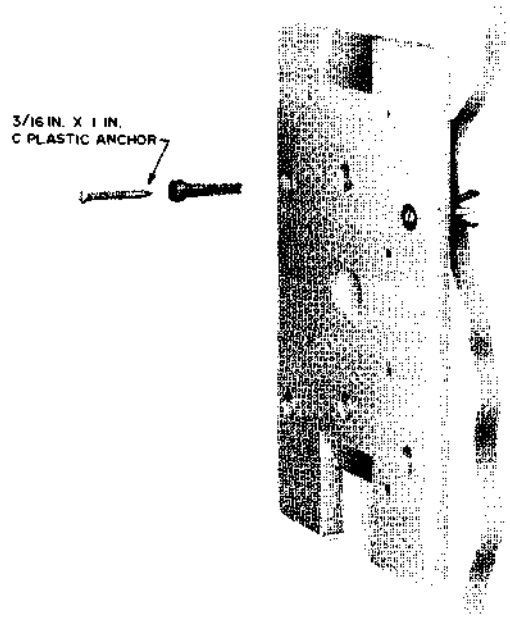


Fig. 26 — C Plastic Anchor, 168F Backboard

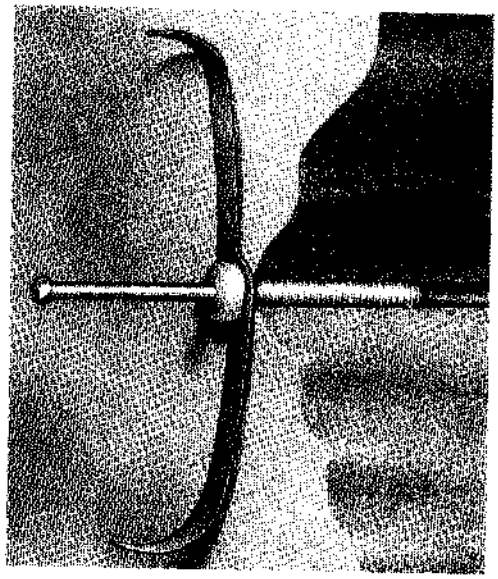


Fig. 27 — C Plastic Anchor, Cable Clasp

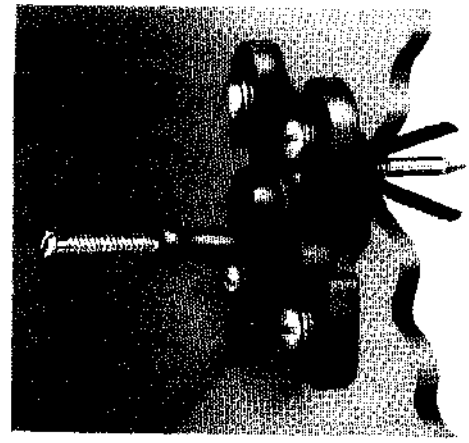


Fig. 28 — C Plastic Anchor, 42A Connecting Block

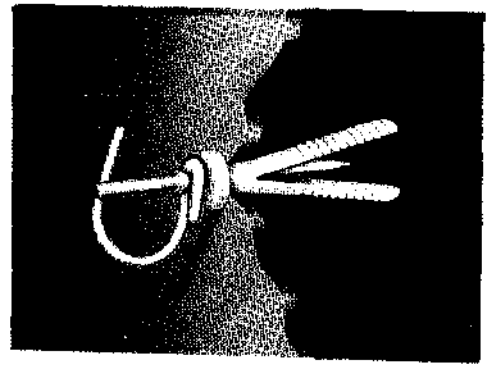


Fig. 29 — C Plastic Anchor, Drive Ring

7.00 HOLLOW-WALL FASTENERS

Wall Screw Anchors

7.01 The wall screw anchor is used for attaching various items of station apparatus, inside wire, and cable to interior wall surfaces of hollow construction. They can be used in plywood, wallboard, masonite, and hollow plaster wall.

- A disposable wrench for use in facilitating anchor attachment on soft-textured walls is included in each box of Molly and Star anchors, Fig. 30.
- A wrench is not furnished with the Diamond anchor, Fig. 31.
- To obtain maximum holding power, the wall thickness should first be determined and then the correct size anchor should be selected. See Table J for selection.

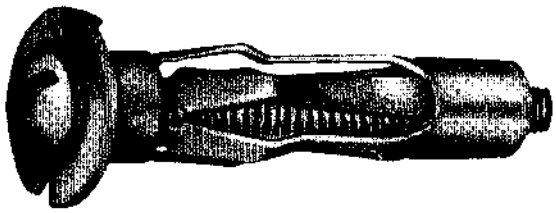


Fig. 30 — Molly and Star Anchor

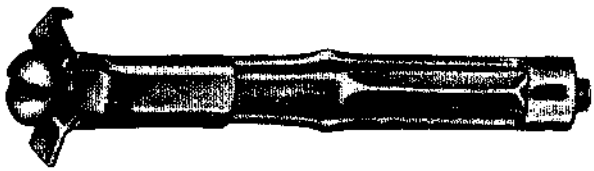


Fig. 31 — Diamond Anchor

TABLE J

SELECTION OF WALL SCREW ANCHORS

Wall Thickness	Anchor Size	Drill Size	
		D and E	Masonry
in.			
Up to 1/2	1-1/2	1/4	1/4
5/8 to 3/4	2	1/4	1/4
3/4 to 1-1/4	2 (Fig. 30)	3/8	5/16
	2-1/4 (Fig. 31)		
1-1/4 to 1-3/4	2-1/2 (Fig. 30)*	3/8	5/16
1-1/4 to 1-3/4	3-1/2 (Fig. 30)†	1/2	7/16

* Size 2-1/2 in. anchors are used for light loads, eg, 554-type sets, etc.

† Size 3-1/2 in. anchors are used for heavy loads, eg, control unit for speakerphone.

Installation

7.02 To install a wall screw anchor after the proper anchor has been selected, proceed as follows:

- Mark spot where anchor is desired.
- Drill hole in wall corresponding to anchor size (see Table J).
- Insert anchor and tap gently until cap prongs are embedded and cap is firmly set against wall surface.
- Tighten screw while pressing firmly in order to prevent anchor from rotating.
- In soft-textured walls it will be necessary to use wrench to hold the anchor body from rotating while turning the screw until the anchor is in its fully expanded position.
- When anchor is fully expanded, remove screw and attach hardware. (There is some resistance to turning the screw when the anchor is fully expanded.)
- Hold equipment in position; replace screw and tighten.

Toggle Bolts (Fig. 32)

7.03 Toggle bolts are of two general types, flop-over and spring. They are intended for use in attaching fixtures to hollow tile and similar supports. A secure toggle bolt installation depends on a satisfactory bearing area for the toggle. The hole should be restricted to the size that will accommodate the toggle in the collapsed condition. The table below lists the various sizes of toggle bolts and the diameter to which the drilled hole should be restricted for best results.

TABLE K

Size of Toggle Bolt	Spread of Toggle	Dia of Drilled Hole
	in.	
1/8	2	1/2
3/16	2-1/4	5/8
1/4	2-1/2	3/4
5/16	2-3/4	7/8

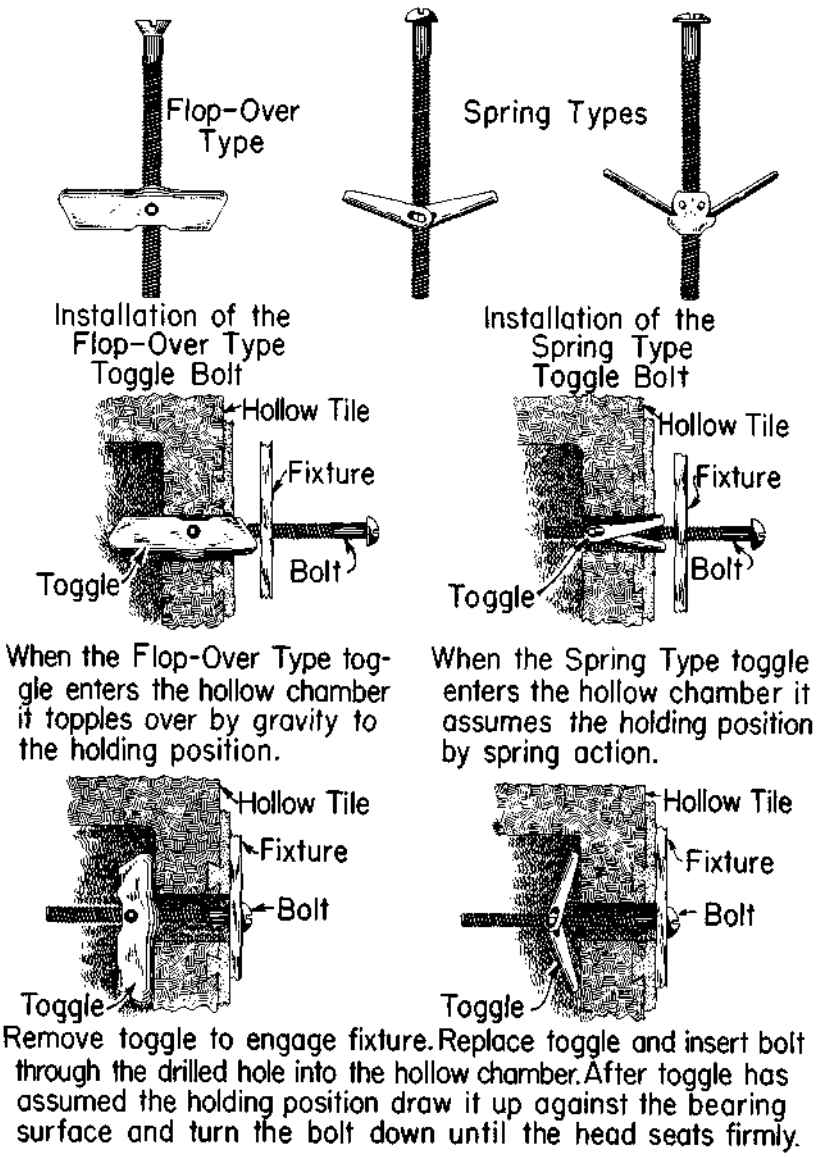


Fig. 32 — Toggle Bolts

Installation

7.04 To install toggle bolts proceed as follows:

- Select type and size required.
- Select size of drill in accordance with Table K.
- Drill hollow tile by light taps with hammer, rotating drill slowly. If a rib is struck, tilt drill toward hollow chamber. Use care to keep hole as small as possible.

8.00 SURFACES ENCOUNTERED

8.01 In order to obtain secure attachments and to avoid damage to building surfaces it is essential that the specific instructions covered in this section of the practice for each type of surface be followed. Of particular importance are the clearance and lead holes for wall fasteners and fixtures as a means of preventing wall damage.

Cement or Cinder Block

8.02 Masonry fasteners (B, C, or D) or hammer drive anchors are recommended. However, if the wall is old and the fastener is not firm, the second choice is a toggle bolt through the existing hole. If the toggle bolt pulls out, the last choice is a carriage bolt. Install the carriage bolt (with a board under the head large enough to cover the hole in the wall surface) completely through the board and the wall.

Masonry or Substantial Brick Veneer

8.03 In general, the same methods apply in making attachments to masonry and substantial brick veneer. Veneering may be considered substantial where its thickness is at least 3-3/4 inches (as observed at an outside corner), the bricks are joined firmly by the mortar, and indications are that no trouble will result from making attachments in the manner specified for masonry. If there is any question as to whether the veneering is substantial, follow the methods specified in 8.16 for thin-wall brick veneer. On masonry and substantial brick veneer, drill holes for all attachments as close to the center of bricks as practicable and exercise care to avoid damaging and loosening the bricks. In the case of face brick or ornamental types of brick, holes for intermediate and last attachments may be drilled in the seam to avoid breakage, if secure attachments can be obtained.

8.04 No predrilled holes are required when using the newer steel fasteners that are driven directly into masonry. These are explained in another part of this section, and it is important to understand them thoroughly before using.

Metal (Desk, Paneling, or Siding)

8.05 Be sure protrusion of fasteners will not cause damage or injury. Inside fasteners for paneling or desks can be of the following variety: self-tapping metal screw, B or C plastic anchor, toggle bolts, or bolts and nuts. There is also a possibility of using an adhesive clip for a wire.

8.06 Aluminum siding presents other problems. The customer should be contacted to determine the type of siding and method used to install it. This will determine type of fastener or attachment to be used. Permission should be obtained at this time for proposed wire runs, etc.

8.07 When using an extension ladder against aluminum siding use necessary precaution to prevent damage.

Plaster on Lath, Rock Lath, Plasterboard, etc

8.08 When any substantial attachment is used it will be necessary to locate the studding as in 8.15. The holding power of toggle bolts or wall screw anchors is such that any movement or shifting of weight tends to loosen them. This must be considered at all times so that costly maintenance and hazards are not built into plant. If wood lath is used under plaster and can be entered by a slanting lead hole, a secure attachment can usually be made.

Rigid Composition Shingles

8.09 *General:* On buildings finished with rigid composition shingles, make attachments to substantial wood trim where practicable. If suitable woodwork is not available, locate attachments on the shingles as outlined in 8.10 to 8.12 and provide clearance holes through the shingles for the wood screws or screw-type fixtures as specified.

8.10 ***Precaution:*** Because of the brittleness of rigid composition shingles, the following precautions shall be observed:

(a) Place ladder lightly against the shingles, preferably at points where the shingles overlap. where it is felt that additional precaution is necessary, secure a board across the top of the ladder as outlined in Section 081-740-200.

(b) Use only well sharpened drills.

(c) Never employ drills which require the use of a hammer.

(d) Do not apply excessive pressure to the brace when drilling clearance holes through the shingles.

(e) Wood screws should not be tightened excessively as the pressure on the shingle might cause it to break.

8.11 ***Locating Clearance Holes:*** In general, wood screws are required in making attachments through composition shingles. Where one screw is required to attach the drop wire fixtures, locate the clearance hole through the shingles as follows:

(a) ***Rectangular Shaped Shingles Installed with the Long Dimension Horizontal:*** Locate the hole midway between the vertical edges of the shingle and approximately 3/4 inch above the bottom edge.

(b) ***Rectangular Shaped Shingles Installed with the Long Dimension Vertical:*** Locate the hole at the midpoint of the visible shingle height and approximately 3/4 inch from either vertical edge.

(c) ***Shingles Installed in Diamond Formation:*** Locate the hole near a nail hole and approximately 3/4 inch from either exposed edge of the shingle.

8.12 Where more than one wood screw is required to attach the drop wire fixture, observe 8.11 and the following points in locating the clearance holes through the composition shingles:

(a) ***House Bracket:*** The distance between the edge of the shingle and the nearest hole in the bracket should be approximately 3/4 inch.

(b) ***S or L Corner Bracket:*** The bracket should be located so as to bear evenly on the shingles with the hole nearer the porcelain knob located approximately 3/4 inch from the edge of the shingle.

(c) ***W Leader Bracket:*** The bracket should be located so as to bear evenly on the shingles with at least one of the holes located approximately 3/4 inch from the edge of the shingle.

Stucco on Wood

8.13 On stucco on wood buildings, attach to substantial wood trim where practicable. Where required to install fixtures on stucco finished walls, drill a clearance hole for wood screw or screw type fixture, preferably by means of an installer drill in a ratchet brace as specified in 8.16 or with an L masonry drill, using care to avoid cracking the stucco. Locate screws in studding where practicable.

Woodwork

8.14 On woodwork, drill lead holes for fasteners and screw-type fixtures as specified in 8.16 to avoid splitting the wood and to obtain maximum holding power. Locate fasteners in studding where practicable.

8.15 Studs in buildings of wood frame construction may usually be located by one of the following methods:

- Buildings Finished with Clapboards

(a) By location of heads of nails used in fastening clapboards to studding.

- Buildings Finished with Shingles or Stucco

(b) By sounding.

(c) By locating studs in cellar or attic.

(d) By location of heads of nails used in fastening trim to studding.

Thin-Wall Brick Veneer

8.16 Thin-wall brick veneer is considered as veneering having a thickness of less than 3-3/4 inches (as observed at an outside corner) or veneering having bricks that loosen or crack easily when drilled. On such surfaces, make the first attachment on substantial wood trim, where practicable. Where suitable woodwork is not available, make the first attachment on the brick veneer surface by drilling a clearance hole in the seam to permit a wood screw to be passed through the brick portion of wall and screwed into the sheath-

ing, wood backing, or studding. The length of wood screw selected should provide a penetration of at least 1 inch into the wood backing or preferably the studding. A greater penetration, however, is desirable if conditions permit using a longer screw. For intermediate and last attachments, drill holes in center of brick if secure attachment can be obtained and no cracking or loosening of bricks will result. Otherwise, make intermediate and last attachments on wood trim or in the seams, if secure attachments can be obtained. On slab type of veneering (approximately 1 inch thick), it will usually be necessary to secure intermediate and last attachments to the wood backing in the manner specified above for the first attachment.