TECHNICAL DATA

Thread Rolling with Flat Dies

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CONTENTS

The Reed Rolled Thread Die Co. wishes to express appreciation for the cooperation and assistance given in the preparation of the material used in this booklet by the Manufacturers of machines using flat thread rolling dies.

Application of Reed Flat Dies

Flat dies are used in reciprocating type thread rollers, including boltmaking type machines. These machines are made in a number of sizes, each for a limited diameter range and with a specified length of die. Two dies are used: one stationary and one moving — and the rolling faces of the dies are located opposite each other as shown in Fig. 1. A thread is rolled on one blank at a time during the forward stroke of the machine. There is no appreciable axial movement of the blank during rolling. The diameter of the finished thread is controlled by the diameter of the blank, and the distance between the faces of the dies at the finish end of the stroke.

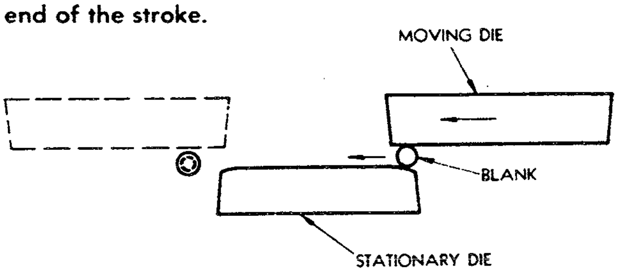


FIG. 1
Reciprocating (Flat-Die) Machine

Reed Flat dies are used for all types of machine and cap screws, tapping screws, lag screws, wood screws, knurling and many types of special threads and forms as shown in Fig. 2. Standard and stock sizes are very popular with our customers for the more common threads because of lower price and immediate deliveries. Dies for special threads and forms and heat-treated parts of high Rockwell hardness are made to order according to requirement and are not confined to stock or standard sizes.

The illustrations on the following pages show some of the many different flat die applications that have been developed by Reed in cooperation with flat die users. These include combination dies of many types, dies for self-pointing, knurling, and straightening, as well as dies for many different thread forms. These examples illustrate how Reed flat dies can be applied to a wide variety of parts and, in many cases, how operations can be combined and performed at one time.

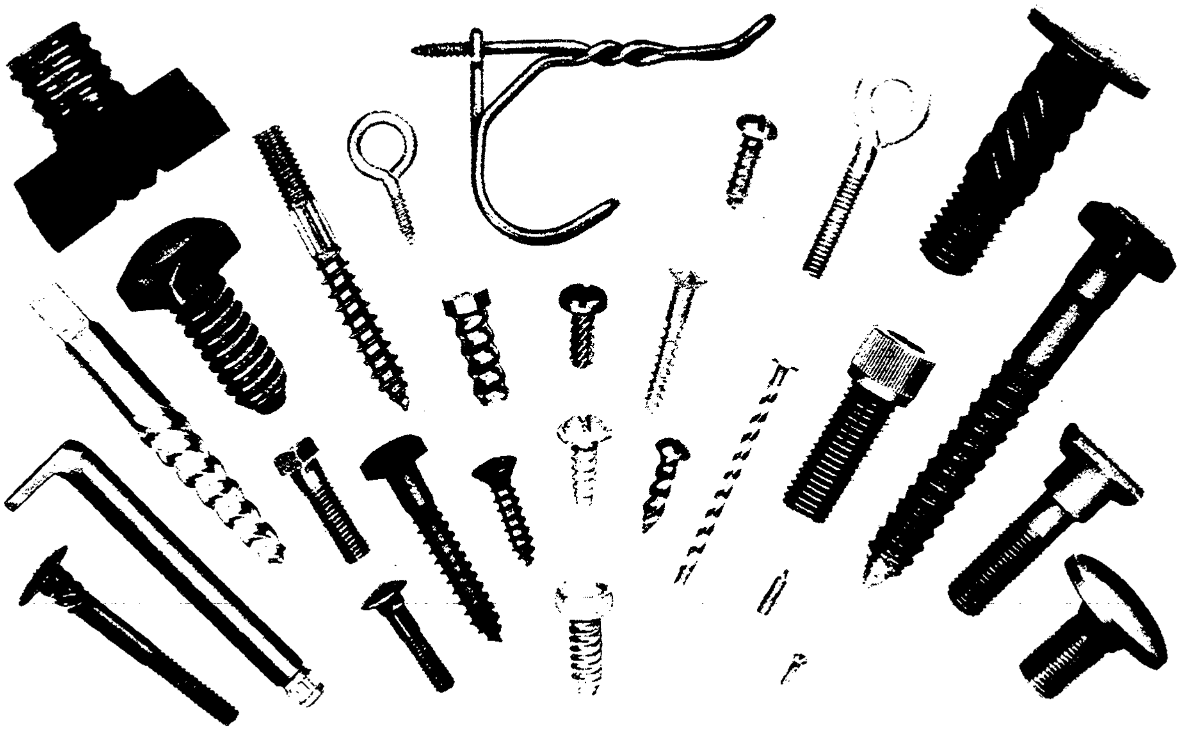


FIG. 2

Typical Thread and Form Rolling Applications with Reed Flat Dies

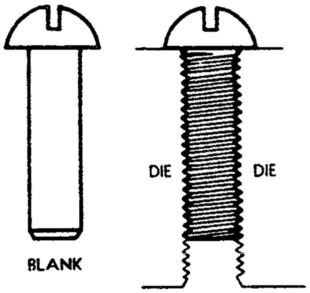


FIG. 3
Rolling Threads on Machine and Cap Screws

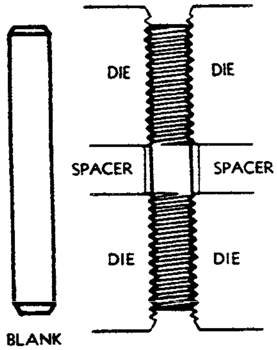


FIG. 4
Rolling Threads on Both Ends of Studs

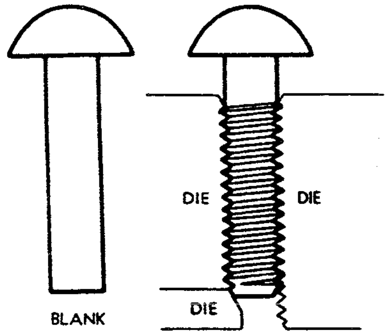


FIG. 5
Rolling Thread and Chamfering End of Part

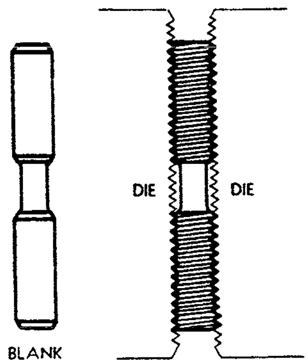


FIG. 6
Rolling Two Threads with Continuity of Lead

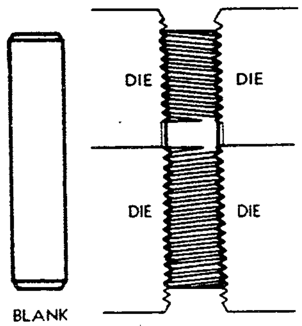


FIG. 7
Rolling of Right and Left Hand Thread at Same Time

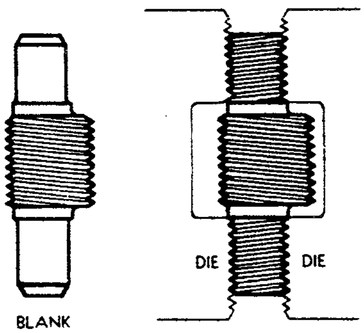


FIG. 8
Rolling Threads on Both Ends of Part with Eccentric Body

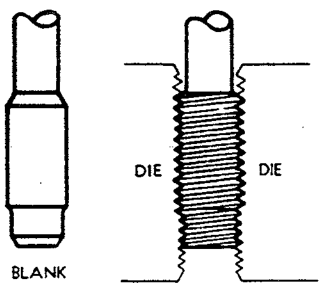


FIG. 9
Rolling Single Step Threads

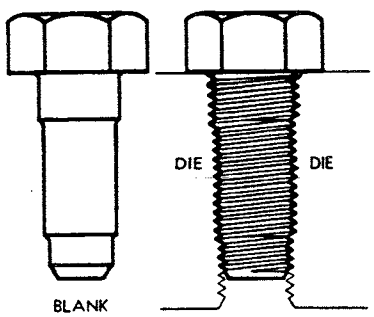


FIG. 10
Rolling Multi-Step Threads

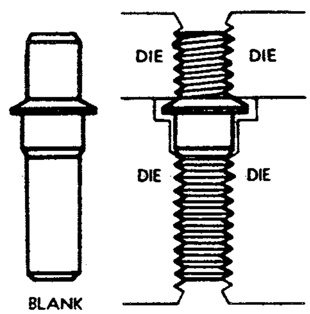


FIG. 11
Rolling Thread and Annular Grooves

Typical Thread and Form Rolling Applications with Reed Flat Dies

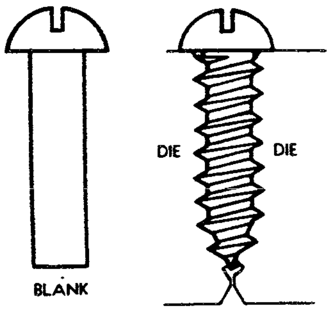


FIG. 12
Rolling Threads on Type A Screws
Straight blank shown.

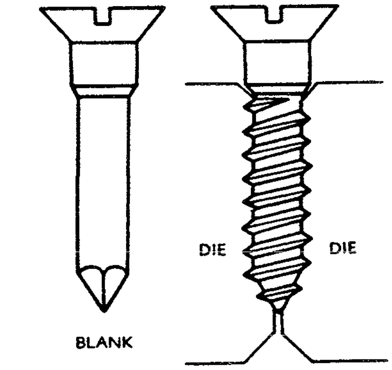


FIG. 13
Rolling Threads on Wood Screws
Pinch point blank shown.

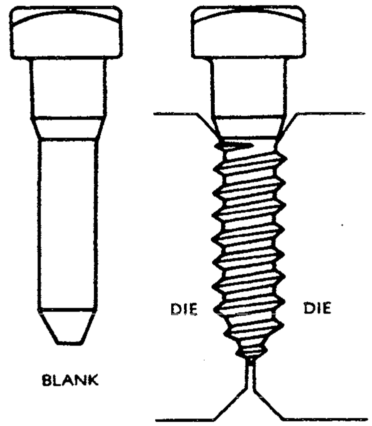


FIG. 14
Rolling Threads on Lag Screws
Cone point blank shown

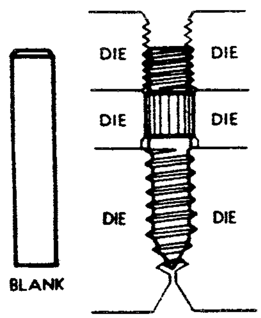


FIG. 15
Rolling Machine Screw and Gimlet Point Threads and Knurling

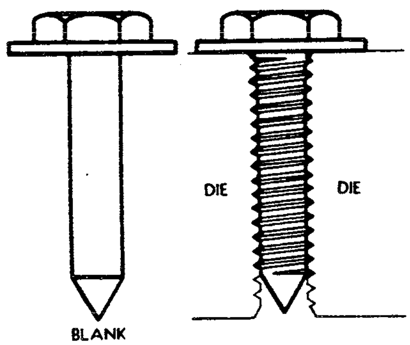


FIG. 16
Rolling Thread on Tapping Screw and Washer Assembly

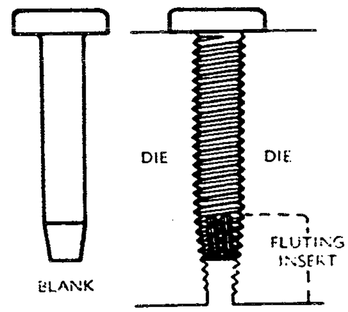


FIG. 17
Rolling Thread and a Number of Flutes

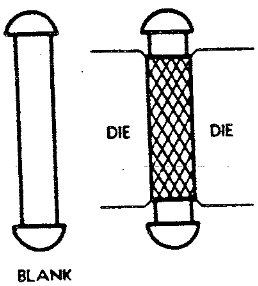


FIG. 18
Diamond Knurling Double Headed Part

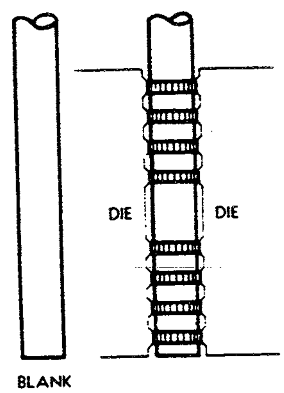


FIG. 19
Multiple Band Knurling

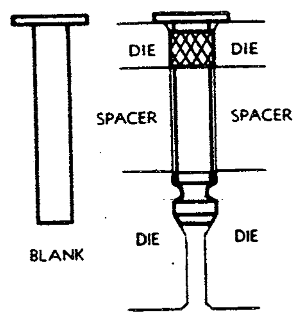


FIG. 20
Rolling Tapered Annular Groove and Chamfer and Diamond Knurling

Typical Thread and Form Rolling Applications with Reed Flat Dies

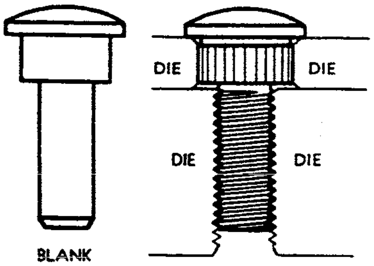


FIG. 21
Rolling Thread and Knurling of a Larger Diameter in one Machine Cycle
Threading at one end of die assembly, Knurling at other end

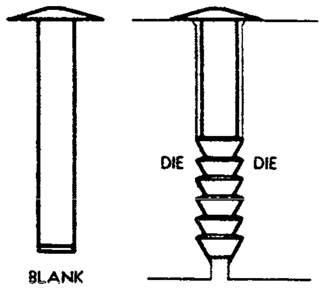


FIG. 22
Rolling Annular Fetter Shaped Grooves

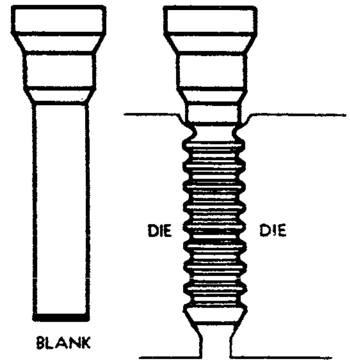


FIG. 23
Rolling Two Forms of Annular Grooves and Chamfering End of Part

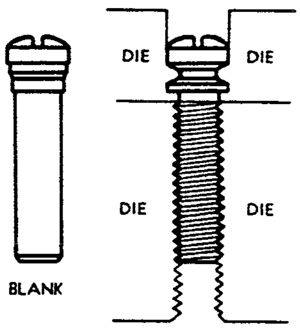


FIG. 24
Rolling Thread and Annular Thread

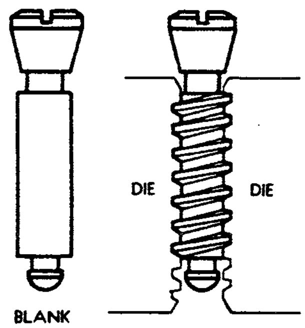


FIG. 25
Rolling Modified Buttress Thread

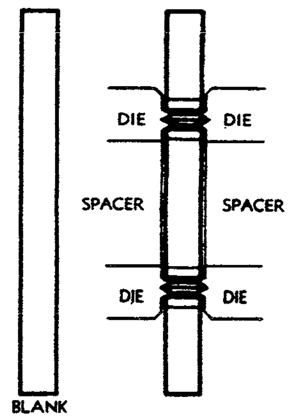


FIG. 26
Rolling Raised Annular Forms
Material Displaced on each side of form to raise center portion

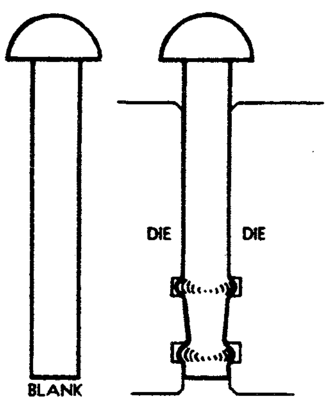


FIG. 27
Rolling Tapered Annular Groove
Displaced material confined according to design of die

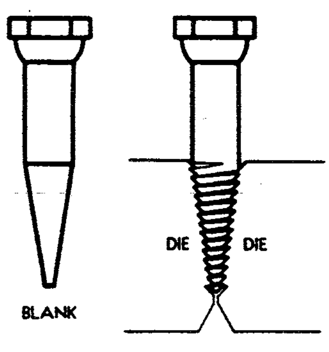


FIG. 28
Rolling Tapered Pointed Fetter Thread

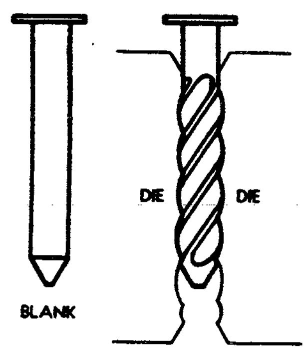


FIG. 29
Rolling Helical Flutes in Drive Nails and Dowels

Application Procedure

The following sequence of procedure in applying Reed thread rolling dies to reciprocating thread rolling and boltmaking type machines will be found helpful to both processing and operating departments:

1. How to determine Die Specifications.
   a. Die Design
   b. Machine Selection
   c. Depth of Die Face
2. Selection of filler blocks and adapters, if required.
3. Provide starter finger (and work stop, if required).

Determine Die Specifications

The general specifications of the dies are dependent on the equipment selected for the job. The particular design of the dies, however, is determined according to the method of processing and the specific details of the part. Normally there is ample clearance provided above the dies for shoulder diameters, but in certain instances it may be necessary to provide special clearances. Auxiliary tooling may be required for feeding and supporting of the part.

Die Design

Under ordinary conditions, each thread diameter and pitch requires a set of dies made especially for the diameter and pitch specified. The same dies are not used for different diameters of the same pitch.

It is well to remember that even though the threads to be rolled do not necessarily have to be held to close limits, precision dies are always more economical to use. Accurate dies can be set up more quickly and precisely with the result that not only is down time reduced but the life of the dies is increased.

The reliefs at the ends of the stationary die should be perpendicular to the edge of the die and parallel with the axis of the work blank. The thread form of the relief should be as accurate as the form on the face of the die and should be correctly blended with it.

For precision threading, precision dies are absolutely essential. Accurate threading requires dies that have accurate thread form and lead, lead angles and straight pitch lines.

Reed dies produce uniformly accurate threads. They can be set up quickly and precisely, with the result that not only is down time reduced, but the life of Reed dies is superior and uniform.

Stock sizes of Reed dies are designed and suitable for the more common threads. We recommend the use of standard stock dies where possible because of lower price and immediate deliveries. Stock dies are very popular with our customers and constitute a large portion of our die business. Complete stock lists are available upon request.

Dies for special threads and forms and heat-treated parts of high Rockwell hardness are made to order according to requirements and are not confined to stock or standard sizes.

The reliefs at the starting and finish ends of the Reed stationary die are made so they will be parallel with the axis of the work blank when rolling. The thread form of the reliefs are as accurate as the thread form on the face of the die; and are properly aligned and correctly blended with it. This allows the blank to roll freely through the entire length of the dies. The carefully matched threads of the correct lead angle on a pair of Reed dies is a very important feature. The properly aligned, blended and correctly matched thread form on Reed dies minimizes skidding, increases die life and produces a better quality thread.

Reed Stock UNR dies are recommended for rolling American Standard Classes 1, 2, and 3 threads, and Unified and American Standard Classes 1A, 2A, and 3A threads.

Machine Selection

The best rolling conditions and maximum die life can only be obtained when correct die speeds and number of blank revolutions are used for rolling the thread. This is particularly true when close accuracy for roundness and size is required, especially on harder materials. Too many revolutions of the blank may have a tendency to work-harden some types of materials, and thereby reduce the life of the dies.

Production rates vary with the nature of the work, hardness and kind of material, and the equipment used. The rate of production is usually less for harder materials and where the work is difficult and slow to handle.

To secure the most satisfactory rolling conditions and die life, it is important that the proper type and size of equipment be used. Rugged equipment with ample power is required to roll threads on heat-treated parts.

The shape of the rolling face of a flat die determines the amount of die penetration for each revolution of the blank. The penetration rate is usually much greater at the beginning than at the end of the rolling stroke. For rolling heat-treated material more gradual penetration is obtained by using dies with a long starting taper.

When rolling parts made of harder steel on a reciprocating type of machine, long threads of the maximum diameter capacity usually require more revolutions of the blank than short threads. In such cases it may be necessary to use the next larger size machine to roll long threads of maximum diameter.

Table I may be used as a guide in determining the preferred number of blank revolutions and the relative speed of the machines for different types of threads and materials. The relative machine speeds for the different materials are based on an index figure of 100 for soft 1010-1025 steel. For instance, 30-50 Carbon steel of 26 to 32 Rockwell C hardness has an index figure of 50 which indicates that the machine speed for this steel would be approximately 50% of that for soft 1010-1025 steel.

Tables II, III and IV show the number of blank revolutions obtainable with various makes of reciprocating machines for common Unified and American Standard threads, tapping and gimlet point threads and pipe threads. These tables make it possible to determine the desired machine size for rolling the thread on a given part.

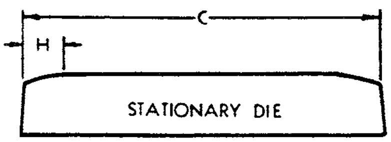
Although taper pipe threads are most satisfactorily rolled on cylindrical machines, they are listed in the tables for those who would like to roll these threads on reciprocating machines. However, it should be understood that considerable care must be exercised when rolling taper pipe threads on reciprocating machines. Blank revolutions for taper pipe threads are based on the mean pitch diameter taken halfway between E_0 and E_2 pitch diameters. Too few revolutions of taper pipe thread blanks will not produce satisfactory threads and too many revolutions tend to make the threads barrel-shaped. It is also important that the axis of the blank be at right angles to the top of the dies at the time the dies start to roll the thread.

Considerable heat is generated in rolling heat-treated blanks, especially larger sizes, and slower rolling speeds on reciprocating machines minimize this heating condition. An ample supply of coolant is commonly used to reduce the temperatures of both the blanks and the dies. Special refrigerated coolant units are sometimes used for this purpose.

When gimlet point type screws are made of soft or ductile materials, rolling without coolant is often preferred.

Table I — Blank Revolutions and Relative Machine Speeds

for Reed Dies Used in Reciprocating Thread Rolling Machines



$$N = \frac{C - .5H}{\pi A}$$

Where:

N = Number of revolutions of blank
C = Length of working face on stationary die in inches
H = Length of finish relief on stationary die in inches
A = Diameter of blank in inches

Type of Thread	Material	Hardness	Preferred *Rev. of Blank	†Relative Machine Speeds
Machine Screw, Types B, C Tapping Screw	Aluminum	Soft	5-6	80
	Brass	Soft	5-6	100
	Steel 1010-1025	Soft	5-6	100
	Steel 30-50 Carbon or Alloy	15-25 Rock C	6-7	70
		26-32 Rock C	7-8	50
		33-40 Rock C	8-10	25
	Stainless Steel	300 Series (Chrome-Nickel Alloy)	7-8	50
		400 Series (Chrome Alloy)	6-7	60
Type F Tapping Screw	Steel 1010-1025	Soft	6-7	70

Type of Thread	Material	Hardness	Preferred *Rev. of Blank	†Relative Machine Speeds
Type A Tapping, and Wood Screw	Aluminum	Soft	5-6	80
	Brass	Soft	5-6	100
	Steel 1010-1020 (Basic Wire)	Soft	5-6	100
Lag Screw	Steel 1010-1020	Soft	7-8	100
Pipe	Aluminum	Soft	5-6	60
	Brass	Soft	5-6	75
	Steel 1010-1025	Soft	5-6	75
	Steel 30-50 Carbon on Alloy	15-25 Rock C	6-7	50

*Long threads on steel sometimes require more revolutions than shorter threads.

†Based on an index figure of 100 for1010-1025 steel.

Table II – Approximate Number of Blank Revolutions for Rolling Unified and American Standard Threads

on Reciprocating Type Machines with Reed Dies

Thread Size Unified and American Standard														
	Waterbury Farrel Machines													
	00 / 00 "V"	0 / 0 "V"		1015		10 / ¼ "V"	5⁄16 "V" / 5⁄16 BMU	20 / ⅜ BMU	30 / ½ BMU	40	50 / ¾ BMU	60	70	100
	National Machinery Machines													
	Multiple Die*			3⁄16		¼	5⁄16	⅜	½	⅝	¾	1	1¼	
	SINGLE-DIE**					#34		#56						
	Manville Machines													
		OC 130C	1B 2 188C			2B 2C	250C 312C	3B 3C 375C	4B 500C	5B 625C	6B 750C	7B / 1000C / †15"	1000D / 1000C / †19"	
	Hartford Special Machines													
		O-400 A-190 O-500				10-400 10-300 A312		20-225	30-180	40-140				
	Roy Machinery Machines													
					O									
2(.086)	7.2	11.5	13.0											
3(.099)	6.2	10.0	11.3	12.8	12.8									
4(.112)	5.5	8.8	10.0	11.4	11.4	13.9								
5(.125)	4.8	7.8	8.8	10.0	10.0	12.3	14.5							
6(.138)	4.4	7.1	8.1	9.2	9.2	11.2	13.2							
8(.164)		5.9	6.6	7.6	7.6	9.2	10.9	13.1						
10(.190)		5.1	5.7	6.6	6.6	8.0	9.4	11.4	14.3					
12(.216)		4.4	5.0		5.7	7.0	8.2	9.9	12.4					
¼			4.3		5.0	6.1	7.2	8.7	10.9	13.1				
5⁄16						4.6	5.5	6.6	8.3	10.1	12.4			
⅜							4.4	5.3	6.7	8.2	10.0	13.9		
7⁄16								4.5	5.7	7.0	8.6	11.9		
½									4.9	6.0	7.4	10.1	13.1	
9⁄16									4.3	5.3	6.5	9.1	11.5	
⅝										4.8	5.8	8.1	10.3	14.1
¾											4.7	6.6	8.5	11.6
⅞												5.6	7.2	9.9
1												5.0	6.3	8.6
1⅛													5.6	7.6
1¼													4.9	6.7

*NATIONAL Progressive Multiple Die BOLTMAKER ® Machines.

**NATIONAL SINGLE-DIE "SCREWMAKER" Machines.

†Stationary Die Lengths.

NOTE: National Electric Welding Junior Machine is appproximately the same as a No. 20 Waterbury Farrel and the National Electric Welding Senior Machine is approximately the same as a No. 40 Waterbury Farrel.

Table III – Approximate Number of Blank Revolutions for Rolling Gimlet Point Threads

on Reciprocating Type Machines with Reed Dies

Screw Sizes																	
				Waterbury Farrel Machines													
				00 00 "V"	0 0 "V"		1015		10 ¼ "V"	5/16 "V" 5/16 BMU	20 3/8 BMU	30 ½ BMU	40	50 ¾ BMU	60	70	100
				National Machinery Machines													
				Multiple Die*			3/16		¼	5/16	3/8	½	5/8	¾	1	1¼	
				SINGLE-DIE**					#34		#56						
				Manville Machines													
					OC 130C	1B 2 188C			2B 2C	250C 312C	3B 3C 375C	4B 500C	5B 625C	6B 750C	7B 1000C †15"	1000D 1000C †19"	
				Hartford Special Machines													
					O-400 A-190 O-500				10-400 10-300 A312		20-225	30-180	40-140				
				Roy Machinery Machines													
Type A	Type B	Wood	Lag					O									
0	0	0		11.7													
1	1	1		9.4													
2	2	2		7.9	12.6												
3	3	3		6.6	10.6												
4	4	4		5.9	9.4	10.6											
5	5	5		5.2	8.3	9.4	10.7	10.7	13.0								
6	6	6		4.7	7.6	8.6	9.8	9.8	11.9								
7	7	7		4.3	6.9	7.8	8.9	8.9	10.8								
8	8	8		3.9	6.4	7.2	8.2	8.2	10.0	11.8	14.3						
		9			5.8	6.6	7.5	7.5	9.2	10.8	13.1						
10	10	10	10		5.6	6.3	7.2	7.2	8.8	10.3	12.5						
12	12	12			4.8	5.5		6.2	7.6	9.0	10.8						
14		14			4.2	4.8		5.4	6.6	7.9	9.5	11.9					
	¼		¼		4.0	4.6		5.2	6.4	7.6	9.1	11.5					
16		16			3.8	4.3		4.9	6.0	7.1	8.6	10.8					
18		18				4.0		4.6	5.5	6.5	7.9	9.9	11.9				
	5/16		5/16						4.9	5.8	7.1	8.9	10.8				
20		20							4.9	5.8	7.1	8.9	10.8				
24		24							4.2	4.9	6.0	7.5	9.0	11.1			
	3/8		3/8						4.1	4.8	5.8	7.4	8.9	10.9			
	7/16		7/16							4.1	4.9	6.2	7.5	9.2	12.6		
	½		½								4.3	5.4	6.5	8.0	10.9	13.9	
			9/16								3.8	4.8	5.8	7.1	9.8	12.4	
			5/8									4.4	5.3	6.5	8.9	11.3	
			¾										4.3	5.3	7.3	9.2	12.7
			7/8										3.6	4.5	6.1	7.8	10.8
			1											3.9	5.4	6.8	9.4
			1⅛												4.7	6.0	8.3
			1¼												4.2	5.3	7.3

†Stationary die lengths.

Note: National Electric Welding Junior Machine is approximately the same as a No. 20 Waterbury Farrel and the National Electric Welding Senior Machine is approximately the same as a No. 40 Waterbury Farrel.

Table IV – Approximate Number of Blank Revolutions for Rolling Pipe Threads

on Reciprocating Type Machines with Reed Dies

NPT, ANPT, NPTF, NPTG, NPTR, NPTC, NPSL, NPSM, NPSH

Pipe Size									
	Waterbury Farrel Machines								
	10	5/16 BMU	20 3/8 BMU	30 1/2 BMU	40	50 3/4 BMU	60	70	100
	NATIONAL Progressive Multiple Die BOLTMAKER ® Machines								
	1/4	5/16	3/8	1/2	5/8	3/4	1	1 1/4	
	NATIONAL SINGLE-DIE "SCREWMAKER" Machines								
	3/16		#56						
	Manville Machines								
	2B 2C	250C 312C	3B 3C 375C	4B 500C	5B 625C	6B 750C	7B 1000C *15"	1000D 1000C *19"	
	Hartford Special Machines								
	10-400 10-300 A312		20-225	30-180	40-140				
1/16	4.6	5.5	6.6	8.3	10.0				
1/8		4.1	4.9	6.2	7.4	9.1			
1/4			3.7	4.6	5.6	6.9	9.5		
3/8				3.6	4.4	5.4	7.4	9.4	
1/2					3.5	4.3	6.0	7.6	10.5
3/4						3.4	4.7	5.9	8.1
1							3.7	4.8	6.6

*Stationary die lengths.

Note: National Electric Welding Junior Machine is approximately the same as a No. 20 Waterbury Farrel and the National Electric Welding Senior Machine is approximately the same as a No. 40 Waterbury Farrel.

Machine Size

The size of machine to be used for a particular application not only depends on the number of blank revolutions preferred, which is determined by the diameter of the thread, but also the length of thread and, in some cases, the design of die required. This is particularly true on the gimlet point type of screw where selection of the size of machine by diameter alone may not result in the best overall rolling conditions.

Tables VI, VII and VIII have been prepared as a guide for the application of gimlet point types of screws to various sizes of reciprocating machines. The diameters and maximum lengths of threads suggested for each machine are based on the experience of fastener manufacturers for rolling on soft steel. It is usually considered good practice to use the next larger machine than shown when rolling on harder materials, such as stainless steel. Boltmaking type machines are also used for rolling tapping screws and lag screws. The same considerations of blank revolutions, thread length and die design should be given for applications on these machines.

Depth of Die Face

The depth of face on a thread rolling die is very important. The proper depth of face and the correct bevels on the dies not only prevent chipping of the edge threads, but determine the number of settings possible for rolling on the face of the die.

The depth of the die faces must always be greater than the length of thread to be rolled. The amount the die face is greater than the length of the thread is dependent on the nature of the thread, design of the die and other factors determined by experience with rolling.

Thread rolling dies may be selected for either single or multiple settings as illustrated in Figs. 30, 31 and 32.

When using double settings, the edges of the dies are repositioned so the unused portion of the die face is made available for rolling. For multiple settings (Fig. 32) the condition is the same as the double settings except the work is placed in different positions along half of the die face before the die is repositioned.

On reciprocating thread rolling machines both single and duplex face flat dies are used. The single face dies have a threaded surface on one side of the die, while duplex face dies have threaded surfaces on opposite sides. Duplex face dies are more widely used. It is common practice to roll on both sides by reversing the die faces in a machine and also use double settings on each face – making possible a total of four settings on one pair of dies. Dies for boltmaking type machines are always single faced and in most cases for single settings due to the design of the die face.

Dies for gimlet point threads are made for single settings and always have single faces, as shown in Fig. 33. The rise on the face of the die which rolls

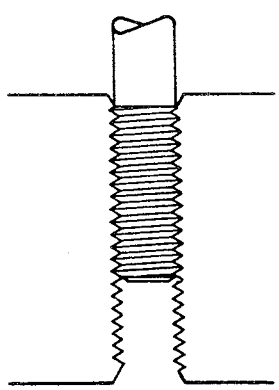


FIG. 30
Single Setting

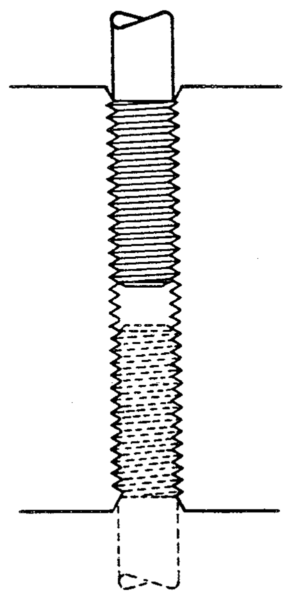
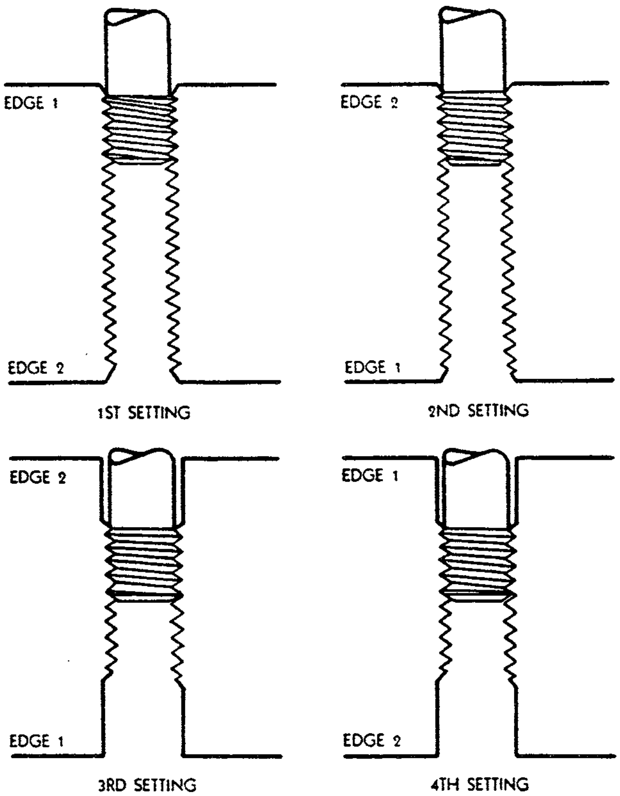


FIG. 31
Double Setting

the gimlet point prohibits the use of duplex dies and also prevents the use of double and multiple settings as illustrated. Each pair of dies is made for a given screw size and length of thread. However, in some cases dies designed for a particular length of screw may be used for shorter screw or thread lengths. The alternate use of dies for various lengths of gimlet point type screws is shown in Tables XX, XXI and XXII on pages 34 and 35.

The information shown in Table V gives different amounts that should be added to the length of thread on the work to determine the minimum die face to use. If it is desired to roll threads of the same diameter and pitch but of different thread lengths, the minimum die face may be determined by the addition of two thread lengths plus the amounts indicated in table. When rolling extra long threads, it may be necessary to use a larger size of machine than the one selected, due to the depth of die face required being too great for the standard die pockets provided.

When ordering dies, always specify the die manufacturers nearest larger standard die face, wherever possible, for reasons of economy. Reed standard die faces are given in Tables XII, XIII and XIV on pages 18 and 19. The suggested standard depth of die faces for gimlet point type threads based on maximum thread lengths is given in Tables VI, VII and VIII on pages 14, 15 and 16 for various machine sizes and styles.



RELIEVE EDGES 1 AND 2 FOR 3RD AND 4TH SETTINGS AS SHOWN

FIG. 32
Multiple Setting

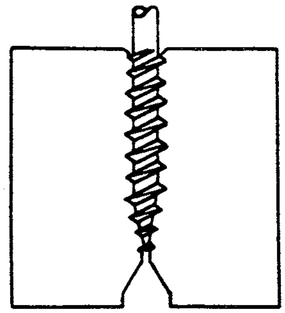


FIG. 33
Single Faced Die — With Single Setting for Gimlet Point Threads

Examples for Determining Standard Die Face Depths

Determine a standard die face to roll a 5/16″-18 UNC, Class 2A, R.H. thread, 7/8″ long when using a No. 20 Waterbury Farrel or No. 3B Manville Machine.

Single Setting—Fig. 30

Add three (3) pitches to the maximum thread length:

Thread length (7/8″)	.875″
Three pitches (3 x .0556)	.167″
Minimum Depth of Die Face	1.042″

Select the next larger Reed standard depth of die face (from page 18) which is 1 5/8″.

Double Setting—Fig. 31

Multiply the maximum thread length by two (2) and add six (6) pitches:

Two thread lengths (2 x 7/8″)	1.750″
Six pitches (6 x .0556″)	.334″
Minimum Depth of Die Face (for two settings)	2.084″

2.084″ represents the minimum depth of die face necessary to roll the thread if two settings per face of die are desired.

Select the next larger Reed standard depth of die face (from page 18) which is 2 1/8″.

Bevels on Dies

Bevels on Flat Dies are accurately controlled by the manufacturer. The angle of the bevel is usually measured from the threaded face of the dies and varies with the thread size. This permits rolling the threads as close as practicable under the heads of the screws. Dies are supplied with no bevels for certain washer assembly applications when needed. Dies with special bevels may be used for applications where standard bevels will not meet the requirements.

Table V – Amounts to Add to Thread Lengths

To Determine Minimum Depth of Flat Die Faces.

For Single Setting of Dies (Fig. 30)

Straight and Taper Threads	Minimum Amount to Add to One Thread Length
Lag Screws (Lag Bolts) — with cone point not threaded	
1/4 diameter and smaller	3/16
5/16-7/16 diameters	1/4
1/2-5/8 diameters	3/8
3/4-1 diameters	1/2
1 1/8-1 1/4 diameters	5/8
Metallic Drive Screws, Type U	*
Tapping Screws, Type B and C	3 pitches of thread
Type F (refer to Table VII, page 15)	3 pitches of thread
Unified and American Standard Threads (including Acme and Pipe threads)	3 pitches of thread
Wood Drive Screws, and Drive and Screw Nails	Approx. 1 blank diam.

For Double Setting of Dies (Fig. 31)

Straight Threads	Minimum Amount to Add to One Thread Length
Metallic Drive Screws, Type U	*
Unified and American Standard, (including Acme)	6 pitches of thread

For Multiple Setting of Dies (Fig. 32)

Straight Threads

Unified and American Standard

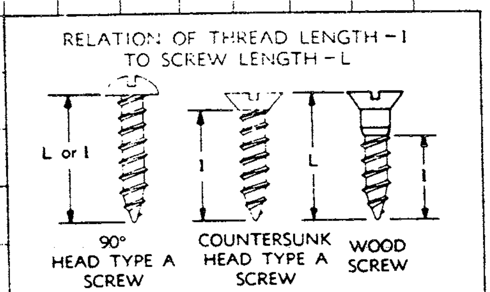
3 pitches for each thread length

* Dies for Type U Metallic Drive Screws are usually threaded the full depth of die face. They are most often used for more than one setting, depending on the length of the screw, and thread length on the dies altered to suit the clearance required for the pilot.

Table VI – Suggested Depth of Die Face and Machine Selection For Type AB or A Tapping Screws, and Wood Screws

listed according to screw size, and lengths shown

Machine Size and Style																					
WATERBURY FARREL MACHINES		00		0			10			20, 3/8BMU				30, 1/2BMU				40			
MANVILLE MACHINES				OC, 130C			2B, 2C			3B, 3C, 375C				4B, 500C				5B, 625C			
HARTFORD SPECIAL MACHINES				0-500, 0-400, A190			10-400, 10-300, A312			20-225				30-180				40-140			
Depth of Die Face		5/8	1 1/8	3/4	1 1/4	1 5/8	1 1/8	1 5/8	2 1/8	1 5/8	2 1/8	2 5/8	3 1/8	2	2 3/4	3 1/4	4 1/8	2 5/8	3 1/4	4 1/8	4 5/8
Screw Type and Size: Type AB or A	Wood	MAXIMUM THREAD LENGTHS–l																			
0	0	3/8	7/8																		
1	1	3/8	7/8																		
2	2	3/8	3/4		1	1 3/8															
3	3	3/8	5/8		1	1 3/8															
4	4	3/8	1/2		1	1 3/8															
5	5	3/8		1/2	1	1 3/8															
6	6			1/2	1	1 1/4		1 3/8	1 7/8												
7	7			1/2	1	1 1/4		1 3/8	1 7/8												
8	8			7/16	15/16	1		1 1/4	1 3/4			2 1/4	2 3/4								
	9			7/16	5/8		13/16	1 1/4	1 1/2		1 3/4	2 1/4	2 3/4								
10	10			7/16	5/8		13/16	1 1/4	1 1/2		1 3/4	2 1/4	2 3/4								
12	12						13/16	1 1/4			1 3/4	2 1/4	2 3/4								
14	14						13/16	1		1 1/4	1 3/4	2 1/4	2 1/2			2 7/8	3 3/4				
16	16						3/4	7/8		1 1/4	1 3/4	2			2 3/8	2 7/8	3 3/4				
18	18									1 1/4	1 1/2			1 5/8	2 3/8	2 7/8	3 3/4				
20	20									1				1 5/8	2			2 1/4	2 7/8	3 3/4	4 1/4
24	24									3/4				1 5/8				2 1/4	2 7/8	3 3/4	4 1/4



Note: 90° Head Types include: Hex, Round, Pan and Truss Heads. Countersunk (C'sk.) Head Types include Oval and Flat Heads.

Table V — (continued) Amounts to Add to Thread Lengths

To Determine Minimum Depth of Flat Die Faces.

For Single Setting of Dies (Fig. 33)

Gimlet Point Threads

Lag Screws (Lag Bolts) (refer to Table VIII, page 16)

	Minimum Amount to Add to One Thread Length
No. 10 (.190) and smaller diameters	7/16
1/4-5/16 diameters	7/16
3/8-7/16 diameters	7/16
1/2 diameters	9/16
5/8 diameters	9/16
3/4 diameters	9/16
7/8 diameters	3/4
1 diameters	3/4
1 1/8 diameters	3/4
1 1/4 diameters	3/4

For Single Setting of Dies (Fig. 33)

Gimlet Point Threads

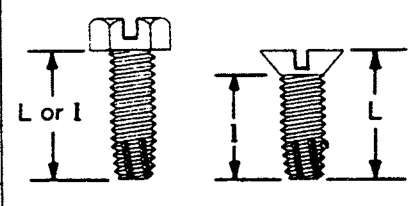
	Minimum Amount to Add to One Thread Length
Tapping Screws—Type A (refer to Table VI, page 14)	
No. 0 (.060) - No. 14 (.254)	**1/8**
No. 16 (.280) - No. 24 (.390)	**1/4**
Wood Screws (refer to Table VI, page 14)	
No. 0 (.060) - No. 7 (.151)	1/4
No 8 (.164) - No. 14 (.242)	3/8
No. 16 (.268) - No. 24 (.372)	1/2

Table VII — Suggested Depth of Die Face and Machine Selection For Type F Tapping Screws

listed according to screw size, and lengths shown

Machine Size and Style												
WATERBURY FARREL MACHINES	00	0			10			20, 3/8BMU				30, 1/2BMU
MANVILLE MACHINES		OC, 130C			2B, 2C			3B, 3C, 375C				4B, 500C
HARTFORD SPECIAL MACHINES		0-500, 0-400, A190			10-400, 10-300, A312			20-225				30-180
Depth of Die Face	5/8	3/4	1 1/4	1 5/8	1 1/8	1 5/8	2 1/8	1 5/8	2 1/8	2 5/8	3 1/8	4 1/8
Type F Screw Size	MAXIMUM THREAD LENGTHS-l											
2-56 2-64 3-48 3-56 4-40 4-48	1/2	5/8	1 1/8	1 1/2								
5-40 5-44 6-32 6-40		5/8	1 1/8	1 1/4		1 1/2						
8-32 8-36		5/8	1			1 1/2	2					
10-24					7/8	1 3/8	1 7/8					
10-32					1	1 1/2	2					
12-24 12-28					7/8	1 3/8	1 7/8					
1/4-20 1/4-28					7/8	1 3/8	1 1/2		1 7/8	2 3/8	2 7/8	
5/16-18 5/16-24								1 3/8	1 7/8	2 3/8	2 7/8	
3/8-16 3/8-24								1 3/8	1 7/8	2 3/8	2 1/2	3 7/8

RELATION OF THREAD LENGTH - l TO SCREW LENGTH - L



Note: 90° Head Types include: Hex, Round, Pan and Truss Heads. Countersunk (C'sk.) Head Types include Oval and Flat Heads.

Table VIII — Suggested Depth of Die Face and Machine Selection For Lag Screws (Lag Bolts)

listed according to screw size, and lengths shown

Machine Size and Style											
WATERBURY FARREL MACHINES	10			20, ⅜BMU				30, ½BMU			
MANVILLE MACHINES	2B, 2C			3B, 3C, 375C				4B, 500C			
HARTFORD SPECIAL MACHINES	10-400, 10-300, A312			20-225				30-180			
Depth of Die Face	1⅛	1⅝	2⅛	1⅝	2⅛	2⅝	3⅛	2	2¾	3¼	4⅛
Lag Scew Size	MAXIMUM THREAD LENGTHS - l										
#10	⅝	1⅛			1⅝	2⅛	2⅝			2¾	3⅝
¼	½	1	1½			2	2½			2⅝	3½
5/16				1	1½	1⅞			2⅛	2⅝	3½
⅜								1¼	2	2¼	

RELATION OF THREAD LENGTH - l TO SCREW LENGTH - L

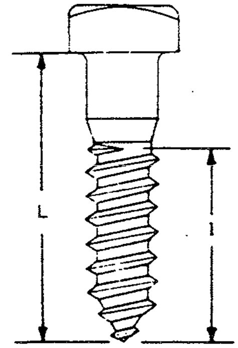


Table VIII — (continued) Suggested Depth of Die Face and Machine Selection For Lag Screws (Lag Bolts)

listed according to screw size, and lengths shown

Machine Size and Style													
WATERBURY FARREL MACHINES	40				50, ¾BMU					60			
MANVILLE MACHINES	5B, 625C				6B, 750C					7B			
HARTFORD SPECIAL MACHINES	40-140												
Depth of Die Face	2⅝	3¼	4⅛	4⅝	2⅝	3¼	4⅛	4⅝	5⅛	4⅛	4⅝	5⅝	6⅝
Lag Screw Size	MAXIMUM THREAD LENGTHS - l												
5/16				4									
⅜		2½	3⅜	3⅞					4⅜				
7/16	1⅞	2½	2⅝				3⅜	3⅞	4⅜			4⅞	5⅞
½	1⅝	2¼	3				3⅛	3⅝	4⅛			4⅝	5⅝
⅝					1⅝	2¼	3⅛	3⅝	3¾			4⅝	5⅝
¾										2⅞	3⅜	4⅜	5⅜

Refer to factory for depth of die faces suggested for rolling larger screw sizes and longer thread lengths.

Shoulder Clearance Requirements

Most of the work rolled on reciprocating type machines does not require much clearance for shoulders. These machines generally provide sufficient clearance for shoulders on the common type of threaded fasteners. Since the position of the work during rolling is controlled by the dies, clearance for separate support equipment is not usually necessary.

When odd shaped parts having large shoulders are to be rolled, or when the diameter of any shouldered work is close to the maximum capacity of the machine, it is considered good practice to check the available clearance. Tables IX, X and XI give the dimensions of the clamp position at the top of the die for various types and sizes of machines.

Clamping arrangements vary with different machines. The dimensions shown in the typical machine pocket illustrated in Fig. 34 may be used in the following formula for determining shoulder clearance.

Formula:

$$S = 2B + K - 2P - 1/32$$

Where:

S = Shoulder Clearance

B = Die Thickness (Refer to Tables XII, XIII and XIV, pages 18 and 19)

K = Minor Diameter of Screw

P = Position of Clamp

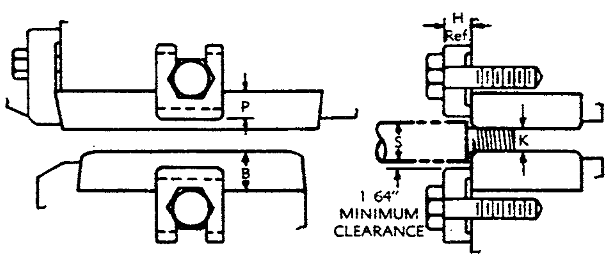


FIG. 34

Table IX Top Die Clamp Position for Determining Shoulder Clearance

For Hartford Special Machines

Machine Size	P	H min.
A190	1/2	11/16
A312	5/8	1 1/8
0-400	3/8	15/16
10-300	11/16	1 1/8
10-400	3/4	1
20-225	11/16	1 1/4

Table X Top Die Clamp Position for Determining Shoulder Clearance

For Waterbury Farrel Machines

Type	Machine Size	Model	P Min.	H Min.
"V" Thread-Roller	00	8571	7/16	3/8
	0	8572	7/16	3/8
	1/4	8573	7/16	3/4
	5/16	8574	7/16	3/4
	3/8	8575	9/16	7/8
	1/2	8584	9/16	7/8
BMU-Bolt Making Unit	5/16	8578	7/16	7/8
	3/8	8579	9/16	1 1/8
	1/2	8580	3/4	1 1/2
	3/4	8581	1 1/8	2 1/4
Inclined with Rotor Vane Feed	00	7717	7/16	3/8
	0	7741	7/16	1/2
	10	7753	7/16	3/4
	20	7797	9/16	7/8
Inclined with Chain Feed	20	7122	9/16	7/8
	30	7123	13/16	1
	40	7124	1 3/16	1 1/8
	50	7125	1 3/16	1 3/8
	60	8006	1 3/8	1 1/2
Lift Blade	30	6485	15/16	1
Horizontal Hand Feed	00	6496	7/16	5/16
	0	6456	7/16	7/16
	10	7120	9/16	11/16
	20	7112	9/16	7/8
	30	7113	13/16	1
	40	7114	15/16	1 1/8
	50	7115	1 3/16	1 3/8
	60	6579	1 9/16	1 1/2
Horizontal Hand Feed with Deep Dies	10	4705	9/16	11/16
	20	4704	11/16	7/8
	30	4706	1	1
	40	4606	1 1/16	1 1/8
	50	4707	1 1/16	1 1/4
	60	4708	1 1/4	1 1/2
Inclined Side	30	6738	13/16	1
	30	6944	13/16	1
	70	6850	1 5/8	1 1/2
Horizontal Side	10	4601	9/16	11/16
	20	4534	11/16	7/8

Table XI Top Die Clamp Position for Determining Shoulder Clearance

For NATIONAL Progressive Multiple Die BOLTMAKER ® Machines

Machine Size	P*	H	I
3/16	3/16	3/8	3/8
1/4	3/16	1/2	3/8
5/16	1/4	9/16	15/32
3/8	1/4	5/8	19/64
1/2	5/16	5/8	11/32
5/8	1/4	7/8	13/32
3/4	1/4	1	7/16
1	3/8	1 3/8	9/16
1 1/4	5/8	1 3/4	1 3/16

* When a guard is used over the moving die, the "I" dimension should be used in place of the "E" dimension in the formula for shoulder clearance.

Reed Flat Dies are made for all types of machine and cap screws, tapping screws, lag screws, wood screws and many types of special threads and forms.

The precise control of die dimensions and carefully matched threads of the correct lead angle on a pair of Reed dies assures quick and accurate setup. This results in the production of uniformly accurate threads with reduced machine down time and superior die life.

IN STOCK

Over 400
Types and Sizes

For Use on:

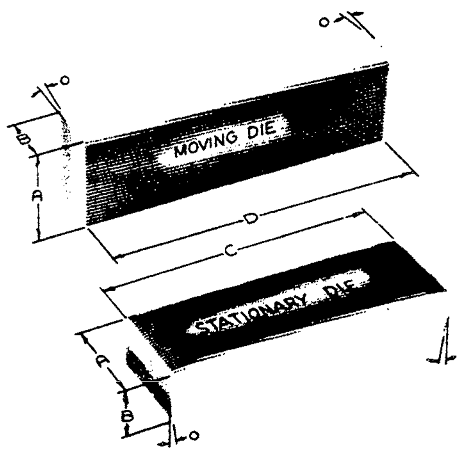
Waterbury Farrel
National Machinery
Hartford Special
E. J. Manville
Roy Machinery

Reciprocating Thread Rolling Machines

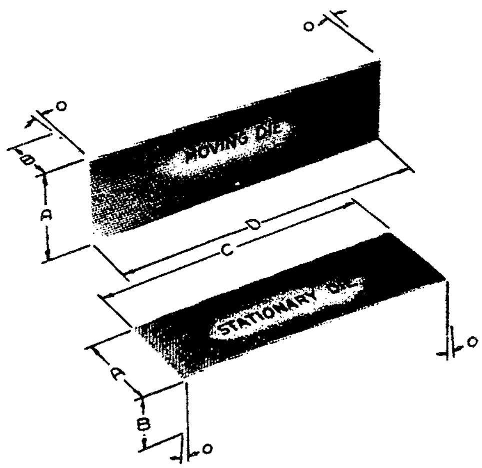
Other types of dies, and dies for thread forms not shown quoted on application.

STOCKING WAREHOUSES: At Chicago, Cleveland, Detroit, Holden and Los Angeles.

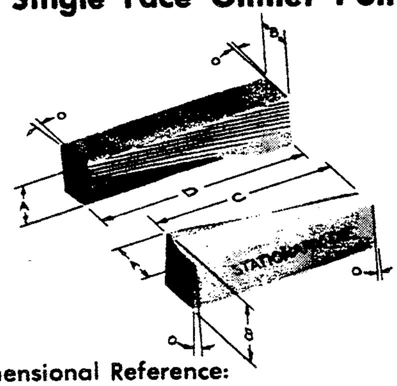
Reed Duplex Face Dies



Reed Single Face Dies



Reed Single Face Gimlet Point Di



Dimensional Reference:
A Depth of Die Face
B Die Thickness (standard)
C Length of Stationary Die Face
D Length of Moving Die Face
O Holding Angle

Other Machines That Accept Waterbury Farrel Die Sizes

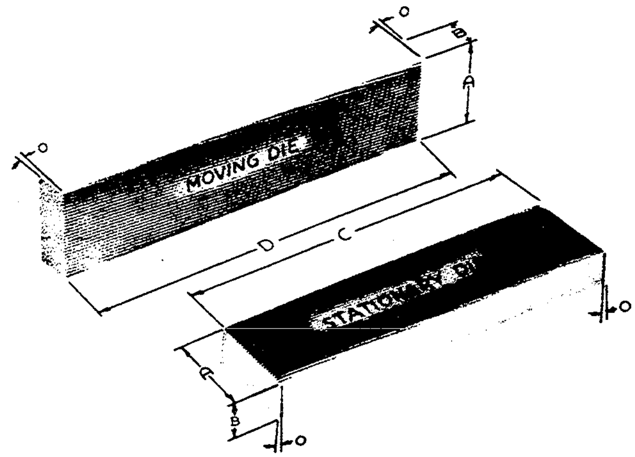
Waterbury Farrel	0	10	20	30	40	50
Greenwood & Batley		¼	⅜	½	⅝	¾
Despaigne	RFA 0	RFA 1	RFA 2, 2½	RFA 3	RFA 4	RFA 5
Covmac		AM ⅔				
Roy	O					

STEEL STOCKED FOR THESE
Reed Duplex and Single Face Dies

MACHINE SIZE					DIE SPECIFICATIONS				
						Length of Face			
Farrel	Manville	Hartford Special	National Electric Welding	Roy Machinery	Depth of Face A	Thickness B	Station-ary Die C	Moving Die D	Holding Angle O
00) "V"					5/8 1-1/8	11/16	1-3/4	2	5°
0 "V"	OC 130C	0-500 0-400 A190			3/4 1-1/4 1-5/8 2-1/8	13/16	2-3/4	3-1/4	5°
	1B-2 188C				1	9/16	3-3/32	3-3/8	30°
015				"O" Special	3/4 1-1/4 1-5/8	13/16	3-1/2	4	5°
10 "V"	2B 2C	10-400 10-300 A312			1-1/8 1-5/8 2-1/8 2-5/8	15/16	4-1/4	5	5°
BMU "V"					1-1/8 1-5/8 2-1/8	15/16	5	5-3/4	5°
	250C 312C				1-1/8 1-5/8 2-1/8	15/16	5	5-3/4	5°
20 BMU "V"	3B 3C 375C	20-225			1-1/8 1-5/8 2-1/8 2-5/8 3-1/8 4-1/8	1-3/16	6	6-3/4	5°
			Junior		1-1/8 1-5/8 2-1/8 2-5/8	1-3/16	6	6	5°
*30 BMU "V"	4B 500C	30-180			1-1/8 2 2-3/4 3-1/4 4-1/8	1-7/16	7-1/2	8-1/2	5°
*40	5B 625C	40-140			2-5/8 3-1/4 4-1/8 4-5/8	1-11/16	9	10	5°
			Senior		1-1/8 2-1/8 2-5/8 3-1/8	1-3/16	10	10	5°
50 BMU	6B 750C				2-5/8 3-1/4 4-1/8 4-5/8 5-1/8	1-15/16	11	12	5°
60	7B				3-1/8 3-5/8 4-1/8 4-5/8 5-1/8 5-5/8 6-5/8	2-3/16	15	16	5°

teel available for any special depth of face.

STEEL STOCKED FOR THESE
Reed Single Face Dies for National Machinery Machines



DIE SIZE			DIE SPECIFICATIONS					Special Die Thickness for Threads Larger Than Nominal Size of Machine	
Multiple Die Machine [2]	Single-Die [1] Machine				Lgth. of Face				
	Std. Stroke	Long Stroke	Depth of Face A	Standard Thickness B	Station-ary Die C	Moving Die D	Holding Angle O	Die Thickness Both Dies	Thread Diameter
3/16M			1-1/8	1/2	3-1/2	4-3/16	5°	Std.	12
	3/16S		1-5/8	15/16†	4-1/4	5	5°		
1/4M	#34		1-1/4 1-1/2	5/8	4-1/4	5	5°	19/32	5/16
5/16M			1-1/4 1-1/2 1-3/4	5/8	5	5-3/4	5°	19/32	3/8
	5/16S		2-1/8	1-3/16	6	6-3/4	5°		
3/8M	#56		1-1/4 1-1/2 1-3/4 2	5/8	6	6-3/4	5°	19/32	7/16
1/2M			1-1/2 1-3/4 2 2-1/2	13/16	7-1/2	8-1/2	5°	25/32	9/16
5/8M			2 2-1/4 2-1/2 3	7/8	9	10	5°	13/16	3/4
*3/4M			2 2-1/4 2-1/2 2-3/4 3-1/4	1	11	12	5°	15/16	7/8
1M			3-1/4 5-1/8	1-1/4	15	17	5°	1-3/16	1-1/8

[1] **NATIONAL SINGLE-DIE "SCREWMAKER" Machines.**

[2] NATIONAL Progressive Multiple Die BOLTMAKER ® Machines. Dies for these machines may also be used on Waterbury Farrel Machines with backing plates. The tabulation below shows the sizes of dies that are used on the different sizes of Waterbury Farrel Machines.

Die Size	1/4"	3/8"	1/2"	5/8"	3/4"
Waterbury Farrel Machine Size	#10	#20	#30	#40	#50

†1/32" shims may be required in back of the standard thickness dies.

Select Filler Blocks and Adapters

As all die pockets in reciprocating machines are made to a standard depth for each machine size, and the die face depths vary according to the length of the work to be rolled, it is often necessary to compensate for this difference by the use of filler blocks. Filler blocks are parallel bars of varying depths being made of the proper width so as not to interfere with the part. Filler blocks are used in three ways, as follows:

a. To roll threads up to a head (Fig. 35). Filler blocks are placed under the die to bring the die level with the top of the die pocket and the feeding mechanism.

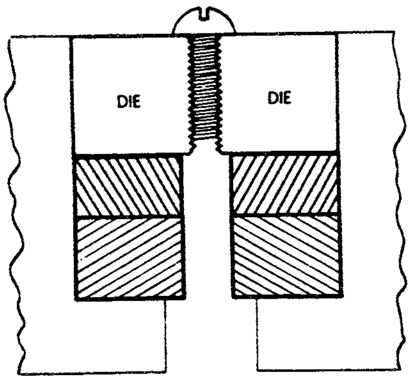


FIG. 35

b. To roll threads with a space between the head and the thread (Fig. 36). A filler block is placed on top of the die that is equal to the unthreaded space between a head or shoulder and the thread. Other filler blocks, if needed, are placed under the die to bring the top filler block level with the top of the die pocket and the feeding mechanism.

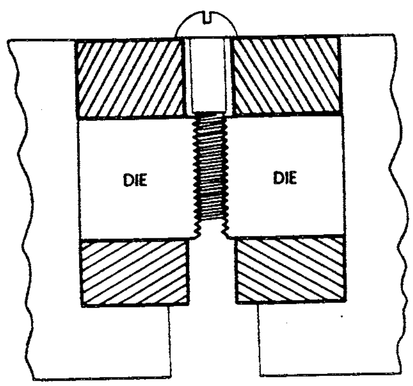


FIG. 36

c. When a work stop is used to determine the length of thread to be rolled, filler blocks are placed under the die in order to bring the top of die even with the die pocket (Fig. 37).

Filler blocks are usually of the same width and are assembled as needed to locate both the moving and the stationary die in the same relative position.

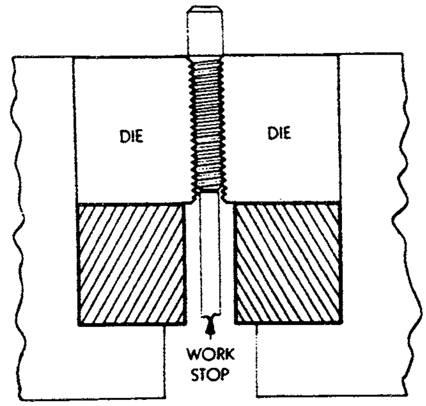


FIG. 37

Reed filler blocks, Table XV, are available for use with Reed standard depth dies and fit the die pockets of standard reciprocating thread rolling machines.

The blocks are used for positioning the dies in the die pockets as shown. Reed filler blocks reduce setup time and assist in correct positioning of dies.

Table XV – Reed Filler Blocks

Filler Block Number	Machine Size	Filler Block Sizes
HARTFORD SPECIAL MACHINES		
FF0	A190	3/8-7/8
FF10	A312	1/2-1
MANVILLE MACHINES		
FF1B	1B	5/8
FF10	2B	1/2-1
FF2	2	7/16
FF312	312C	5/8
FF20	3B	1/2-1-1 1/2
FF30	4B	7/8-1 3/8-2 1/8
FF40	5B	1/2-1 3/8-2
FF50	6B	1/2-1-1 7/8-2 1/2
NATIONAL Progressive Multiple Die BOLTMAKER ® Machines		
FF1/4BM	1/4	1/4
FF5/16BM	5/16	1/4-1/2-3/4
FF3/8BM	3/8	1/4-1/2-3/4
FF1/2BM	1/2	1/4-1/2-3/4-1
FF5/8BM	5/8	1/2-3/4-1
FF3/4BM	3/4	1/2-3/4-1-1 1/4
WATERBURY FARREL MACHINES		
FF00	00	1/2
FF0	0	3/8-7/8
FF10	10	1/2-1
FF20	20	1/2-1-1 1/2
FF30	30	7/8-1 3/8-2 1/8
FF40	40	1/2-1 3/8-2
FF50	50	1/2-1-1 7/8-2 1/2
FF60	60	1/2-1-2-3

NOTE: Two each of the above sizes per set.

Often the only machine available to roll a given thread is larger than is needed. In such cases, it is more economical to purchase smaller size dies and adapt them to the available machine by using Reed Adapters.

Reed Adapters, Table XVI, provide greater flexibility for the threading department by making possible the use of dies of the next smaller size than those for which a machine was designed.

Table XVI – Reed Adapters

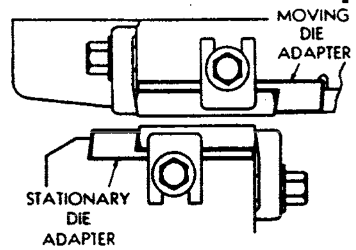


FIG. 38

Adapter Number	Machine Size		Die Size*	Standard Depth of Adapter Face
	Waterbury Farrel	Hartford Special		
0-00	0	A190 0-400 0-500	00	1⅝
10- 0	10	10-400, 10-300, A312	0	2⅛
20-10	20		10	3⅛
30-20	30		20	4⅛
40-30	40		30	4⅛
50-30	50		30	4⅝
50-40	50		40	4⅝
60-50	60		50	5⅛

*Special adapters can be provided to accommodate smaller die sizes if required.

Starter Fingers and Work Stops

A starter finger, Fig. 39, is selected to accommodate the blank to be fed. The starter finger should be slightly thinner than the minor diameter of the thread and the pushing surface of the finger should be of sufficient depth to support the entire length of the portion of the blank to be threaded.

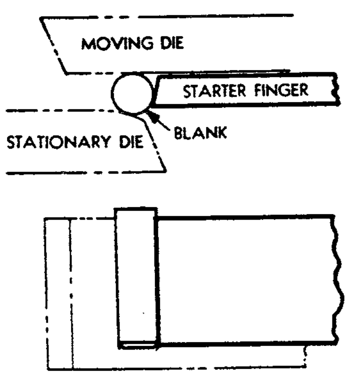


FIG. 39

The pushing surface of the starter finger (Fig. 39) may have an angle of about 15° which tends to force the blank toward the moving die, but this surface must be vertical to hold the axis of the blank perpendicular to the top of the dies. The use of a starter finger that allows the blank to start with a forward or backward lean will result in drunken or mismatched threads.

The use of a contoured starter finger should be considered when the length of thread is very short in comparison with the overall length of an irregular shaped blank, or when the blank may not be properly balanced as it starts into the dies. Fig. 40 illustrates typical starter fingers designed to provide straight starting of the blank into the dies.

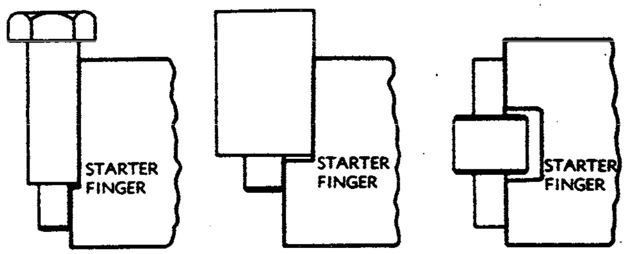


FIG. 40

Work stops or depth gages are used to facilitate hand feeding of parts or when it is not desirable to locate from a head or shoulder on the part. A simple work stop consists of a projecting shelf arranged on the lower part of the starter finger. Adjustable work stops or depth gages may also be used and in such cases the end of the starter finger passes over the stop (Fig. 42).

Transfer fingers that are contoured to fit the blank will prevent improper starting when filler blocks are used above the dies. Refer to Fig. 41.

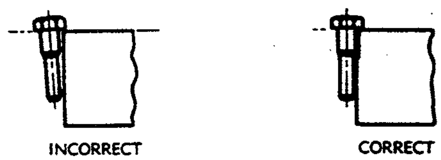


FIG. 41

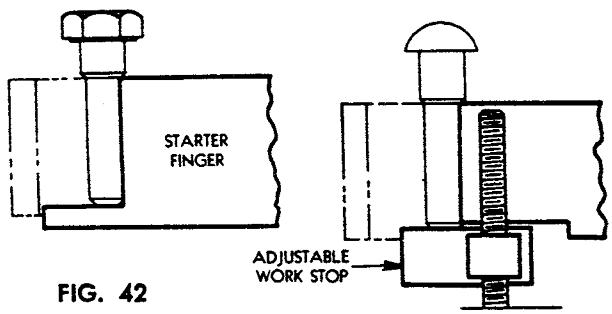


FIG. 42

When rolling gimlet point threads it is essential that a constant volume of material be introduced to the pointing section of the dies in order to roll uniform points. This may be accomplished by using an adjustable work stop to properly position the blanks. In order to use a work stop with gimlet point dies, it is necessary to cut away a portion of the dies so they may clear the work stop.

Setup Instructions

Installation and Use of the Dies

The care exercised in the installation, adjustment, and day-to-day use of the dies has a much more important effect upon die life than is sometimes realized. This situation is particularly true because of the nature of common die failures. Chipping, crumbling, and abrasive wear failures are progressive in nature and involve thousands of applications of loading of the die threads. The rate at which these failures progress is always accelerated by poor setup of the dies and by the presence of abrasive material on the surface of the blanks and in the coolant. It is not always easy to appreciate that more care in the control of operating conditions might greatly extend the useful life of the dies.

Each time a pair of dies is used there is a loss in die life encountered due to setup. The amount of die life lost depends on the care taken in making a setup. It is important therefore that extreme care be exercised when setting up the dies if the greatest amount of die life is to be obtained. Also, as many parts as possible should be processed per setup in order to reduce the number of setups made during the life of a pair of dies. Die life can be increased considerably by eliminating poor setups and by processing as large size lots as possible.

Dies for Machine Screw and Similar Threads

Insert Dies (and Filler Blocks, If Needed) in Die Pockets

Before making a setup, especially for precision rolling, it is good practice to check the machine to see that it is in good operating condition. There should be no unnecessary looseness in the ram and the stationary die blocks must seat firmly on the base and against the adjusting screws. The die pockets should be in good condition, clean and free from burrs or chips that might affect the seating of the dies. It is important that the surfaces of the die pockets be flat so that the dies are fully supported during rolling. Place the moving die (long) (and the correct filler blocks, if used) in the die pocket of the ram, and clamp securely in place. Next, place and clamp the stationary die (short) (and its filler blocks, if used), in the pocket of the stationary die block.

In order to insure correct matching conditions, Reed single face dies should be placed in the die pockets of the machine with the trade-marks positioned as shown in Fig. 43. When used for two settings, the dies should both be turned so that the trade-marks face the bottom of the pocket.

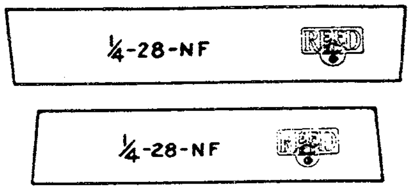


FIG. 43

Reed Duplex face dies should be set up with the trade-marks as shown in Fig. 44. For the third and fourth settings, where used, the dies are turned with the trade-mark towards the bottom of the pocket and facing the operator for the third setting and away from the operator for the fourth setting.

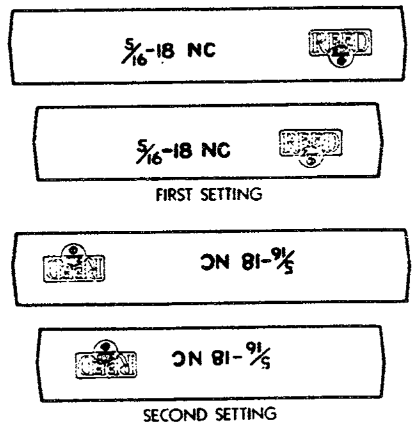


FIG. 44

The dies should be checked with a straight edge, as shown in Fig. 45, to make certain they are of approximately the same height and the working faces are parallel.

For the ultimate in precision rolling, the top of each die should be indicated for its full length to be certain it is parallel to the stroke. If the position of the dies is accurate, there is usually only a slight amount of adjustment required for matching the dies.

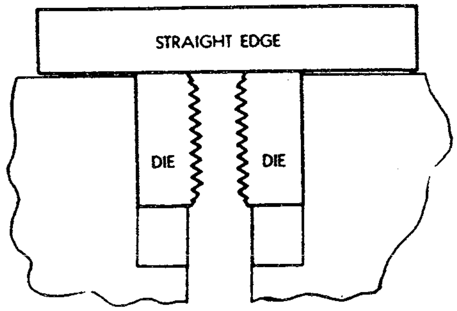


FIG. 45

Adjust Dies for Correct Spacing

Position the moving die opposite the stationary die as shown in Fig. 46. The opening should be adjusted until the finish ends of the dies are a few thousandths of an inch closer together than the minor diameter of the thread to be rolled. This will allow for any spring in the machine that may occur during rolling. The opening at the starting end of the dies should be adjusted to an amount equal to the minor diameter plus approximately ¼ thread depth. Then lock the adjustable die block firmly in place by means of the proper adjusting screw.

In cases where the length of the threads is to be controlled by a vertically adjustable work stop or depth gage, rather than by suspending the blank from its head, this stop should next be set.

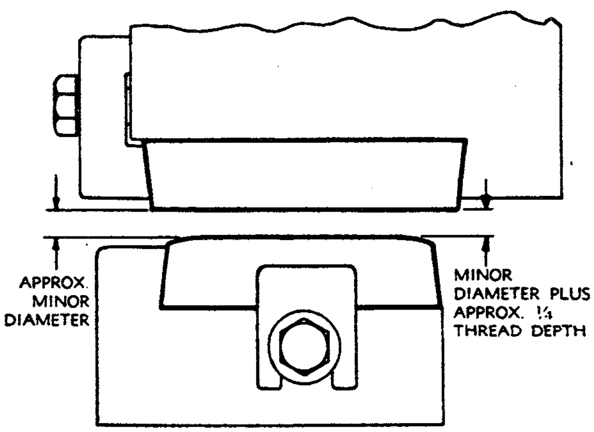


FIG. 46

Assemble Starter Finger

The correct starter finger is selected as described on page 21. In assembling the starter finger care should be taken to see that the starter cam is adjusted to advance this starter finger before completion of the back stroke of the ram. By means of the adjustment provided, the longitudinal setting of a starter-finger should be adjusted to the proper feed opening and follow through until the blank is firmly picked up by the dies.

With the machine properly adjusted the blank should be introduced into the wedge-shaped opening formed by the flat face of the moving die and the starting relief of the stationary die just before the moving die reaches the end of its back stroke. Then, as the moving die starts on its forward stroke, it causes the blank to wedge between the dies and start rolling. (Fig. 47). By using this method the blanks will always start rolling at the same point on each die. If this conventional method of starting is not always effective, special aids, as described on page 29, may be used.

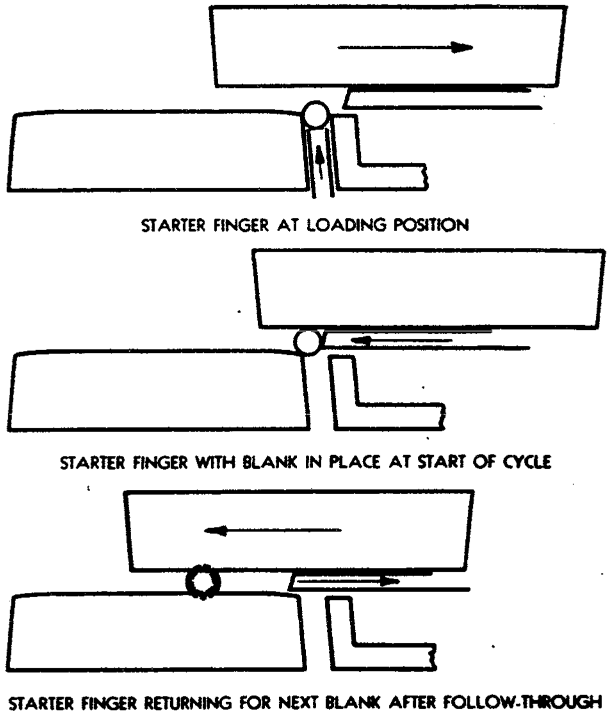


FIG. 47

Match the Dies

This is one of the most important steps in the setup of reciprocating flat die type machines. It is essential that the dies be so adjusted that the crest of the threads on the moving die are directly opposite the root of the threads on the stationary die at the point where the starting finger introduces the blank to the dies and the blank starts to roll. If the dies are not properly matched, a poorly threaded part will result and die life will be shortened considerably.

To determine whether or not the dies are in match, place a marked blank in the feeding position, the mark facing one of the dies (Fig. 48) and turn the machine over slowly by hand until the blank is picked up and has rotated 180°, as shown by the mark on the blank. Then reverse the machine, take the blank out and examine it under a magnifying glass.

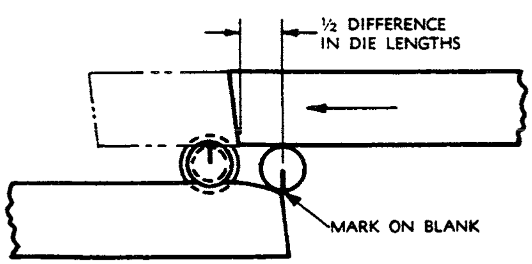


FIG. 48

If the impressions produced by one die are accurately in line with the impression produced by the other die, Fig. 50, the dies are in match and you may proceed with the next step in the setup. If the impressions are not in line, Fig. 49, determine how much one die is lower than the other and then raise the lower die by means of shims only to a parallel position indicated by Fig. 45. Any additional correction required should be made by available matching adjustments built into the various type machines.

FIG. 49
Dies Mismatched

FIG. 50
Dies Properly Matched

To check the machine for the correct starting position, place a set of dies in the machine and move the ram so the moving die is at the extreme end of the back stroke and at the starting position. With the dies in this position, the moving die should extend beyond the starting edge of the stationary die by ½ the difference in die length, which is also the matching point as shown Fig. 48. If the machine is in poor condition due to ram wear or if the Pitman arm has been repaired without consideration of the die location, the reversing point at the start of the stroke may be incorrect.

It is good practice to make the necessary changes in the machine to assure proper location of the reversing point, otherwise it will be difficult to obtain a good match even when using perfectly matched dies.

This condition is more serious on work with greater lead angles and is particularly noticeable when rolling tapping screws.

This procedure can be repeated until the dies are in match. When the thread roller is equipped with an adjustable Pitman arm, the moving die is matched to the stationary die by the use of an adjustable eccentric which permits the operator to change the position of the moving die slightly at the beginning and end of its stroke with respect to the position of the stationary die, thereby causing the work to contact this die at a different position on the helix. On boltmaking type machines the matching is done by lowering or raising the stationary die by the use of a wedge.

Adjust for Correct Pitch Diameter

With the dies properly matched, roll one piece through the machine and if the pitch diameter is incorrect proper adjustments can be made by changing the space between the two dies through the use of the adjustments built into the machine for this purpose. It is usually desirable to have the dies adjusted with the finish ends slightly closer than the starting ends, as indicated in Fig. 46 on page 23.

It is desirable to start any change in setup by adjusting the dies so that the first power rolled sample will not have a full depth of thread .Overloading of the dies and stalling of the machine is avoided by gradually adjusting the setting so as to secure proper matching of the dies, positioning of the blank to prevent rolling on enlarged diameters, and control of dimensions of the finished thread.

If, in the process of obtaining the correct pitch diameter, the blank tends to slip rather than roll or it becomes apparent that pressure is being applied too suddenly, it may be necessary to reduce the pressure at the start by backing away slightly on the adjusting screws at the starting end. If, on the other hand, the finished thread is out of round it is an indication that too much work is being left for the finish end of the dies.

After the thread form on the dies is filled as shown by burnished crests on the rolled thread, the pitch diameter can only be reduced by decreasing the diameter of the blank. After a full thread form has been rolled the blank diameter can be decreased in direct proportion to the amount needed to bring the pitch diameter within limits.

If the correct pitch diameter is obtained and the major diameter is undersize, the size of the blank diameter should be increased slightly. This is usually done by increasing the blank diameter in increments of one thousandths of an inch and then continue further trials.

On boltmaking type machines the dies have the starting taper built into them and the pitch diameter adjustments are made through the use of a wedge arrangement that moves the stationary die either toward or away from the moving die.

Before starting to roll it is advisable and indeed necessary to recheck the matching as subsequent adjustments may have changed the match of the dies.

Correct for Taper on Work
(when necessary)

If on checking the pitch diameter of the thread throughout its entire length, it is found to have taper, it can be corrected by placing suitable shims in back of either the top or the bottom of the back face of one die as well as the corresponding position under the lower edge of the die to provide the necessary support, as shown in Fig. 51.

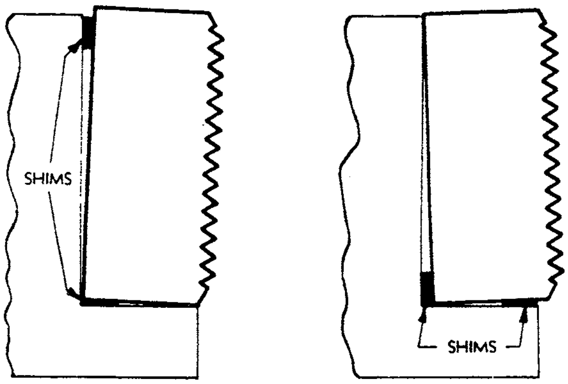


FIG. 51

Some types of machines are provided with adjusting screws to accompish taper adjustment. On boltmaking type machines, taper is controlled by a wedge that moves the bottom edge of the stationary die either toward or away from the moving die.

Taper in the great majority of cases is usually larger near the head, Fig. 52. This is referred to as "front taper" and is corrected with suitable shims on both dies as shown in Fig. 52. When both dies are shimmed uniformly, the accuracy of die matching previously made in most cases will be maintained. If only one die is shimmed for taper correction, the match can be affected and it will be necessary to adjust the match after the correct amount of shim has been placed in back of the die. In all cases, the match should be checked after any adjustments with shims are made. It will also be found necessary to again adjust the dies for correct pitch diameter.

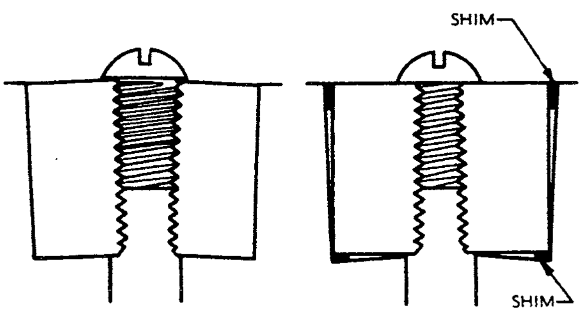


FIG. 52

Excessive adjustment for "front taper" can cause the threads at the top of the die to chip out. When not enough adjustment is made to correct "front taper," very often the threads will peel out of the dies at the opposite end. This is due to overolling the threads at the end of the work in an attempt to fill out the threads over the entire length of the thread.

When using duplex dies, the hardened threaded surface of the die will often cut into the shim stock and change its original thickness. It is therefore advisable to place a backing plate having the same length and depth as the die between the die pocket and the die as shown in Fig. 53. This plate is usually made of blued spring stock having a thickness of .025"-.030". All shims used for taper are then placed between the die pocket and the backing plate, and therefore are not affected by the threaded surface of the dies.

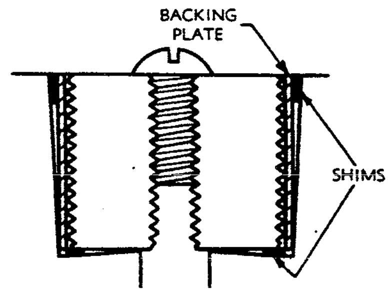


FIG. 53

On short thread lengths where only a small portion of the machine pocket depth is utilized, it is not uncommon to shim each die as much as .030" to obtain a straight thread since only a small percentage of the shimming is effective on these short lengths of thread.

Dies for Gimlet Point Threads

As mentioned previously, it is important that the dies are placed in the machine with care and exactness. Position the dies, with top edges the same height, so that the finish ⅓ of the dies are opposite one another (Fig. 54). With the dies in this position, move the stationary die in or toward the moving die until the dies are at least from .005 to .007 apart at the point section, being careful to keep the dies parallel while this is being done.

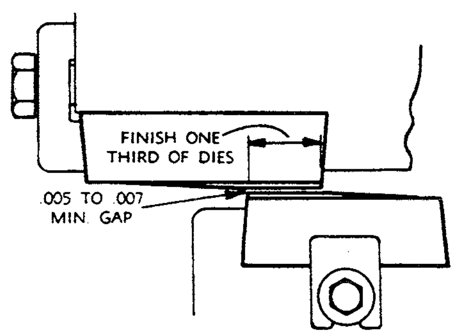


FIG. 54

With the above adjustments made, roll one blank through the dies, turning the machine by hand, and keeping the blank far enough out of the dies to prevent the point section from being rolled. If the dies have been placed in the machine correctly and with sufficient care, they should be approximately in match.

Check and correct matching if necessary, adjusting the dies for size, following instructions as outlined in the previous section. When correct size has been obtained, check the match again and correct if necessary.

Blank preparation for gimlet point screws is a very important part of screw production. When using straight shank blanks that are not prepointed, blank length should equal nominal screw length, with a minus .020 inch tolerance for optimum results. With prepointed blanks, it is desirable to provide just the right volume of metal to roll good points on the screws.

When rolling gimlet point screws the minor diameter is formed at the starting end of the die. It is therefore important to have the dies parallel to maintain the correct minor diameter size as the screw is rolled thru the dies to the finish end. As illustrated in Fig. 56, the initial penetration of the "V" form at the starting end of the die to the minor diameter of the screw is gradually changed to obtain the required width of root flat at the finish end of the die. The material displaced during this change forms the crest of a fully formed thread.

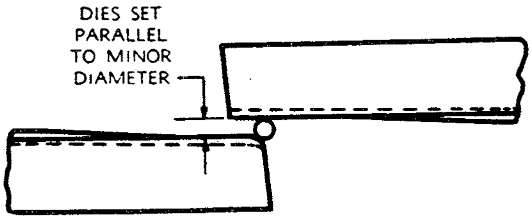


FIG. 55

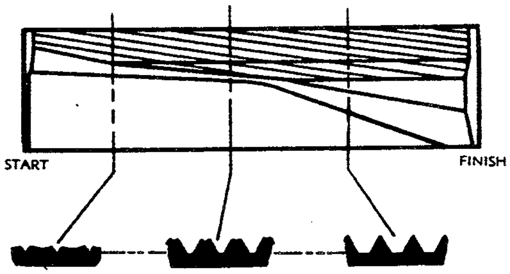
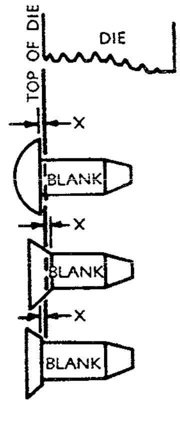


FIG. 56

The position of the blank in relation to the dies is important when rolling gimlet point screws. The quality of the screw rolled and life of the dies is influenced by the accuracy of blank positioning. Tables XVII and XVIII show the proper location in relation to the dies. With the blanks positioned as shown, sufficient clearance is provided between the bevels on the dies and chamfers of shouldered blanks which prevents overloading and early die failure.

Table XVII – Approximate Blank Location for Tapping Screws – Types AB, A, B, BP, BF, BG and BT

Type AB shown



MACHINE SIZE						
W.F.F.	00	0	10	20	30	40
Man.		OC 130C	2B 2C	3B 3C 375C	4B 500C	5B 625C
Hart. Spec.		A190 0-400 0-500	10-400 10-300 A312	20-225	30-180	40-140
BLANK LOCATION – X						
90° Head	.005		.005		.005	
Countersunk Head	.000 to .005		.005 to .015		.015	
Undercut Countersunk Head	.005		.005		.005	

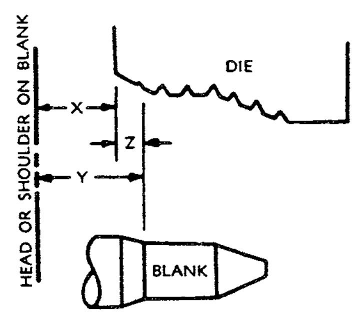
Table XVIII – Approximate Blank Location for Wood Screws and Lag Screws

X = Y – Z

where X = Distance from head or shoulder on blank to top of die.

where Y = Length from head or shoulder

where Z = Distance to top of die



Wood Screw		Lag Screw	
Screw Size	Z	Screw Diam.	Z
0	1/64	#10	1/16
1	1/64	1/4	1/16
2	1/64	5/16	5/64
3	1/32	3/8	7/64
4	1/32	7/16	7/64
5	1/32	1/2	7/64
6	3/64	5/8	9/64
7	3/64	3/4	5/32
8	3/64	7/8	5/32
9	1/16	1	3/16
10	1/16	1 1/8	3/16
12	1/16	1 1/4	3/16
14	5/64		
16	3/32		
18	7/64		
20	7/64		
24	1/8		

Most small diameter gimlet point screws are rolled from square end blanks with blank pointing and threading dies. The quality of the screw and particularly control of the material at the point requires careful attention in setup.

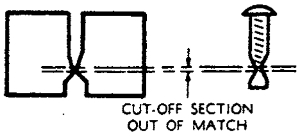


FIG. 57

Positioning of the dies to obtain the proper relation beween the cutting off section is essential. Fig. 57 shows dies that are **not** correctly matched at the cutoff section and how this misalignment would affect the work that is rolled. Fig. 58 shows the progression of the cutoff section of a blank through the dies. The excess material is cut off prior to complete forming of the point threads.

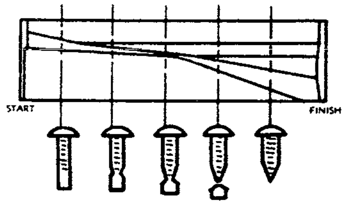


FIG. 58

Process wire is recommended to obtain the desired ductility of material when using blank pointing and threading dies. Wire which is too ductile will tend to stretch out and leave too much material at the point section of the screw. Wire that is too brittle will have the opposite effect and break off too soon, leaving insufficient material with which to form the correct threaded point.

Dies for Type F Tapping Screws

A comparison of the dies used for "Paint Scraper" screws and Type F Screws are shown in Fig. 59. The "Paint Scraper" screw has a straight thread made from a pointed blank, and the threads at the point of the screw have unfilled crests. The Type F Screw is a gimlet point screw with full tapered threads on the point. The flutes in the "Paint Scraper" and Type F Screws are rolled by means of an insert in one die.

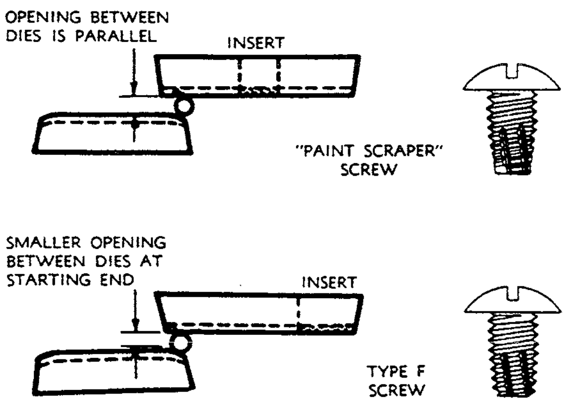
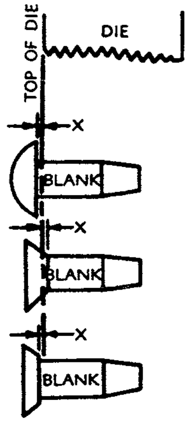


FIG. 59

Better quality screws will be produced by careful attention in setup to the proper relation of the blank to the dies. This relationship is shown in Table XIX for screws with the various head styles.

Table XIX — Approximate Blank Location for Tapping Screws — Types C, D, F, G and T

Type F shown



MACHINE SIZE						
W.F.F.	00	0	10	20	30	40
Man.		OC 130C	2B 2C	3B 3C 375C	4B 500C	5B 625C
Hart. Spec.		0-500 A190 0-400	10-400 10-300 A312	20-225	30-180	40-140
BLANK LOCATION — X						
90° Head	.005		.010		.015	
Counter-sunk Head	.000 to .005		.005 to .015		.015	
Undercut Counter-sunk Head	.005		.010		.015	

The fluting insert is located at the center of the die for "Paint Scraper" screws. This is necessary to finish roll the thread on the point and remove any burrs in these threads produced in the fluting operaton. However, this is not necessary on the dies for Type F screws which are made with the fluting insert at the finish end of the die.

In setting up dies for Type F or "Paint Scraper" screws the fluting insert is left out of the dies until they have been properly adjusted for size. The moving die hold down clamp bolt should be only lightly tightened to prevent damage of the die at the insert section. The threading section of the dies for Type F screws is set up so that the majority of the work of forming the thread is completed by the time the screw blank reaches the insert. In order to accomplish this, the dies are set closer together at the starting end than they are at the finish end. The dies for "Paint Scraper" screws are set as near parallel as possible.

These methods of setup are contrary to that which is recommended for the rolling of machine screws, but are made necessary by the addition of the fluting operation.

The dies should be adjusted to roll a full thread on the body or straight section of the blank, and approximately a one-half filled thread on the tapered section, Fig. 60. To accomplish this, the blank should be made to the correct specifications and positioned properly between the dies.

After the proper body thread size has been obtained and the dies are in match, adjust the transfer mechanism to feed the blanks into the dies at

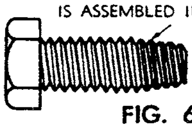


FIG. 60

the proper height to insure correct forming of the point threads. The heads of the screws should clear the top edges of the dies and by an amount of clearance as given in Table XIX. When this has been accomplished, remove the moving die and locate the fluting insert in long die, making sure the clamp is tightened securely to maintain the accuracy of the setup. The use of a special clamp as shown in Fig. 61 is recommended on top of the moving die to lock the insert in place and help stabilize the threading section above the fluting insert.

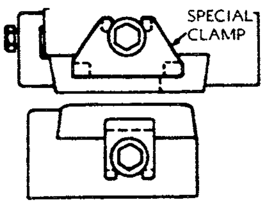


FIG. 61

If the flutes are too shallow, they can be rolled deeper by placing shims behind the fluting section as shown in Fig. 62. If the flutes are too deep, they can be made shallower by grinding a few thousandths off the back of the insert, Fig. 62.

When rolling the flutes, it is possible the threads on the tapered point of the screw may be overrolled. This would indicate the tapered section of the blank may be too large in diameter or improperly positioned. Conversely, if the threads in the tapered point are not filled out, the tapered section of the blank may be improperly positioned or too small in diameter.

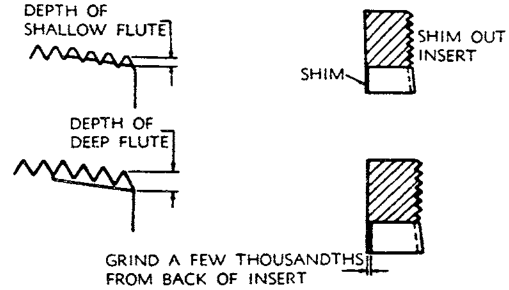


FIG. 62

Dies for Knurling

Straight, diagonal and diamond knurling can be produced on reciprocating type thread rolling machines. The same care should be taken with the setup of dies for knurling as is taken with dies for machine screws. It is not necessary to match the two dies used for producing a male diamond knurl pattern as the dies for this type of work consist of one right-hand and one left-hand diagonal knurl die. Dies for producing straight, diagonal or female diamond knurl patterns are matched by advancing one die by placing shims in the end of the die pocket. On machines having an adjustable pitman arm, the dies can be matched by advancing or retarding the moving die with the adjustment provided.

As is the case with rolling threads, it is also desirable to provide a slight angle on the face of the starter finger in order to force the blank to be knurled against the long or moving die.

Where more precise knurling is required, an adjustable end stop can be used on the moving die (Fig. 68). By adjusting this stop in either direction, it is possible to match the dies so that clean, sharp knurling is produced. It should never be necessary to move the adjustable end stop more than one pitch to secure a good match.

Special Aids to Flat Die Setup and Operation

Although the foregoing instructions will be found ample to cover the majority of setup jobs, there will be a number of cases where the special aids that follow will be found helpful.

Machine Pocket Liners

The condition of the die pockets and filler blocks when used is an important consideration in setting up reciprocating thread rolling machines. Considerable time can be saved by making certain the die pockets are not worn and accurate filler blocks are used.

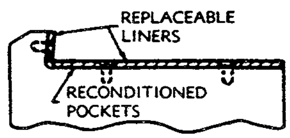


FIG. 63

Replaceable liners as shown in Fig. 63 are recommended when worn die pockets have been reconditioned. They not only prevent further damage to the pockets, but can be easily replaced when worn. This type of replaceable liner is also beneficial when using duplex face dies.

Roughening the Start

Roughening of the starting end of the dies to provide a non-skid surface is a practice that is occasionally used but one that should be avoided wherever possible, especially in precision rolling. When a poor setup is the cause of resistance to rolling, it is more practical to correct the cause rather than to introduce a second fault in an attempt to correct the first. A little extra care in adjusting the match, pressure and start will serve the purpose far more effectively and will result in better accuracy and finish in the screws as well as longer life in the die. In the cases where a non-skid surface may be considered necessary, it should preferably be accomplished by a course sandblasting of the faces of the dies for a short distance on the starting end (Fig. 64).

This aid to starting also may be accomplished by machining fine grooves crossways of the thread at the time the dies are made. These grooves are known as crossnicks and are illustrated in Fig. 65.

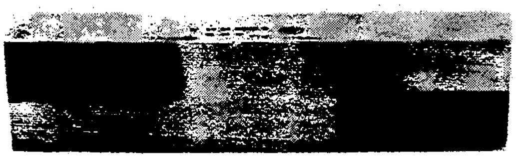


FIG. 64
Die Properly Roughened by Light Sandblasting on the Starting Ends with Coarse Grit Sandblast

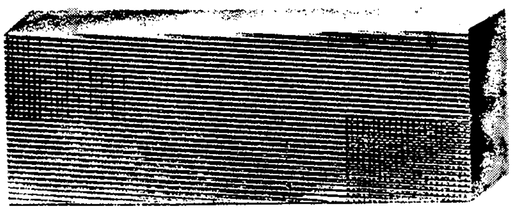


FIG. 65
Die Properly Roughened by Crossnicking

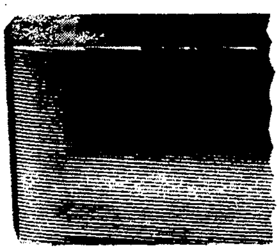


FIG. 66
Improper Roughening by Rough Freehand Grinding

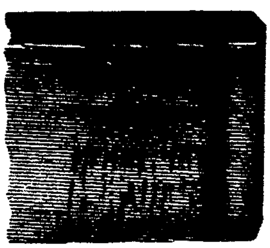


FIG. 67
Improper Roughening by Using Cold Chisel

This crossnicking should never be done with a cold chisel or by rough freehand grinding as illustrated in Figs. 66 and 67, which are actual photographs of dies that were discarded "because they gave poor service." Such practices result in flaky threads and hasten die failures.

Special End Stop

On particularly fussy work that is difficult to feed and where it is important that blanks be started absolutely straight at the exact point of match, a device similar to the one shown in Fig. 68 is being employed successfully by many users of reciprocating type thread rolling machines. This stop can be readily constructed and installed by reference to the sketch and the following description.

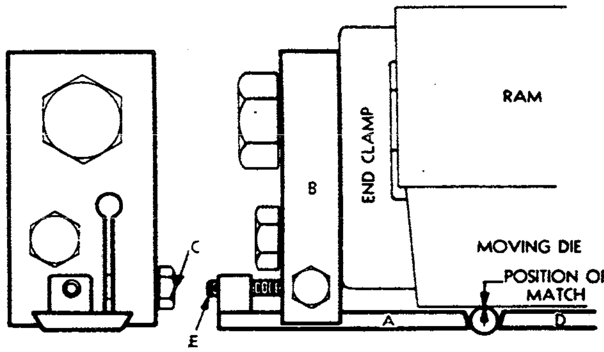


FIG. 68
Adjustable End Stop

This arrangement consists of an adjustable stop (A) held in position by a clamping member (B) that is attached to the end clamp on the moving die. The stop should have a slight angle, as shown, which tends to force the blank against the face of the moving die. The stop is located by means of a fine adjusting screw (E) so that the blank is positioned at the correct point of match. The stop is then locked in place by a clamping screw (C). Care should of course be taken to see that it holds the blank perfectly square with the sides of the die. The starter finger (D) should also have its end ground so that it will hold the blank firmly against the stop and against the moving die. If the starter cam is then properly adjusted, the blank can be fed on the back stroke of the ram and it will be clamped in its true position relative to the moving die the instant before reversal. Thus clamped, it moves backwards a small fraction of an inch with the moving die then forward as the stroke reverses. When the blank touches the stationary die, it rolls away from the fixed stop forcing the starter finger backwards a small fraction of an inch against its spring. The starter finger then strikes its stop and the blank rolls clear.

Knockoff Device

On some types of work, it may be necessary to employ a "knockoff" device to prevent the finished part from being caught by a return motion of the dies. If the machine is not equipped with such a device, it is a simple matter to make one and attach it to the machine. Fig. 69 illustrates such a device made of a flat spring attached to a rigid holder which is secured to the frame of the ma-

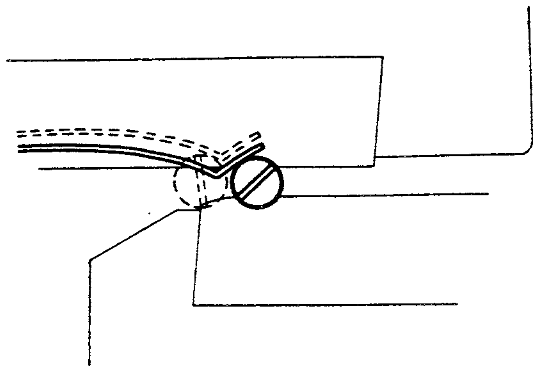


FIG. 69
Knockoff Device

chine. With the spring shaped as shown, it is forced back by the head of the screw as it passes, then as the screw rolls off the end of the stationary die, the stored energy in the spring kicks the blank clear so that it cannot ride back and get caught between the dies.

Adjustments for Incorrect Prepointed Blank Lengths

In some cases dies made for rolling gimlet point type threads can be altered or shimmed to compensate for a small amount of error in the blank length. This should be carefully undertaken and made only when the blank diameters are within tolerance and results can be achieved with minor changes in the setup. Alterations that are made incorrectly may result in damaged dies or affect the life of the dies. It is important to make certain that changes to the dies or shimming are necessary and the length of screw rolled, using the incorrect length of prepointed blank, will still be within specified tolerances.

For short blanks, both dies are placed together and the top edges ground off an amount equal to

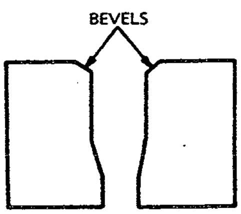


FIG. 70

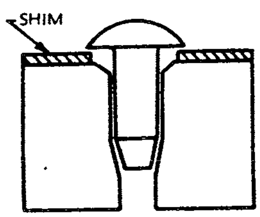


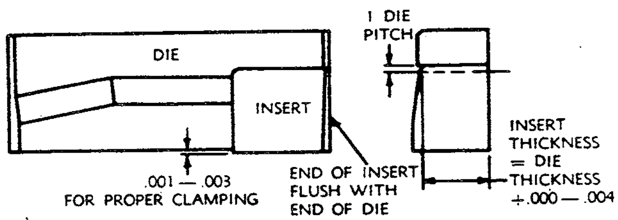
FIG. 71

the difference between the "G" length of the short blanks and the correct "G" length. Before alterations are made, the amount of bevel on the dies as shown in Fig. 70, should be checked and recorded. The dies should be rebevelled to the same amount after grinding the top edge of the dies. On dies without bevels, all feathered edges at the thread breakouts should be removed. Adequate coolant should be used when making alterations to the dies to reduce the possibilities of heat checks produced by grinding.

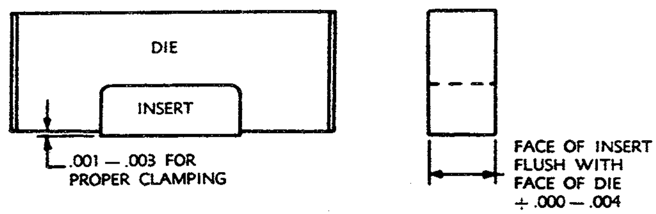
Shims are used on the top edge of both dies as shown in Fig. 71 to correct the setup for long blanks. The thickness of the shim should be equal to the difference between the "G" length of the long blank and the correct "G" length. This will raise the prepointed blank in the dies to eliminate overfilling the point section of the dies.

Dies with Fluting Inserts

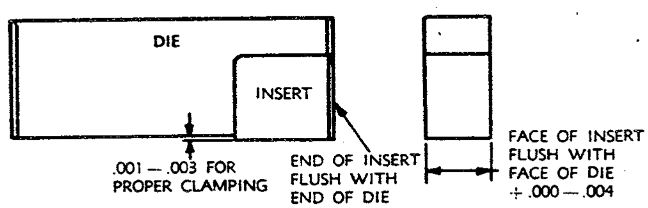
Dies furnished with fluting inserts for tapping screws are assembled and machined to provide the correct relation between the insert and the die. If inserts are supplied as replacements or separate from the die, it is good practice to check the proper relation of the insert with the die at assembly. It is usually necessary to alter the insert slightly to obtain the correct relationship as shown in Fig. 72 for proper clamping.



Die for Type F Screw



Die for Type F (Paint Scraper) Screw



Die for Type BF Screw

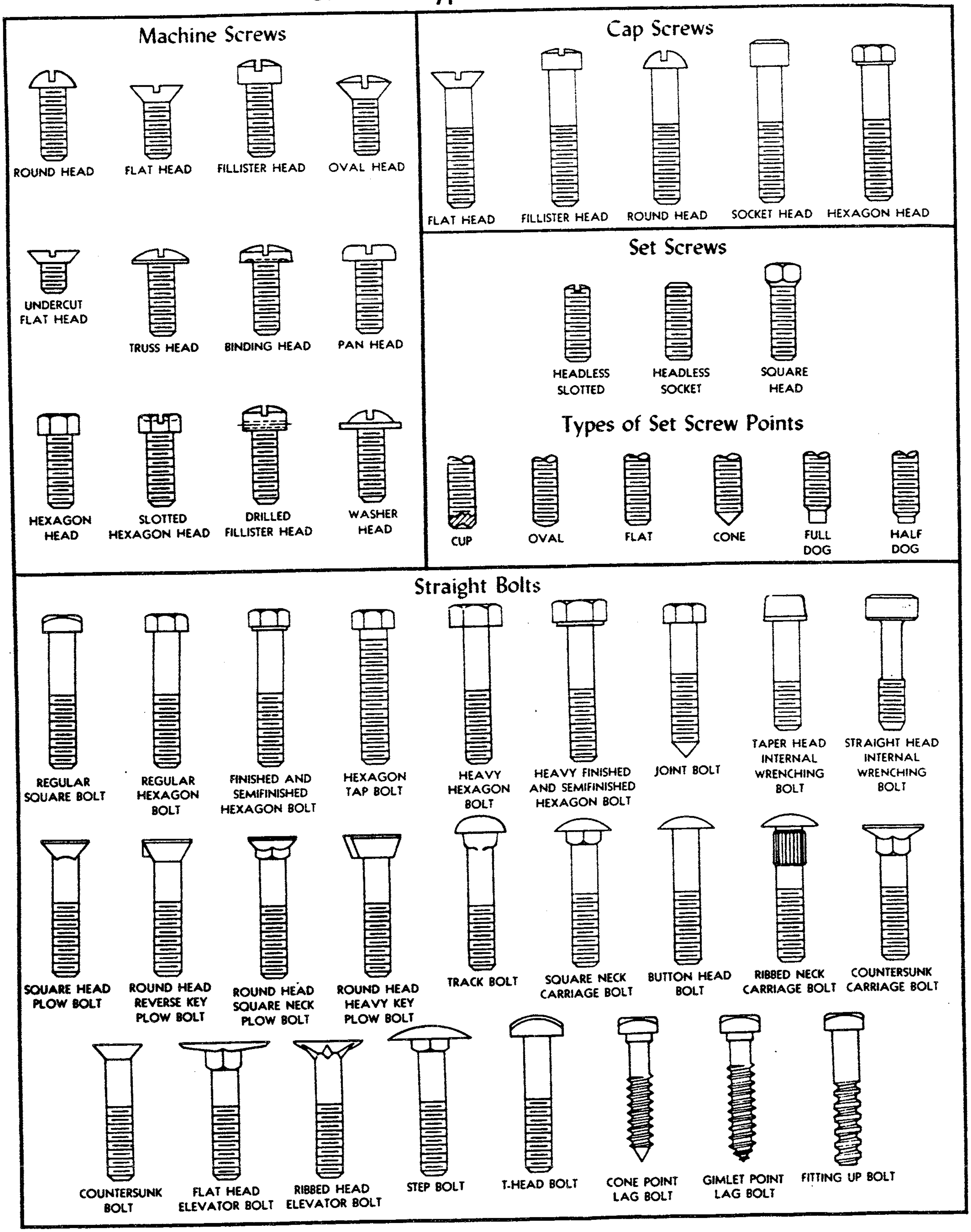
FIG. 72

Operator's Check List

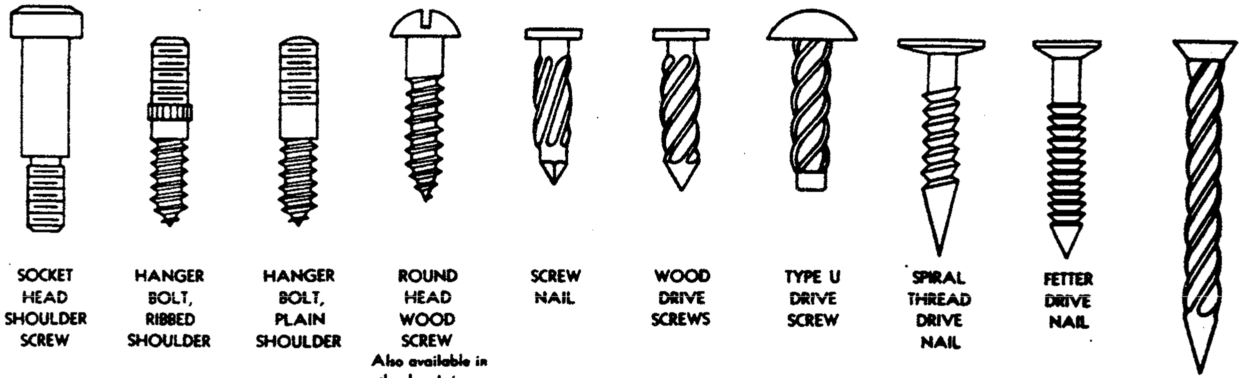
Problem	Probable Cause
Slivers or flakes	1. Dies not in match, or 2. Tipped start, or 3. Deep cross-nicking on dies, or 4. Slipping at start, or 5. Improper helix angle on dies, or 6. Machine and dies too large and clumsy for the job, or 7. Overfilling dies, or 8. Material not adaptable to cold-working, or 9. Seamy stock
Drunken threads	1. Dies not in match, or 2. Tipped start, or 3. Crooked relief on dies, or 4. Slipping at start, or 5. Improper helix angle on dies, or 6. Inaccurate dies
Offsize threads	
1. PD and OD both oversize	Oversize blanks
2. PD oversize, OD right size	Oversize blanks. If finished thread is full, die thread is too shallow
3. PD oversize, OD undersize	Insufficient squeeze on dies. If finished thread is full, die thread is too shallow
4. PD right size, OD oversize	Blank too large. Die thread deeper than necessary
5. PD right size, OD undersize	Blank too small. If finished thread is full, die thread is too shallow
6. PD undersize, OD oversize	Too much squeeze. Die thread deeper than necessary
7. PD undersize, OD right size	Blank too small. Die thread deeper than necessary
8. PD and OD both undersize	Blank too small
Out of round	1. Out-of-round blank, or 2. Too much pressure on finish end of dies, or 3. Poor thread form on the relief of the die, or 4. Dies too short for the job, or 5. If thread is full on one side and not on the other, poor match or crooked start, or 6. Material not ductile enough for coldworking
Taper	
1. PD straight, OD tapered and not filled out on small end	Tapered blank
2. PD and OD both tapered same way	Tapered blank, and dies set up with taper to match
3. PD and OD tapered in opposite directions and thread not filled out on end with small OD	Dies not squeezed tight enough on edge with large PD and small OD
Thread with expanded lead	Expanded lead in the dies
Thread with contracted lead	1. Contracted lead in dies 2. Hard material (Rockwell 18-C scale and harder) will contract slightly when released from rolling dies. For accurate work, use dies with expanded lead

Problem	Probable Cause
Poor thread form	1. Poor thread form in the dies, or 2. Dies not in match, or 3. Crooked start, or 4. Machine and dies too large and clumsy for the job
Line running axially down one side	1. Insufficient relief on the stationary die and too much pressure on the finish end, or 2. Not gradual enough release of pressure at finish end, or 3. Dies too short for the job
Thread filled out in center but not at ends, or vice versa	1. Face of die not flat, or 2. Blank with varying diameter from end to end
End threads not filled out	This is characteristic of thread rolling but can be minimized by beveling ends of blanks
Split thread	1. Seamy stock, or 2. Too much pressure on dies, usually at finish end, or 3. Dies too short for the job
Poor finish on thread	1. Correspondingly poor finish on dies, or 2. Dies that are worn out or broken, or 3. Dies not in match, or 4. Slipping, or 5. Deep cross-nicking on start, or 6. Material not ductile enough for coldworking
Crests not filled out Many users do not consider this a serious objection, and by allowing their screws to pass with crests not filled out, overloading of dies is avoided and die life is prolonged	1. Blank too small, or 2. Die thread too deep
Unfilled gimlet point threads	1. Oversize blanks cause screws to roll out of dies, or 2. Undersize blank point, or 3. Short straight section of blanks, or 4. Blanks improperly positioned
Overfilled gimlet point threads	1. Undersize blanks cause screws to roll down into dies, or 2. Oversize blank point, or 3. Long straight section of blanks, or 4. Blanks improperly positioned

Common Types of Fasteners

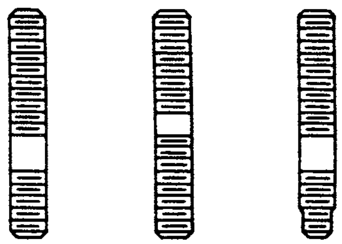


Miscellaneous Screws, Bolts, Nails and Dowels



SOCKET HEAD SHOULDER SCREW — HANGER BOLT, RIBBED SHOULDER — HANGER BOLT, PLAIN SHOULDER — ROUND HEAD WOOD SCREW (Also available in other head sizes) — SCREW NAIL — WOOD DRIVE SCREWS — TYPE U DRIVE SCREW — SPIRAL THREAD DRIVE NAIL — FETTER DRIVE NAIL — DRIVE DOWEL

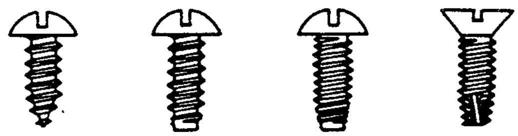
Studs



TAP END — DOUBLE END — STEP

Tapping Screws

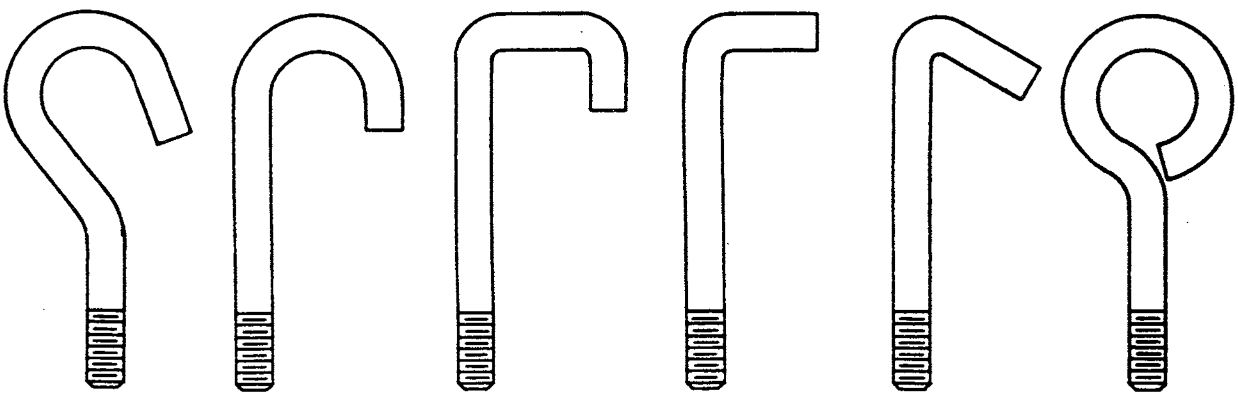
Available in other head styles as well as those shown



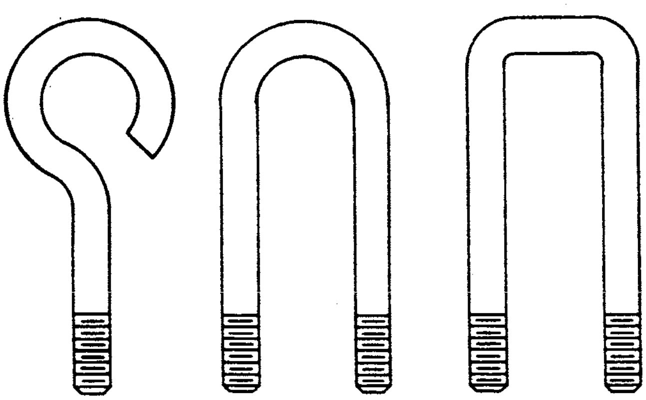
TYPE A or AB — TYPE B — TYPE C — TYPE F— ROLLED FLUTES

NOTE: Types D and G are same as Type C with the addition of cut flutes on the points.

Bent Bolts



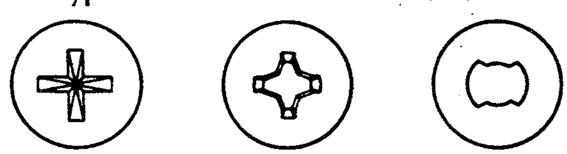
J BOLT — HOOK BOLT, ROUND BEND — HOOK BOLT, SQUARE BEND — HOOK BOLT, RIGHT ANGLE BEND — HOOK BOLT, SPECIAL — EYE BOLT, CLOSED



EYE BOLT, OPEN — U BOLT, ROUND BEND — U BOLT, SQUARE BEND

THREADS ROLLED BEFORE BENDING

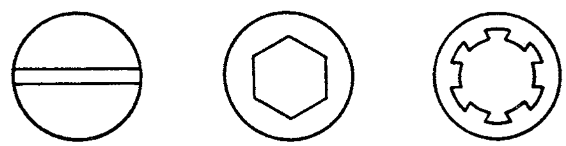
Types of Sockets and Drive Slots



RECESSED— Consisting of two intersecting slots with parallel sides converging to a sharp apex at bottom of recess.

RECESSED— Consisting of a large center opening, tapered wings, and blunt bottom, with all edges relieved or rounded.

CLUTCH RECESS



SLOTTED — HEXAGONAL SOCKET — FLUTED SOCKET

Table XX — Alternate Use of Gimlet Point Dies for Type AB Screws

This table gives the lengths of countersunk head screws that may be rolled with dies made for specific lengths of 90° head screws and the die alterations required.

L — Length of Countersunk Head Screw

H — Amount of Material to be removed from dies

Screw Size		90° HEAD SCREW LENGTHS								
		1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1
4-24	L	U1/4	5/16	3/8		1/2	5/8	3/4		
	H	.055	.079	.079		.079	.079	.079		
	L	5/16	3/8	7/16		9/16	11/16	13/16		
	H	.016	.016	.016		.016	.016	.016		
6-20	L	U5/16		3/8		1/2	5/8	3/4	7/8	1
	H	—		.098		.098	.098	.098	.098	.098
	L			7/16		9/16	11/16	13/16	15/16	1 1/16
	H			.035		.035	.035	.035	.035	.035
7-19	L			U3/8		1/2	5/8	3/4		1
	H			.078		.107	.107	.107		.107
	L			7/16		9/16	11/16	13/16		1 1/16
	H			.044		.044	.044	.044		.044
8-18	L	U5/16	U3/8	1/2	9/16	5/8	3/4	7/8	1	1 1/8
	H	.018	.018	—	—	—	—	—	—	—
	L			U7/16						
	H			.018						
10-16	L			U3/8	U7/16	5/8	3/4	7/8	1	1 1/8
	H			.095	.095	—	—	—	—	—
	L			U7/16	U1/2					
	H			.032	.032					
	L				9/16					
	H				—					
12-14	L			U7/16	U1/2	U9/16	11/16	13/16	15/16	1 1/16
	H			.045	.045	.045	.090	.090	.090	.090
	L					5/8	3/4	7/8	1	1 1/8
	H					.028	.028	.028	.028	.028
1/4-14	L			U1/2	U9/16	U1/2				
	H			—	—	.123				
	L					U9/16	11/16	13/16	15/16	1 1/16
	H					.060	.114	.114	.114	.114
	L					U5/8	3/4	7/8	1	1 1/8
	H					—	.052	.052	.052	.052

U — These screw lengths have **Undercut** Countersunk Heads.

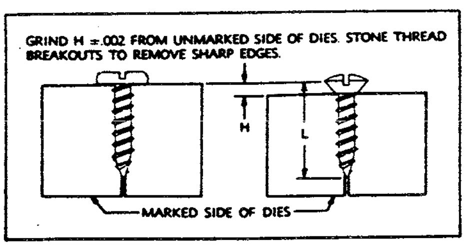
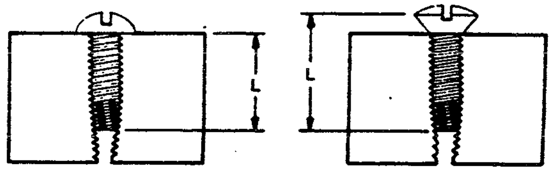


Table XXI – Alternate Use of Dies for Type F Screws

Screw Size	90° HEAD SCREW LENGTHS 3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8
2-56	1/4	5/16	3/8	7/16	1/2				
2-64	1/4	5/16	3/8	7/16	1/2				
3-48	1/4	5/16	3/8	7/16	1/2				
3-56	1/4	5/16	3/8	7/16	1/2				
4-40		5/16	3/8	7/16	1/2				
4-48		5/16	3/8	7/16	1/2				
6-40	*1/4	*5/16							
8-32		*5/16	*3/8	*7/16					
8-36	*1/4	*5/16	*3/8	*7/16					
10-24						5/8	3/4	7/8	1
10-32						5/8	3/4	7/8	1
12-24						5/8	3/4	7/8	1
12-28						5/8	3/4	7/8	1
5/16-18				*1/2		*5/8			
5/16-24			*7/16	*1/2		*5/8			

*These lengths are Undercut C'sk. Heads only.

This table gives the length of countersunk head screws that may be rolled with dies made for specific lengths of 90° head screws.

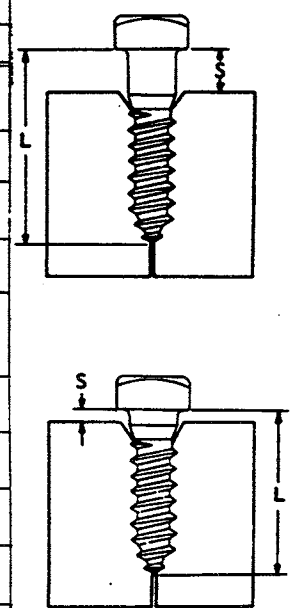


L — Length of Screw

ble XXII – Alternate Use of Gimlet Point Dies for Lag Screws (Lag Bolts)

ies made for a specific length of screw may be used for shorter lengths as given in the table. The houlder length (S) will be within the tolerances as given in the American Standard ASA B18.2-1960.

ominal Screw iameter	LONG SCREW LENGTH 2	2½	3	3½	4	4½	5	6	7	8	9	10
#10	1¾	2	2½	3								
¼	1¾	2	2½	3								
5/16	1¾	2	2½	2½ 3	3 3½							
3/8			2½	3	3 3½	3½ 4						
7/16			2½	3	3 3½	3½ 4						
½			2½	3	3 3½	3½ 4	3½ 4 4½					
5/8				3	3½	3½ 4	4 4½					
¾				3	3½	3½ 4	4 4½	4½ 5				
7/8				3	3½	3½ 4	4 4½	4½ 5	5 6			
1					3½	4	4 4½	4½ 5	5 6	6 7		
1⅛						4	4½	5	6	6 7	7 8	
1¼						4	4½	5	6	6 7	7 8	7 8 9



L — Length of Screw
S — Length of Shoulder

Table XXIII – Reed Flat Thread Rolling Die Selection Chart for Tapping Screws

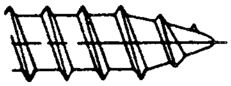
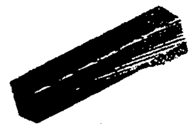
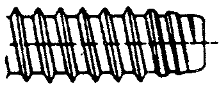
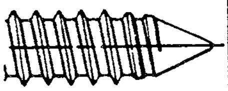
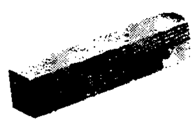
SCREW AND THREAD INFORMATION					Type of Die Used
Type of Screw			Type of Thread	Remarks	
AB or A	Thread Forming		Gimlet Point Spaced Thread	Gimlet points have complete finished threads. Blanks are usually prepared with pilot or pinched points.	 Gimlet Threaded Point Single Face Die
B	Thread Forming		Straight Spaced Thread	Threads on tapered point have unfinished crests as blanks are prepared with tapered points.	 Duplex Face Die (single face optional)
BG	Thread Cutting			Threads on tapered point have unfinished crests as blanks are prepared with tapered points. Screw is slotted after thread rolling.	
BP	Thread Forming			Threads on tapered point have unfinished crests as blanks are prepared with taper and cone point.	
BT	Thread Cutting			Threads on tapered point have unfinished crests as blanks are prepared with tapered points. Screw is slotted after thread rolling.	
F	Thread Cutting		Taper Pointed Machine Screw Thread	Tapered threads on point have complete finished threads. Blanks are prepared with tapered point. Dies produce tapered flutes during thread rolling.	 Taper Threaded Point Single Face Die with Tapered Fluting Insert
"Paint Scraper" (F)	Thread Cutting		Straight Machine Screw Thread	Threads on tapered point have unfinished crests as blanks are prepared with tapered points. Dies produce straight flutes during thread rolling.	 Duplex Face Die with Straight Fluting Insert (single face optional)

Table XXIV – Reed Flat Thread Rolling Die Selection Chart for Tapping Screws

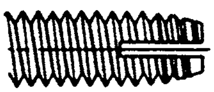
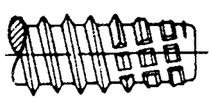
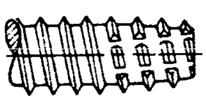
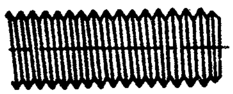
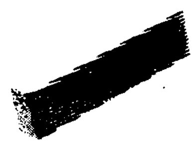
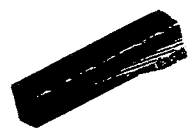
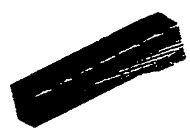
SCREW AND THREAD INFORMATION					Type of Die Used
Type of Screw			Type of Thread	Remarks	
C	Thread Forming			Threads on tapered point have unfinished crests as blanks are prepared with tapered points.	
D	Thread Cutting		Straight Machine Screw Thread	Threads on tapered point have unfinished crests as blanks are prepared with tapered points. Screw is slotted after thread rolling.	
G	Thread Cutting			Threads on tapered point have unfinished crests as blanks are prepared with tapered points. Screw is slotted after thread rolling.	Duplex Face Die (single face optional)
T	Thread Cutting			Threads on tapered point have unfinished crests as blanks are prepared with tapered points. Screw is slotted after thread rolling.	
BF (Std.)	Thread Cutting		Straight Spaced Thread	Threads on tapered point have unfinished crests as blanks are prepared with tapered points. Dies produce tapered flutes during thread rolling.	 Duplex Face Die with Tapered Fluting Insert (single face optional)
BF (Spec.)	Thread Cutting		Taper Pointed Spaced Thread	Tapered threads on point have complete finished threads. Blanks are prepared with tapered point. Dies produce tapered flutes during thread rolling.	 Taper Threaded Point Single Face Die with Tapered Fluting Insert

Table XXV – Reed Flat Thread Rolling Die Selection Chart

SCREW AND THREAD INFORMATION				Type of Die Used
Type of Screw		Type of Thread	Remarks	
U Thread Forming		Spaced Thread with Steep Lead Angle	Threaded face on die made to suit length of thread and provide clearance for pilot.	 Duplex Face Die (single face optional)
Machine Screw		Straight Machine Screw Thread	Straight complete threads, using straight blanks with bevels.	 Duplex Face and Single Face Dies
Lag Screw, Cone Point		Straight Spaced Thread	Straight complete finished threads. Blanks prepared with cone point.	 Duplex Face and Single Face Dies
Lag Screw, Gimlet Point		Gimlet Point Spaced Thread	Gimlet points have complete finished threads. Blanks are prepared with tapered points.	 Gimlet Threaded Point Single Face Die
Wood Screw, Gimlet Point		Gimlet Point Spaced Thread	Gimlet points have complete finished threads. Blanks are usually prepared with pilot or pinched points.	 Gimlet Threaded Point Single Face Die

How to Order REED Flat Dies

The following data should be shown on all orders for dies.

1. Number of Pairs

2. Die Information

(a) Machine Size
(b) Machine Make
(c) Depth of Die Face
(d) Single or Duplex
(e) Dies for right hand threads will be furnished unless otherwise specified.

3. Thread Information

(a) Thread Length on Work
(b) Major (nominal) Diameter
(c) Number of Threads per Inch
(d) Thread Form (UNRC, UNRF, UNR, NC, NF)
(e) State class of thread or thread tolerances

4. Screw Information

It is necessary to supply screw information only when ordering dies for wood screws, lag screws, and tapping screws (except Type B)

(a) Screw Length

(b) Head Style (round head, flat head, flat trim head, undercut oval head, etc.)

(c) Type of Screw (wood screw, lag screw, Type AB, A, B, F tapping screw, etc.)

5. In Unusual Cases

Specify the material to be rolled and its hardness, and any special tolerances. It is desirable to furnish blueprint or sketch and samples of the work to be rolled.

Typical Examples for wording of Die Orders

Dies for Machine Screws

When used on Waterbury Farrel Machines:

12 pair—10WFF
1⅝" Duplex
5/16—18 UNRC-2A

Dies for Tapping Screws

When used on Hartford Special Machines:

4 pair—O-500 Hartford Special—¾" Single, No. 10-16 x ½" Rd. Hd. Type AB Tapping Screw

When used on National Machinery Machines:

6 pair—⅜ M BM
1½" Single
¼—20 UNRC-2A, L.H.