U S A S T A N D A R D

SPINDLE NOSES

USAS B5.9 - 1967

REAFFIRMED 1986

For Tool Room Lathes, Engine Lathes, Turret Lathes, and Automatic Lathes

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Foreword

THE first edition of this standard, known as B5.9–1936, was developed by Technical Committee No. 4 on Spindle Noses of Sectional Committee B5 on the Standardization of Small Tools and Machine Tool Elements. The second edition, known as B5.9–1948, broadened the scope of the standard to include five sizes of Type L spindle noses, two smaller sizes of Types A, B and D spindle noses, namely, the 2 in. and 3 in., and a new spindle nose larger than the 20 in. for Types A and B, now known as the 28-in. nose. Similar changes were made in the American Standard for Chucks and Chuck Jaws (ASA B5.8).

The third edition, known as B5.9–1954, incorporated Unified Screw Threads jointly agreed upon by the American Standards Association, the British Standards Institution, and the Canadian Standards Association. For thread designations and specifications see USA Standard for Unified and American Screw Threads (USAS B1.1–1960). Other minor changes were also incorporated to clarify application of certain tolerances for plug gages, and a new paragraph was added to the text to provide balancing instructions.

In the fourth edition, approved by ASA on February 5, 1960 as B5.9–1960, tolerances for length of pilot and depth of pilot holes for the Type A-1 and B-1 spindles were decreased slightly to reflect current actual practice in order to reduce the possibility of distorting the chuck or face plate when mounted on the spindle. For the same reason, pilot bore diameters for some sizes of these chucks, and corresponding gage dimensions, were changed to reduce interference between chuck and spindle pilot diameters. In addition, the method of dimensioning radial hole locations was changed to follow the practice set forth in American Drafting Standards Manual on Dimensioning and Notes (ASA Y14.5–1957) to insure interchangeability.

This Revision supersedes ASA B5.9–1960. Master ring gage inside diameters were slightly increased for some Types A, B and D spindle nose sizes, to coincide with the 1960 master plug gage change made to suit the increased chuck pilot diameters. Counterbores for socket head screws were also changed to provide clearance for the "1960 Series" cap screws. Tables showing assembly of face plates to Type A and B spindles were eliminated, and tables and pages renumbered. Tables 35, 36 and 37 in this edition, reflect the 1963 revision of Handbook H28 – Screw-thread Standards for Federal Services, and the recent USA Standard Gages and Gaging for Unified Screw Threads, USAS B1.2–1966, in changing "NOT GO threaded plug gages" to "HI thread plug gages" and "NOT GO thread ring gages" to "LO thread ring gages."

Following approval by the USA Standards Committee B5 and the sponsors, the revision was approved by the USA Standards Institute on April 21, 1967.

USA STANDARD

This USA Standard is one of nearly 3000 standards approved as American Standards by the American Standards Association. On August 24, 1966, the ASA was reconstituted as the United States of America Standards Institute. Standards approved as American Standards are now designated USA Standards. There is no change in their index identification or technical content.

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Gages for Type L Spindle Noses

USA STANDARD

SPINDLE NOSES

For Tool Room Lathes, Engine Lathes, Turret Lathes and Automatic Lathes

Introductory Notes

1. Scope and Purpose

1.1 These spindle noses are for use on engine lathes, tool room lathes, turret lathes and automatic lathes and may be used advantageously on other machines wherever chucks or fixtures must be mounted accurately and rigidly on revolving spindles. Complete dimensions for each size and type of nose, as well as for mating backs of chucks, face plates and fixtures, are given in the tables. Also given are dimensions of gages for checking the important dimensions on these spindle noses and the backs of chucks, face plates and fixtures, to insure interchangeability between parts made by different manufacturers.

2. Nomenclature

2.1 The accompanying tables give dimensions of Types A, B, D, and L spindle noses. Ten sizes, from 2 in. to 28 in. inclusive, are provided in Types A and B as shown in Tables 1 and 2. Types A and B are subdivided into two divisions, 1 and 2, and noted as Types A1 and B1 or Types A2 or B2. Types A1 and B1 are provided with holes in both the inner and outer bolt circles in sizes 5 in. to 28 in. inclusive as shown on Tables 2 and 3. Types A2 and B2 are provided with holes in the outer bolt circles only in sizes 2 in. to 28 in. inclusive as shown on Tables 1, 2, and 3. The three smaller sizes, 2 in., 3 in. and 4 in., are available only in Types A2 and B2 with holes in the outer bolt circles only. Type D is provided in nine sizes, from 2 in. to 20 in. inclusive, in one series designated as Type D1 as shown on Tables 6, 8, 10, 12, 18, and 19. Type L is provided in five sizes in one series only as shown on Tables 28, 30, and 33.

2.2 In specifying chucks, face plates or fixtures to be made by another manufacturer, the size, as well as the type of the particular nose to be used, must be designated.

2.3 To clearly identify any spindle nose of Types A, B, or D, the terminology used should include first—the size, second—the type, third—the sub-division of the type which indicates the standard elements employed as given in detail in Tables 1, 2, 6, 8, 10, and 12, and fourth — the words "USA Standard Spindle Nose." For example, a "6-in. Type A1 USA Standard Spindle Nose" designates a 6-in. nose with the dimensions given in Tables 2 and 3 of Type A of subdivision 1; namely, with 11 tapped holes in the outer bolt circle and 8 tapped holes in the inner bolt circle, equipped with a driving button held in place with a driving screw.

2.4 To clearly identify any spindle nose of Type L, the terminology used should include first — the word "Type," second — the symbol indicating the type and size, third — the words USA Standard Spindle Nose." For example, a "Type L00 USA Standard Spindle Nose" designates the smallest size of Type L nose of the dimensions given on Table 28.

2.5 A detailed description of each type of spindle nose is given below.

2.6 The Type A1 spindle nose is provided with two rows of tapped holes and a driving button as explained in Tables 1, 2, and 3. The inner row of tapped holes provides means for attaching certain sizes of scroll chucks by the use of socket-head cap screws which pass inside the scroll plate between the chuck jaws as shown in Table 4. The outer row of tapped holes provides means for attaching face plates, fixtures and other chucks by the use of socket-head cap screws. Table 4 gives the mating dimensions of chucks and face plates. The Type A1 nose is not available in the 2-in., 3-in. and 4-in. sizes.

2.7 The Type A2 spindle nose is the same as Type A1 except that holes in the inner bolt circle are omitted. The Type A2 may be used when the hole in the spindle is so large that there is no space left for the inner bolt circle and where the class of the work which the machine is to do is so restricted that the inner bolt circle is not required.

2.8 The Type B1 spindle nose is exactly the same as Type A1 except the holes in the outer

bolt circle are clearance holes for through bolts or studs so that chucks or fixtures may be attached by the use of bolts or studs passing through the flange and employing nuts on the back side of the flange. The Type B1 nose will take any of the chucks, face plates or fixtures that may be mounted on the Type A1 nose, but the Type B1 necessitates extra overhang from the front spindle bearing of the machine to allow room for the nuts on the back of the flange. The Type B1 nose is provided with the tapped holes in the inner bolt circle exactly like the Type A1 nose. The Type B1 nose is available in seven sizes from 5 in. to 28 in. inclusive, and the dimensions are given in Tables 2 and 3, while Table 4 gives mating dimensions of chucks and face plates which may be attached by socket-head cap screws or Type B studs. The dimensions of Type B studs are given in Table 14.

2.9 The Type B2 spindle nose is the same as Type B1 except the holes in the inner bolt circle are omitted. The Type B2 spindle is available in ten sizes from 2 in. to 28 in. inclusive, and the dimensions are given in Tables 1, 2, and 3, while the backs of mating chucks, face plates, and fixtures are given in Table 4.

2.10 The Type D1 spindle nose is equipped with three equally spaced clearance holes in the outer bolt circle in sizes 2 in., 3 in., and 4 in., and six equally spaced clearance holes in the outer bolt circle in sizes 5 in. to 20 in. inclusive. Each such hole is provided with a cam, cam spring and other elements as shown on Tables 6, 8, 10, and 12 and as shown in the assembled position in Table 20. The cams are for the purpose of engaging and locking the cam lock studs mounted in the back of the face plate or chuck as dimensioned in Tables 7, 9, 11, and 13 and shown in assembled position in Table 20. This type of nose is intended for use on machines where the saving of time in changing face plates and chucks is of considerable importance. A portion of a turn of each of the cams releases the cam lock studs and allows the instant removal of the chuck or face plate. Similarly, when mounting chucks on the spindle, the chuck can be locked in place very quickly and easily by turning each cam a portion of a turn. Where the construction permits, chucks or face plates may also be mounted on the Type D1 spindle noses by the use of cam lock nuts as shown on Table 14. The cam lock nuts are first locked in position in the spindle nose with the cams, and the chuck or face plate is then attached to the spindle with socket head cap screws of the proper length as shown in Table 14.

2.11 The Type L spindle nose is provided with a long, steep taper for locating and centering chucks and face plates, with a key for driving, and with a flanged nut for holding the chuck or face plate on the spindle. This spindle is available in five sizes and is dimensioned in Tables 28 and 30 and shown in assembled position in Table 33. Dimensions of the backs of mating chucks and face plates are shown in Table 29.

3. Gages and Gaging for Types A, B, and D, Spindle Noses

3.1 Master gages of the ring and plug type are recommended for inspecting the taper pilots of Types A, B, and D spindle noses and the taper holes in the mating face plates and chucks. Dimensions of such master gages for each size of spindle are given in the accompanying tables.

3.2 The master plug gages, Table 23, are so made that the point at which the taper, if extended, would intersect the flat face, is of dimensions B, Table 23. For convenience in checking these gages, the table lists the correct dimensions over accurate plug gages 0.250 in. in diameter resting against the flat face.

3.3 Each of the master ring gages, Table 22, is made so that the dimensions B corresponds with the dimension B of the mating master plug gage, Table 23, and so that surfaces W and X of the ring gage are a good Prussian blue fit on surfaces Y and Z of the mating plug gage.

3.4 Taper pilots on the spindles may be inspected with a master ring gage either by using depth gages registering from one face of the gage, or by using feelers of thickness Y, Tables 1 and 2, or thickness S26, Table 12. Three feelers of minimum dimensions Y or S26 should be used as "go" feelers and three feelers of the maximum dimension Y or S26 should be used as "not go" feelers. These feelers should be approximately equally spaced around the flange.

3.5 The taper hole in chucks and face plates, Table 4 and Table 13, may be inspected either by depth gages or by using the proper size master plug gage, Table 23. The plug gage should fit the taper hole without shake if the surface Y of the plug gage strikes the face of the chuck or face plate and should not stand away from the face of the chuck or face plate more than the amount of the gage clearance Y of Table 4 or P17, Table 13. This gage clearance may be in-

spected with three feelers equally spaced around the flange.

3.6 Micrometer working gages, Tables 24, 25, 26, and 27, will be found convenient for manufacturing spindle noses as well as chucks or face plates. These gages should be set to the proper master ring and plug gage as explained in Tables 24, 25, 26, and 27 and will then read the pilot diameters direct.

4. Gages and Gaging for Type L Spindle Noses

4.1 Table 34 gives dimensions of plug and ring taper gages for inspecting the long taper pilots of Type L spindle noses and for inspecting the long taper holes in mating chucks and face plates. Tolerance B applies to dimension A only. Dimension A is the theoretical diameter of the taper at a plane intersecting the face of the large end of the gage. Tolerance E applies to the rate of taper only. On all taper plug gages the rate of taper shall not be less than 3½ in. per foot, and shall not be more than 3½ in. per foot plus E in the length C of the gage.

4.2 The master ring gages, Table 34, should be a good Prussian blue fit on the long taper of the spindle noses, Table 28, and the face of the gage marked "gage line" in Table 34 should stand away from the flange on the spindle an amount equal to the gage clearance CC, Table 28. This gage clearance may be inspected with "go" feelers of the minimum amount of the gage clearance CC and with "not go" feelers of the maximum amount of this gage clearance.

4.3 The location of the key and the height of the key in each spindle nose, Table 28, may be inspected by using this same ring gage, Table 34. Dimension N on this ring gage is made to clear the maximum permissible height G of the key in the spindle nose. The minimum height G, Table 28, may be checked by using the proper feeler between the top of the key and the slot in the ring gage.

4.4 The location and depth of the keyway in the chuck or face plate may be inspected by means of the "go" and "not go" gage blocks, Table 34. The "go" gage block should fit freely the full depth in the keyway of the plug gage when inserted in the taper hole in the chuck or face plate. The "not go" gage either should not enter or should enter without shake.

4.5 The threads on the draw nuts for Type L spindle noses, Table 30, may be inspected by means of the "go" and "not go" HI thread plug gages, Table 35. The "go" gage should screw into the nut the full distance freely. The "not go" HI gage either should not enter or should screw in without shake.

4.6 The thread on the backs of chucks and face plates for Type L spindle noses, Table 29, may be inspected with a "go" and "not go" LO thread ring gage, Table 37. The "go" gage should screw on freely all the way while the "not go" LO thread gage either should not start or should be on without shake.

4.7 The "go" and "not go" LO thread ring gages, Table 37, may be checked and set properly by means of the setting plugs for thread ring gages, Table 36.

5 Chucks

5.1 The dimensions of standard chucks to fit Types A, B, D and L spindle noses are given by USA Standard Chucks and Chuck Jaws (USAS B5.8–1954, Reaffirmed 1959).

5.2 Chucks for Type A and Type B spindle noses shown by the above standard have the backs of the chucks made to the dimensions of Table 4 and are held on the spindle noses with cap screws or bolts. Chucks for Type D spindle noses have the backs of the chucks made to the dimensions of Tables 7, 9, 11, or 13 and and are held on the spindle noses by means shown in Tables 18, 19, or 20. Chucks for Type L spindle noses have the backs of the chucks made to the dimensions of Table 29 and are held on the spindle noses by means shown in Table 33.

5.3 All of the regular chuck builders in the United States are in a position to furnish chucks for Types A, B, D, or L spindle noses.

5.4 The Class I chucks covered by that standard are medium-duty, wrench operated chucks with master jaws of the tongue and groove type and are suitable for use on engine lathes or for medium duty on other machines. These chucks may be interchangeable on the Types A1, B1, B2, and D1 spindle noses. They may be attached to the A1 or B1 noses by socket head cap screws or may be attached to the Type B2 noses by using Type D studs, Table 14, and held with nuts on the back of the flange of the nose as shown in Table 14. These chucks may also be attached to the D1 nose by the use of cam lock studs, Table 13, and assembled as shown in Table 20.

6 Spindle Noses Recommended for Different Types of Lathes

6.1 *Bench Lathes.* The 2 in. Type D1 spindle nose is recommended for 6 in. up to and including 8 in. bench lathes, and the 3 in. Type D1 spindle nose or the Type L00 spindle nose is recommended for 9 in. and 10 in. bench lathes.

6.2 Table 18 shows recommended construction of draw-in collets on 2 in. and 3 in. Type D1 spindle noses for bench lathes, as well as the construction and general dimensions for spindles with American Standard tapers, assembled with face plates and dog plates on 2 in. Type D1 and 3 in. Type D1 spindles for bench lathes in cases where the American Standard taper hole is used in spindles of bench lathes. Table 33 shows the Type L00 nose assembled with dog plate and face plate for 10 in. bench lathes.

6.3 *Tool Room Lathes.* The Type D1 spindle noses or the Type L spindle noses are recommended as alternate standards for tool room lathes. It is recommended that the size of the nose selected for each size of tool room lathe be as follows:

Tool Room Lathes	Noses
10 in.	4 in. Type D1 or Type L0
12 in. up to and incl. 16 in.	6 in. Type D1 or Type L1
Above 16 in. up to and incl. 20 in.	6 in. Type D1 or Type L2

6.4 In each case the size of the tool room lathe given above is the nominal catalog size. The actual swing over the bed and carriage extensions of each such catalog size lathe has been established by a recent agreement among the American engine lathe builders as being 2½ in. more than the catalog size specified.

6.5 *Engine Lathes.* The Type D1 and the Type L spindle noses are recommended as alternate standards for engine lathes. It is recommended that the size of the nose selected for each size of engine lathe be as follows:

Engine Lathes	Noses
12 in. up to and incl. 16 in.	6 in. Type D1 or Type L1
Above 16 in. up to and incl. 20 in.	8 in. Type D1 or Type L2
Above 20 in. up to and incl. 25 in.	8 in. Type D1 or Type L3
Above 25 in. up to and incl. 32 in.	11 in. Type D1 or Type L3

6.6 Tables 18 and 19 show sections through the Type D1 spindle noses for engine lathes and tool room lathes assembled with dog plates, face plates, centers, and sleeves. Table 15 gives the recommended dimensions of sleeves and centers for these spindles, and Tables 16 and 17 give suggested dimensions for the taper holes, counterbores for same, and through holes in these spindles.

6.7 Tables 31, 32, and 33 give the corresponding sections and dimensions for Type L spindle noses for engine lathes and tool room lathes.

6.8 *Turret Lathes.* The Type A1 spindle nose is recommended for use on turret lathes except that each manufacturer of turret lathes may use the Type D1 nose in preference to the Type A1 if he individually prefers. The size of nose to be selected for each size turret lathe should be determined by the size of the hole in the spindle as follows:

Spindle Bores	Noses
Up to 1¾ in.	5 in. or smaller
Over 1¾ in. up to 2-7/16 in.	6 in.
Over 2-7/16 in. up to 3-3/8 in.	8 in.
Over 3-3/8 in. up to 5-3/8 in.	11 in.
Over 5-3/8 in. up to 8-3/8 in.	15 in.
Over 8-3/8 in. up to 13 in.	20 in.
Over 13 in. up to 21½ in.	28 in.

6.9 *Single Spindle Automatic Lathes.* The Type A1 nose is recommended for single spindle automatic lathes, size of nose depending upon the size of the heavy-duty chuck the machine normally takes as follows:

	Noses
Machines taking 6 in. chucks or smaller	5 in. or smaller
Machines taking 8 in. chucks	6 in.
Machines taking 10 in. and 12 in. chucks	8 in.
Machines taking 15 in. and 18 in. chucks	11 in.

6.10 *Other Applications.* In addition to the above, these spindles may be used on other machine tools such as multiple spindle automatic lathes, internal grinding machines, thread grinders and hobbing machines.

6.11 If these spindles are used on multiple spindle automatic lathes, the Type A1 or Type A2 spindle nose is recommended. The size of the nose depends on the size of the hole in the spindle, or the size of heavy duty chuck the machine normally takes. The size of the nose recom-

mended for multiple spindle chucking machines is as follows:

	Noses
Machines taking 4½ in. chucks	4 in.
Machines taking 6 in. chucks	5 in.
Machines taking 8 in. chucks	6 in.
Machines taking 10 in. and 12 in. chucks	8 in.
Machines taking 15 in. and 18 in. chucks	11 in.

6.12 Larger sizes of lathes of any type may be provided with any of the larger spindle noses of Types A1, A2, B1, B2 or D1, depending upon the service for which the lathe is intended, or the size of the hole required in the spindle, or the size of chucks the lathes should take. USA Standard Chucks and Chuck Jaws (USAS B5.8–1954, Reaffirmed 1959), gives dimensions of medium-duty and heavy-duty chucks from 6 in. to 36 in. in diameter and specifies the size of spindle nose for which each chuck is intended. Dimension C_1, Table 2, gives the maximum size hole for any size of Type A1 or B1 nose 5 in. to 28 in. inclusive, and dimension C_2, Table 2, gives the maximum size hole in any Type A2 or B2 nose.

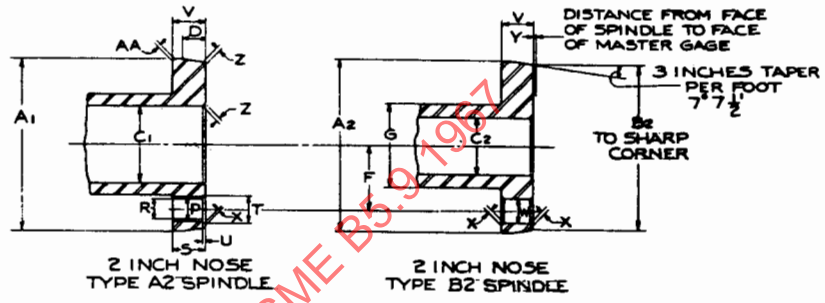
6.13 ***Directions for the Balancing of Spindles and Chucks.*** Directions for balancing chucks for each of the types of spindles are given in B5.8–1954, Reaffirmed 1959. To run in balance with such chucks at high speeds, a spindle of Type A or Type B should be balanced with a full-size driving button in place, but without any chuck or face plate mounted on the spindle. A method of drilling balancing holes in Type A spindles is shown on Table 5. The Type D spindle should be balanced also without any chuck or face plate mounted thereon. The Type L spindle should be balanced with a partial key that fills the keyseat and has an outside contour that coincides with the taper.

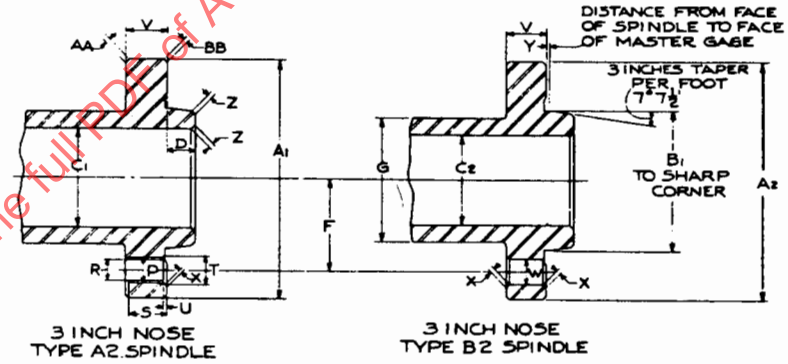
ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

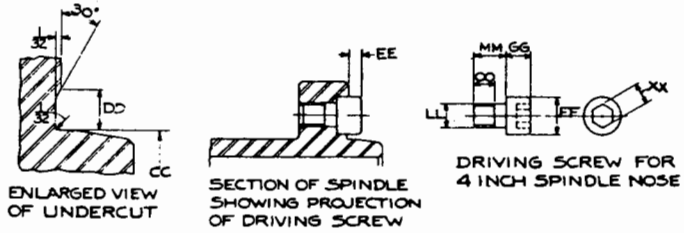
SEE TABLE 3 FOR LOCATION AND NUMBER OF HOLES AND DRIVING SCREW

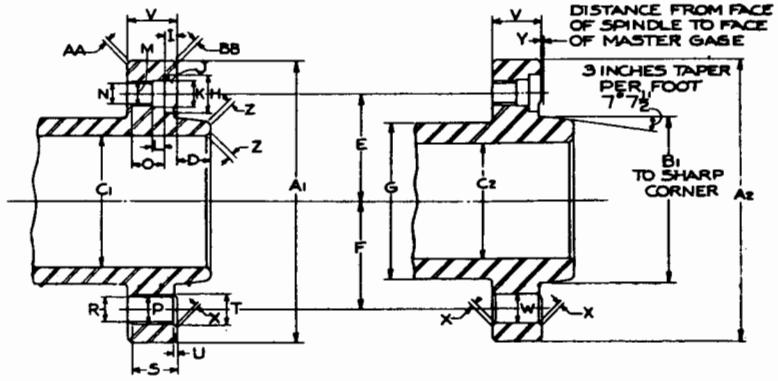
SPINDLE NAME		2 INCH NOSE	3 INCH NOSE	4 INCH NOSE
Dia of Type A Spindles	A_1	2-5/8	3-5/8	4-1/4
Dia of Type B Spindles	A_2	2-5/8	3-5/8	4-1/4
Pilot Dia	B_1		+.00025 2.1250	+.0005 2.5005
Dia at Face of Pilot	B_2	+.00025 2.5312		
Max Hole in Type A2 Spindle	C_1	1-3/16	1-5/8	2
Max Hole in Type B2 Spindle	C_2	7/8	1-3/8	1-3/4
Length of Pilot	D	3/8	7/16	7/16
Location of Drive Screw	E			Note 1 1.625
Radius of Bolt Circle	F	Note 2 .984	Note 2 1.391	Note 2 1.625
Max OD Type B2 Spindle	G	1-3/16	1-7/8	2-3/8
Hole for Driving Screw Head	H			+.002 .5625
Depth of Counterbore	I			3/16
Maximum Radius	J			1/64
Counterbore	K			25/64
Depth of Counterbore	L			3/16
Thread UNC-3B	M			3/8–16
Tap Drill	N			5/16
Full Depth Thread	O			9/16
Thread UNC-3B	P	3/8–16	7/16–14	7/16–14
Tap Drill	R	5/16	3/8	3/8
Full Depth Thread	S	1/2	5/8	3/4
Counterbore	T	25/64	29/64	29/64
Depth of Counterbore	U	1/16	1/16	1/16
Minimum Width of Flange	V	1/2	5/8	3/4
Bolt Hole Type B Spindle	W	13/32	15/32	15/32
Chamfer	X	1/32	1/32	1/32
Gage Clearance	Y	+.001 .000	+.001 .000	+.002 .000
Chamfer	Z	1/32	1/16	1/16
Chamfer	AA	1/32	1/16	1/16
Chamfer	BB		1/16	1/16
Dia of Undercut	CC		−.002 2.109	−.002 2.485
Width of Undercut	DD		3/16	1/4
Projection of Drive Screw	EE			3/16
Dia of Drive Screw Head	FF			−.001 .5625
Length of Drive Screw Head	GG			3/8
Thread UNC-3A	LL			3/8–16
Length Under Head	MM			1/2
Full Length Thread	OO			5/16
Size of Hex Socket	XX			5/16

NOTES: 1 — Hole spaced as shown on Table 3, and located within .003R of true position.
2 — Holes spaced as shown on Table 3, and located within .006R of true position.









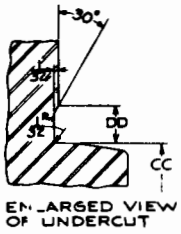
TYPE A AND TYPE B SPINDLE NOSES
SIZES 2, 3 AND 4 INCH

SPINDLE NAME		5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE	28 INCH NOSE
Dia of Type A Spindles	A_1	5-1/4	6-1/2	8-1/4	11	15	20-1/2	28-1/2
Dia of Type B Spindles	A_2	5-1/4	6-1/2	8-1/4	11	15	20-1/2	28-1/2
Pilot Dia	B	+.0005 3.2505	+.0005 4.1880	+.0005 5.50075	+.0005 7.75075	+.001 11.251	+.001 16.251	+.001 23.001
Max Hole in Type A1 Spin.	C_1	1-3/4	2-7/16	3-3/8	5-3/8	8-3/8	13	19
Max Hole in Type A2 Spin.	C_2	2-5/8	3-7/16	4-5/8	6-3/4	10-1/8	15	21-1/2
Length of Pilot for Type A1 and B1 Spindles	D_1	-.001 .5625	-.001 .625	-.001 .6875	-.001 .750	-.001 .8125	-.001 .875	-.001 1.000
Location of Drive Button	E	Note 1 2.0625	Note 1 2.625	Note 1 3.375	Note 2 4.625	Note 2 6.500	Note 2 9.125	Note 2 12.750
Radius Outer Bolt Circle	F	Note 2 2.0625	Note 2 2.625	Note 2 3.375	Note 3 4.625	Note 3 6.500	Note 3 9.125	Note 3 12.750
Radius Inner Bolt Circle	G	Note 2 1.2187	Note 2 1.625	Note 2 2.1875	Note 3 3.250	Note 3 4.875	Note 3 7.250	Note 3 10.4375
Hole for Drive Button	H	+.002 .625	+.002 .750	+.002 .9375	+.002 1.125	+.002 1.375	+.002 1.625	+.002 2.000
Depth of Counterbore	I	1/4	5/16	3/8	7/16	1/2	5/8	13/16
Maximum Radius	J	1/64	1/64	1/64	1/64	1/64	1/64	1/64
Counterbore	K	21/64	21/64	25/64	25/64	33/64	33/64	33/64
Depth of Counterbore	L	1/16	1/16	1/16	1/16	1/16	1/16	1/16
Thread UNC-3B	M	5/16–18	5/16–18	3/8–16	3/8–16	1/2–13	1/2–13	1/2–13
Tap Drill	N	17/64	17/64	5/16	5/16	27/64	27/64	27/64
Full Depth Thread	O	1/2	9/16	5/8	5/8	7/8	7/8	7/8
Thread UNC-3B	P	7/16–14	1/2–13	5/8–11	3/4–10	7/8–9	1–8	1 1/4–7
Tap Drill	R	3/8	27/64	17/32	21/32	49/64	7/8	1-7/64
Full Depth Thread	S	3/4	7/8	1-1/16	1-1/4	1-7/16	1-5/8	2
Counterbore	T	29/64	33/64	41/64	49/64	57/64	1-1/64	1-17/64
Depth of Counterbore	U	1/16	1/16	1/16	1/16	1/16	1/16	1/16
Min Width of Flange	V	7/8	1	1-1/8	1-3/8	1-5/8	1-7/8	2-1/4
Bolt Hole Type B Spindles	W	15/32	17/32	21/32	51/64	59/64	1-3/64	1-19/64
Chamfer	X	1/32	1/32	1/32	1/32	1/32	1/32	1/32
Gage Clearance	Y	+.002 .0008	+.002 .0008	+.002 .0008	+.002 .0008	+.004 .002	+.004 .002	+.004 .004
Chamfer	Z	1/16	1/16	1/16	1/16	1/8	1/8	1/8
Chamfer	AA	1/16	1/16	1/16	1/16	1/8	1/8	1/8
Chamfer	BB	1/16	1/16	1/16	1/16	1/8	1/8	1/8
Diameter of Undercut	CC	-.002 3.235	-.002 4.172	-.004 5.485	-.004 7.720	-.004 11.220	-.004 16.220	-.008 22.970
Width of Undercut	DD	1/4	5/16	5/16	5/16	5/16	3/8	3/8
Projection of Button	EE	3/16	3/16	1/4	5/16	5/16	5/16	5/16
Dia of Driving Button	FF	-.001 .625	-.001 .750	-.001 .9375	-.001 1.125	-.001 1.375	-.001 1.625	-.001 2.000
Length of Driving Button	GG	7/16	1/2	5/8	3/4	13/16	15/16	1-1/8
Counterbore	HH	29/64	29/64	37/64	37/64	49/64	49/64	49/64
Depth of Counterbore	II	13/64	13/64	1/4	1/4	21/64	21/64	21/64
Dia of Hole	JJ	21/64	21/64	25/64	25/64	33/64	33/64	33/64
Chamfer	KK	1/32	1/32	1/32	1/32	1/32	1/32	1/32
Thread UNC-3A	LL	5/16–18	5/16–18	3/8–16	3/8–16	1/2–13	1/2–13	1/2–13
Length Under Head	MM	5/8	3/4	7/8	1	1-1/4	1-1/4	1-1/2
	NN	13/64	13/64	1/4	1/4	21/64	21/64	21/64
Full Length Thread	OO	1/2	5/8	3/4	3/4	1	1	1-1/4
Dia of Head	PP	7/16	7/16	9/16	9/16	3/4	3/4	3/4
	RR	3/64	3/64	1/16	1/16	5/64	5/64	5/64
Slot	SS	.065 To .079	.065 To .079	.074 To .088	.074 To .088	.094 To .110	.094 To .110	.094 To .110
Depth of Slot	TT	3/32	3/32	1/8	1/8	5/32	5/32	5/32
Length of Pilot for Type A2 and B2 Spindles	D_2	1/2	9/16	5/8	11/16	3/4	13/16	15/16

NOTES: 1–Hole spaced as shown on Table 3, and located within .003R of true position.
2–Holes spaced as shown on Table 3, and located within .006R of true position.
3–Holes spaced as shown on Table 3, and located within .008R of true position.

TABLE 2

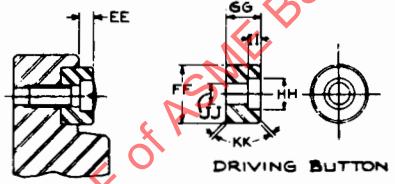
TYPE A AND TYPE B SPINDLE NOSES
SIZES 5 INCH TO 28 INCH INCLUSIVE



ENLARGED VIEW OF UNDERCUT

ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

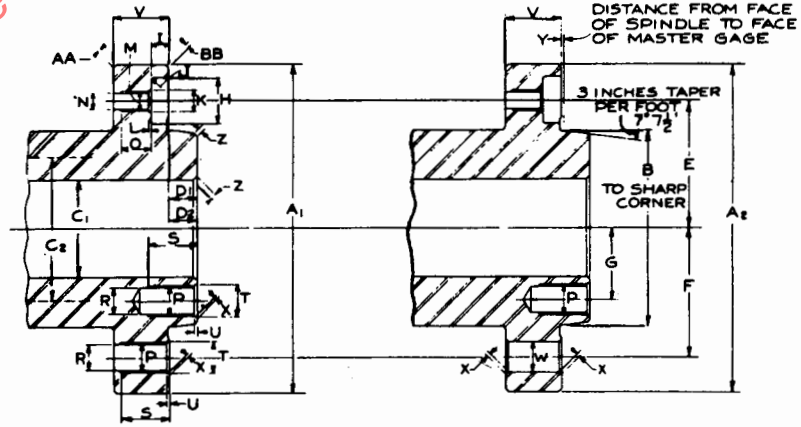
SEE TABLE 3 FOR LOCATION AND NUMBER OF HOLES AND DRIVING BUTTONS



SECTION OF SPINDLE SHOWING PROJECTION OF DRIVING BUTTON

DRIVING BUTTON

BUTTON SCREW



TYPE A SPINDLES

TYPE B SPINDLES

TYPE A1 IS EXACTLY AS SHOWN WITH TAPPED HOLES IN BOTH INNER AND OUTER BOLT CIRCLES

TYPE A2 IS SAME AS SHOWN EXCEPT OMIT HOLES IN INNER BOLT CIRCLE

TYPE B1 IS EXACTLY AS SHOWN WITH CLEARANCE HOLES IN OUTER BOLT CIRCLE AND TAPPED HOLES IN INNER BOLT CIRCLE

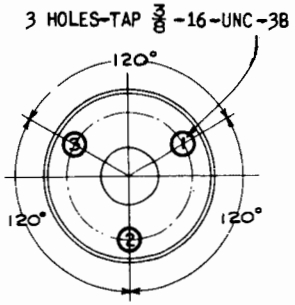
TYPE B2 IS SAME AS SHOWN EXCEPT OMIT TAPPED HOLES IN INNER BOLT CIRCLE

SPINDLES TYPE A1 HAVE ALL TAPPED HOLES IN BOTH INNER AND OUTER BOLT CIRCLES AS SHOWN

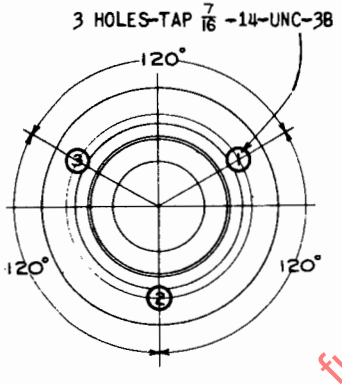
SPINDLES TYPE B1 ARE SAME AS SHOWN EXCEPT ALL HOLES IN OUTER BOLT CIRCLE ARE CLEARANCE HOLES OF DIMENSION W TABLES 1 AND 2

ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

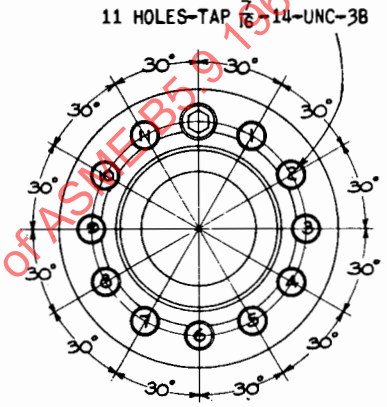
SEE TABLE 1 AND TABLE 2 FOR OTHER DIMENSIONS



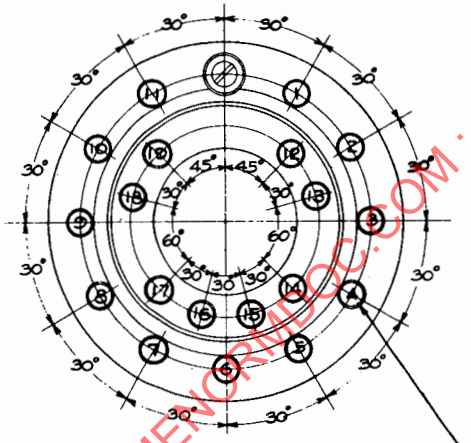
2 INCH NOSE



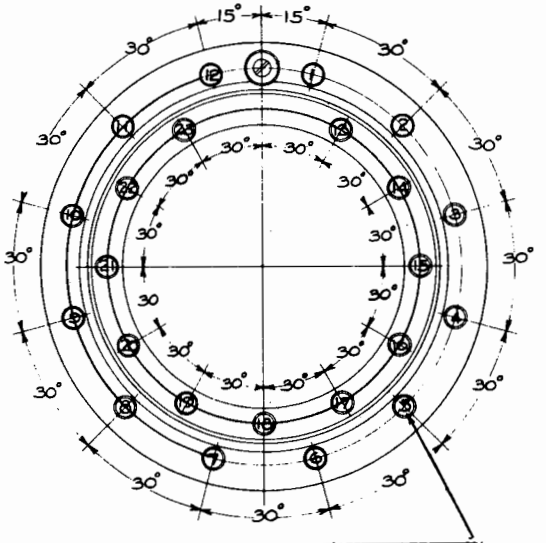
3 INCH NOSE



4 INCH NOSE



SPINDLE NAME	HOLES	TAP SIZE
5 INCH NOSE	19	7/16-14-UNC-3B
6 INCH NOSE	19	1/2-13-UNC-3B
8 INCH NOSE	19	5/8-11-UNC-3B
11 INCH NOSE	19	3/4-10-UNC-3B



SPINDLE NAME	HOLES	TAP SIZE
15 INCH NOSE	23	7/8-9-UNC-3B
20 INCH NOSE	23	1-8-UNC-3B
28 INCH NOSE	23	1 1/4-7-UNC-3B

LOCATION OF HOLES AND DRIVING BUTTONS IN TYPE A AND TYPE B SPINDLE NOSES

TABLE 2

ALL DIMENSIONS IN INCHES
TOLERANCES OF ± 1/64 ARE PERMISSIBLE UNLESS OTHERWISE
SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

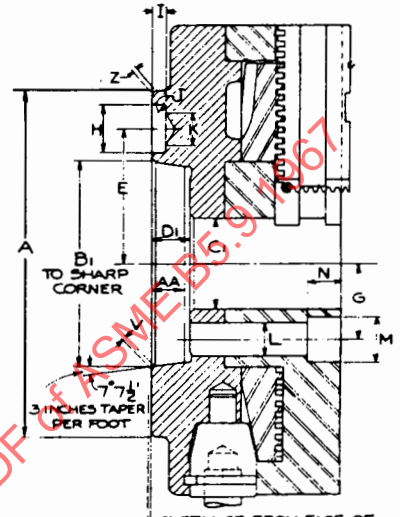
SPINDLE NAME		2 INCH NOSE	3 INCH NOSE	4 INCH NOSE	5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE	28 INCH NOSE
Minimum Dia of Flange	A	3 1/8	3 5/8	4 1/4	5 1/4	6 1/2	8 1/4	11	15	20 1/2	28 1/2
Pilot Dia	B1		−.0005 2.1250	−.0005 2.5005	−.0005 3.2503	−.0005 4.1878	−.0005 5.50055	−.0005 7.75055	−.001 11.2505	−.001 16.2505	−.001 23.000
Pilot Dia	B2	−.00025 2.5312									
Maximum Hole	C1	1 3/16			1 1/2	2 3/8	3 1/8	5 1/8	8 1/8	12 1/2	18 1/2
Maximum Hole	C2		2-1/64	2-25/64	3 1/8	4-3/64	5-11/32	7-37/64	11 5/16	16-3/64	22-49/64
Depth of Pilot Hole for Type A1 and B1 Spindles	D1	3/8			+.001 .5625	+.001 .625	+.001 .6875	+.001 .750	+.001 .8125	+.001 .875	+.001 1.000
Minimum Depth of Pilot Hole for Type A2 and B2 Spindles	D2		1/2	1/2	9/16	5/8	11/16	3/4	13/16	7/8	1
Location of Driving Button	E			Note 1 1.625	Note 1 2.0625	Note 1 2.625	Note 1 3.375	Note 2 4.625	Note 2 6.500	Note 2 9.125	Note 2 12.750
Radius Outer Bolt Circle	F		Note 2 1.391	Note 2 1.625	Note 2 2.0625	Note 2 2.625	Note 2 3.375	Note 3 4.625	Note 3 6.500	Note 3 9.125	Note 3 12.750
Radius Inner Bolt Circle	G	Note 2 .984			Note 2 1.21875	Note 2 1.625	Note 2 2.1875	Note 3 3.250	Note 3 4.875	Note 3 7.250	Note 3 10.4375
Hole for Driving Button	H			+.004 .578	+.004 .641	+.004 .766	+.004 .953	+.004 1.156	+.004 1.406	+.004 1.656	+.004 2.031
Depth of Driving Button Hole	I			1/4	1/4	1/4	5/16	3/8	3/8	3/8	3/8
Radius	J			1/64	1/64	1/64	1/64	1/64	1/64	1/64	1/64
Minimum	K				7/16	7/16	9/16	9/16	3/4	3/4	3/4
Clearance Holes for Bolts	L	13/32	15/32	15/32	15/32	17/32	21/32	25/32	29/32	1-1/32	1-5/16
Counterbore for Bolt Heads	M	19/32	11/16	11/16	11/16	25/32	1	1-3/16	1-3/8	1-9/16	2
Depth of Counterbore	N	7/16	1/2	1/2	1/2	9/16	11/16	13/16	15/16	1-1/16	1-5/16
Thread UNC-3B	O	3/8−16	7/16−14	7/16−14	7/16−14	1/2−13	5/8−11	3/4−10	7/8−9	1−8	1 1/4−7
Tap Drill	P	5/16	3/8	3/8	3/8	27/64	17/32	21/32	49/64	7/8	1-7/64
Full Depth of Thread	R	5/8	3/4	3/4	3/4	7/8	1-1/16	1-1/4	1-7/16	1-5/8	2
Counterbore	S	25/64	29/64	29/64	29/64	33/64	41/64	49/64	57/64	1-1/64	1-17/64
Depth of Counterbore	T	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16
Chamfer	U	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
Chamfer	V	1/32	1/32	1/32	1/16	1/16	1/16	1/16	1/8	1/8	1/8
Dia of Undercut	W	+.004 2.562	+.004 2.031	+.004 2.406	+.004 3.141	+.004 4.062	+.006 5.359	+.006 7.594	+.006 11.078	+.006 16.062	+.010 22.781
Width of Undercut	X	1/8			1/4	5/16	5/16	5/16	5/16	3/8	3/8
Gage Clearance	Y	+.001 .000	+.002 .000	+.002 .000	+.002 .000	+.002 .000	+.002 .000	+.002 .000	+.004 .000	+.004 .000	+.004 .000
Chamfer	Z	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/8	1/8	1/8
Length of Pilot	AA	1/4	3/8	3/8	7/16	1/2	9/16	5/8	11/16	3/4	7/8

Note: The holes for cap screws used to hold chucks or face plates on spindles must match hole spacing in spindle noses shown on Table 3.

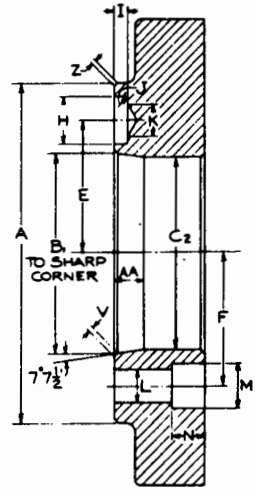
Notes: 1 — Hole spaced as shown on Table 3, and located within .003R of true position.
2 — Holes spaced as shown on Table 3, and located within .006R of true position.
3 — Holes spaced as shown on Table 3, and located within .008R of true position.

TABLE 4

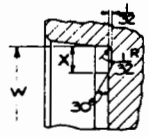
BACKS OF CHUCKS AND FACE PLATES FOR TYPE A AND TYPE B SPINDLE NOSES



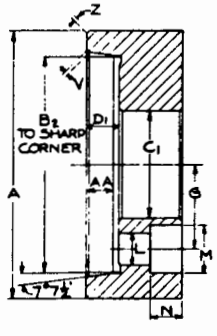
SCROLL CHUCKS HELD BY SOCKET HEAD CAP SCREWS ON INNER BOLT CIRCLE



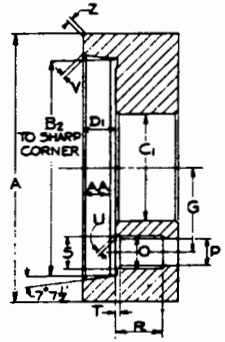
CHUCKS OR FACE PLATES HELD BY SOCKET HEAD CAP SCREWS ON OUTER BOLT CIRCLE



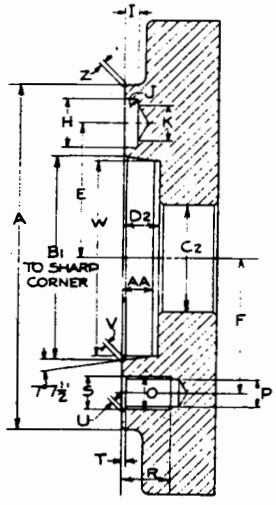
ENLARGED VIEW OF UNDERCUT FOR CHUCKS AND FACE PLATES HELD ON INNER BOLT CIRCLE



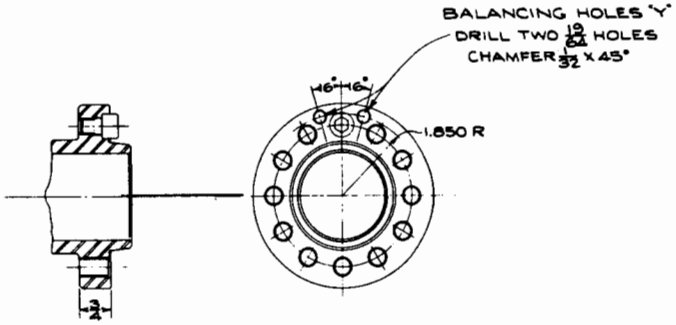
CHUCKS OR FACE PLATES FOR 2 INCH SPINDLE NOSE ONLY HELD BY SOCKET HEAD CAP SCREWS



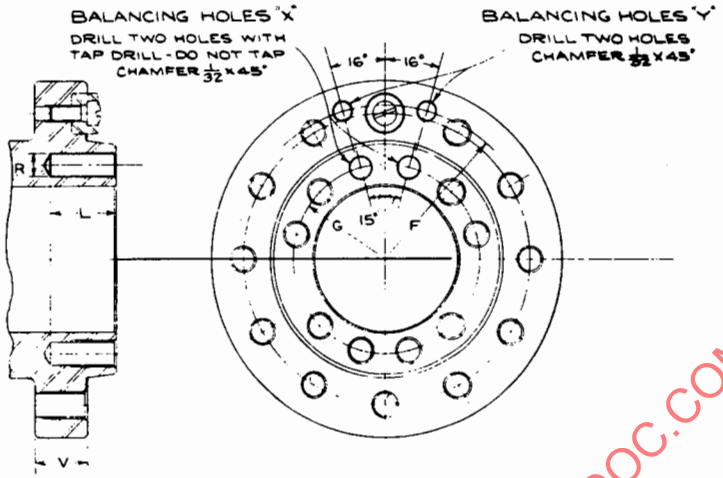
CHUCKS OR FACE PLATES FOR 2 INCH SPINDLE NOSE ONLY HELD BY TYPE B STUDS



CHUCKS OR FACE PLATES HELD BY TYPE B STUDS TO TYPE B SPINDLES



4 INCH TYPE A2 SPINDLE NOSE



5, 6, 8, & 11 INCH TYPE A1 SPINDLE NOSES

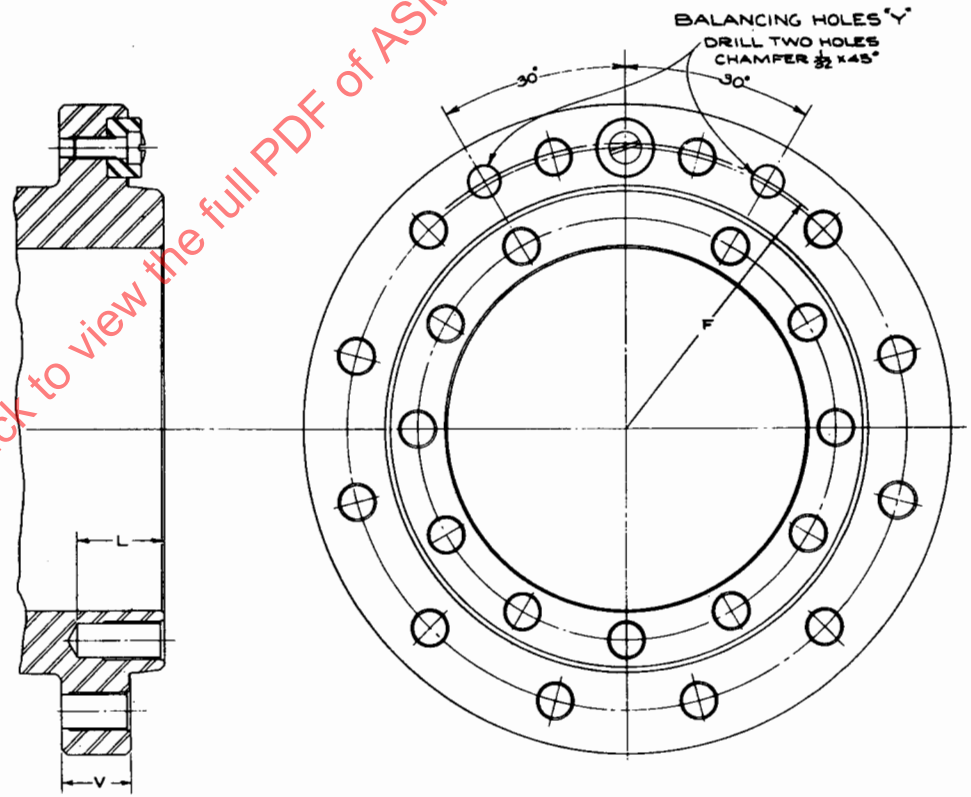
SPINDLE NAME	BALANCING HOLES "X"			BALANCING HOLES "Y"			WIDTH OF FLANGE
	DIA R	DEPTH L	RADIUS G	DIA B	DEPTH	RADIUS F	V
5 Inch Nose	3/8	1-5/32	1-7/32	"L" Drill .290	Thru	2.280	7/8
6 Inch Nose	27/64	1-5/16	1-5/8	"S" Drill .348	Thru	2.820	1
8 Inch Nose	17/32	1-9/16	2-3/16	29/64	Thru	3.570	1-1/8
11 Inch Nose	21/32	1-13/16	3-1/4	35/64	Thru	4.660	1-3/8

ILLUSTRATION OF A METHOD FOR BALANCING TYPE A SPINDLE NOSES

TABLE 5

ALL DIMENSIONS IN INCHES

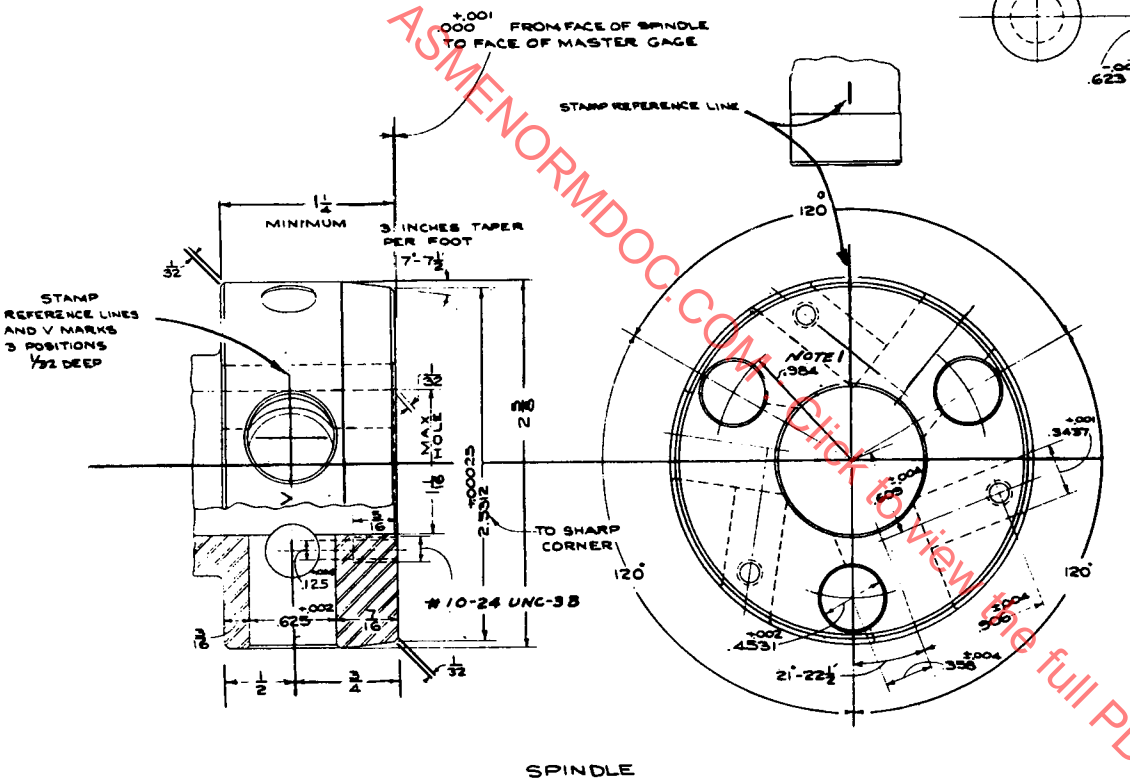
BALANCING HOLES SHOWN IN THIS TABLE ARE CORRECT ONLY FOR WIDTH OF FLANGE AND DEPTH OF TAP DRILL SHOWN.
CALCULATIONS FOR THESE HOLES WERE MADE WITH DRIVING BUTTON IN PLACE.
CHUCKS AND FACE PLATES FOR A BALANCED UNIT SHOULD BE BALANCED SEPARATELY -LOCATION OF BOLTS MUST BE IN BALANCE



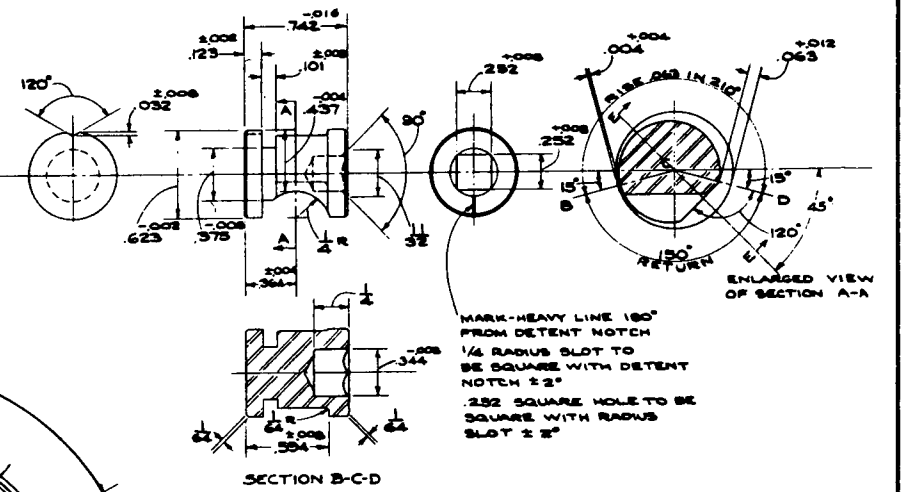
15, 20, & 28 INCH TYPE A1 SPINDLE NOSES

SPINDLE NAME	DEPTH OF TAP DRILL L	BALANCING HOLES "Y"			WIDTH OF FLANGE V
		DIA B	DEPTH	RADIUS F	
15 Inch Nose	2-1/16	47/64	Thru	6.550	1-5/8
20 Inch Nose	2-5/16	53/64	Thru	9.380	1-7/8
28 Inch Nose	2-3/4	1-1/32	Thru	12.780	2-1/4

ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED
WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

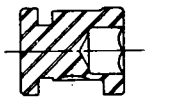


SPINDLE

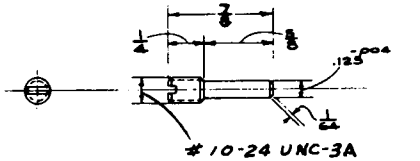


SECTION B-C-D

CAM

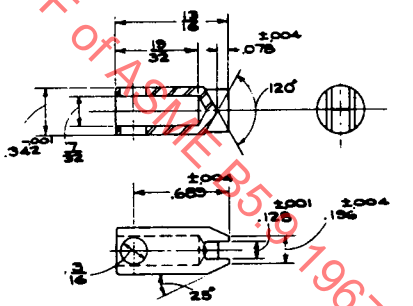


SECTION E-E

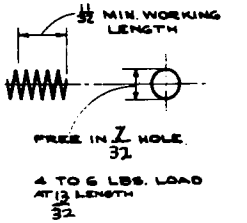


DETENT SCREW

NOTE: #1 - HOLES SPACED AS SHOWN AND LOCATED WITHIN .002R OF TRUE POSITION.



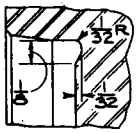
DETENT PLUNGER



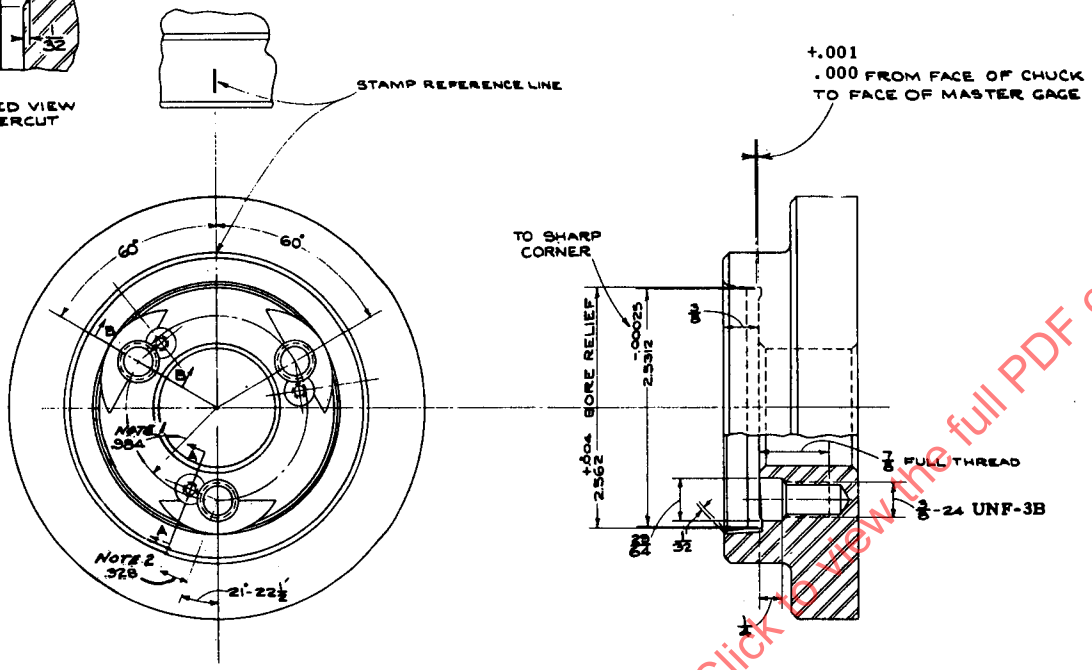
DETENT SPRING

TABLE 6 — 2 INCH TYPE D1 SPINDLE NOSE. CAM. DETENT SCREW. DETENT PLUNGER. AND SPRING

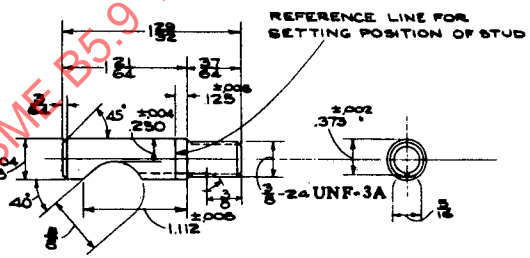
ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED
WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS



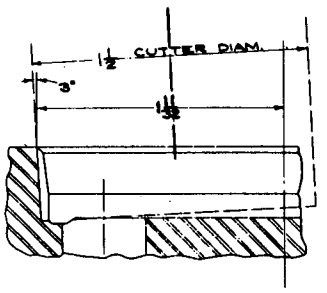
ENLARGED VIEW OF UNDERCUT



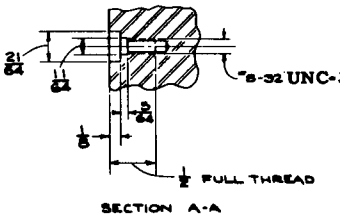
FACE PLATE



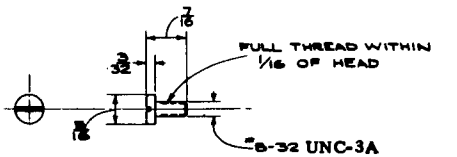
CAM LOCK STUD



ENLARGED VIEW OF SECTION B-B SHOWING UNDERCUT FOR CAM LOCK STUD



SECTION A-A



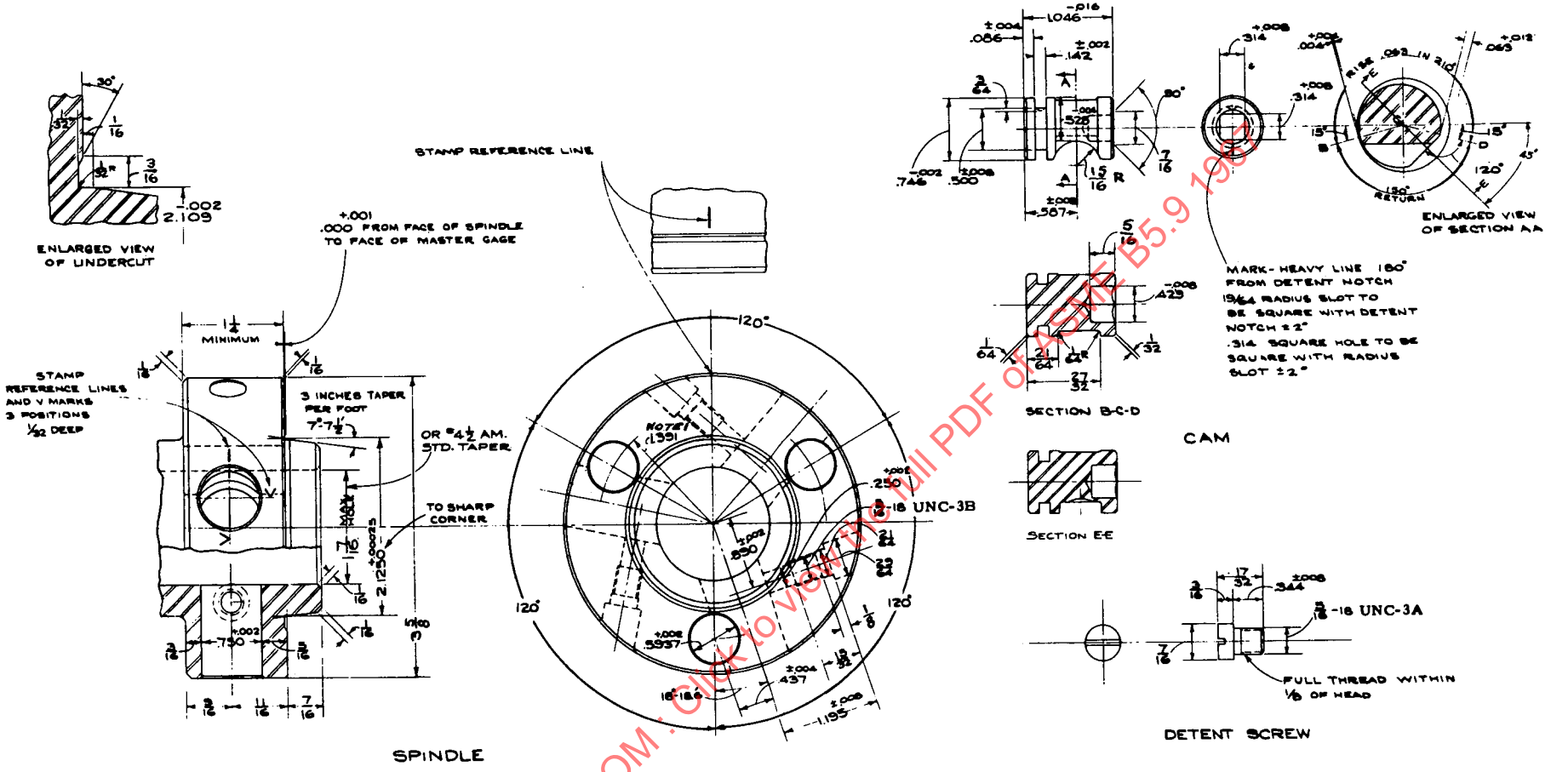
STUD LOCKING SCREW

NOTES: #1 - HOLES SPACED AS SHOWN AND LOCATED WITHIN .002R OF TRUE POSITION.

#2 - HOLES LOCATED AS SHOWN WITHIN .004R OF TRUE POSITION.

BACKS OF CHUCKS AND FACE PLATES. CAM LOCK STUD, AND

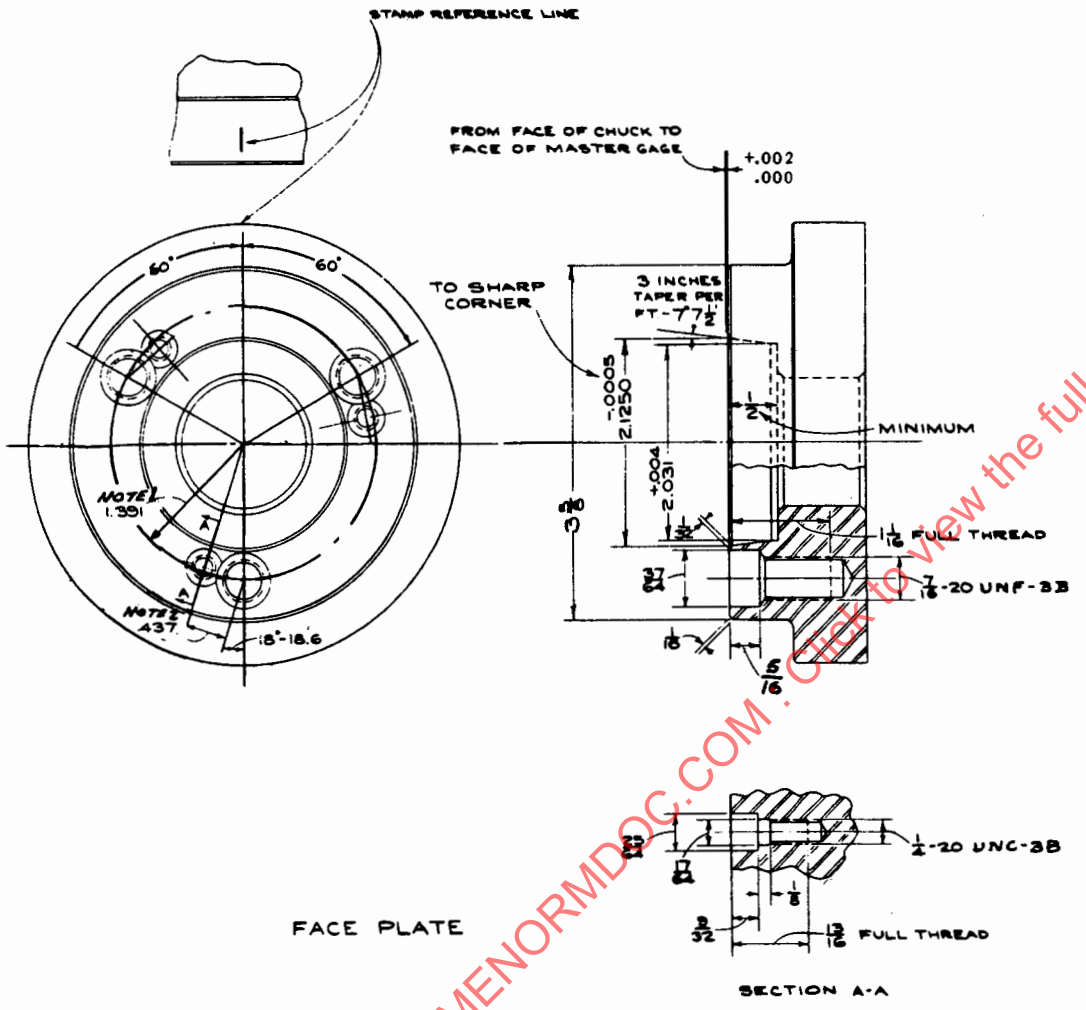
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED
WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS



NOTE: #1 - HOLES SPACED AS SHOWN AND LOCATED WITHIN .002R OF TRUE POSITION.

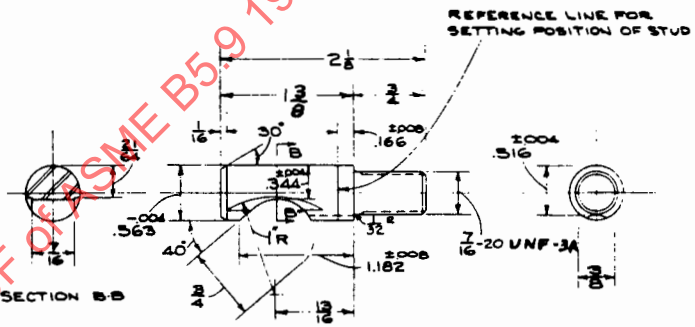
TABLE 8 — 3 INCH TYPE D1 SPINDLE NOSE. DETENT SCREW, DETENT PLUNGER, AND SPRING

ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED
WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

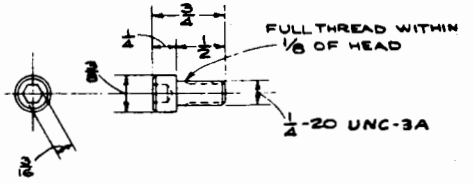


FACE PLATE

SECTION A-A



CAM LOCK STUD



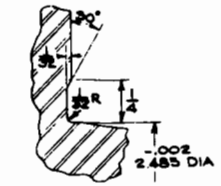
STUD LOCKING SCREW

NOTES: #1 - HOLES SPACED AS SHOWN AND LOCATED WITHIN .002R OF TRUE POSITION.

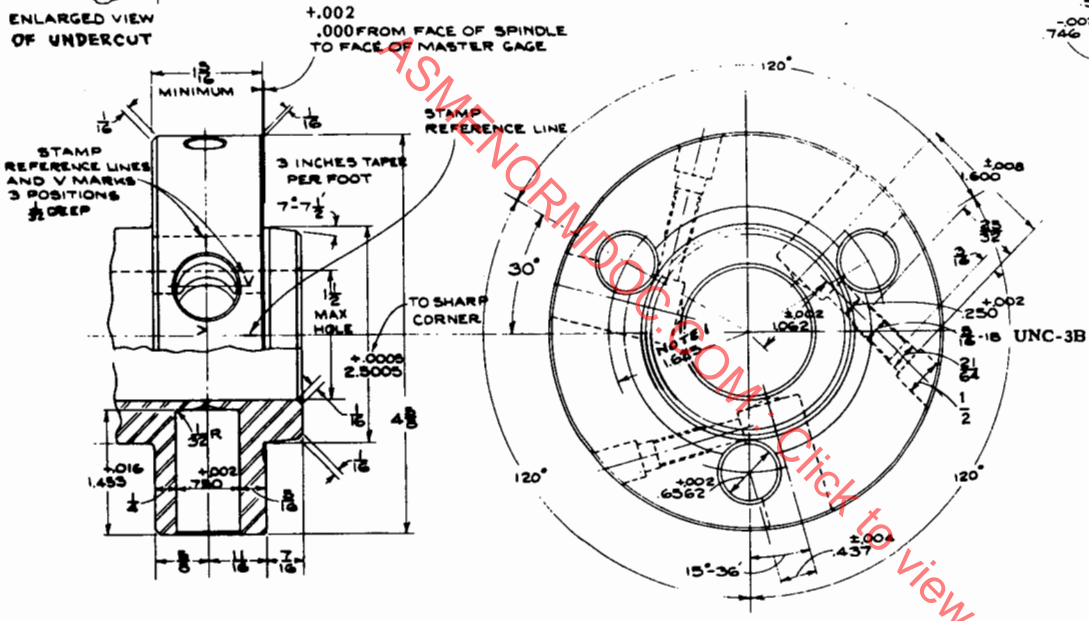
#2 - HOLES LOCATED AS SHOWN WITHIN .004R OF TRUE POSITION.

TABLE 9 BACKS OF CHUCKS AND FACE PLATES, CAM LOCK STUD, AND STUD LOCKING SCREW FOR 3 INCH TYPE D1 SPINDLE NOSE

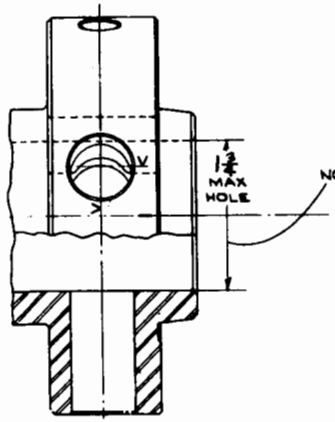
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS



ENLARGED VIEW OF UNDERCUT

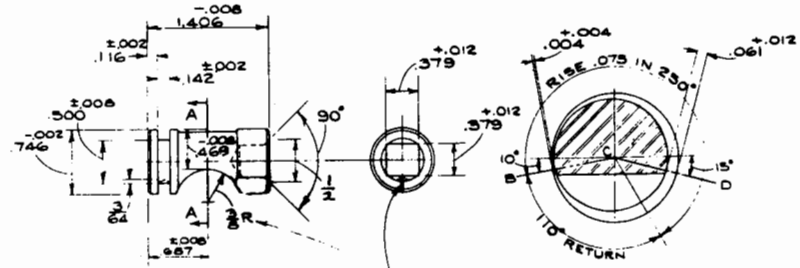


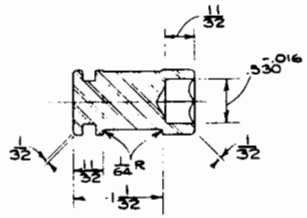
SPINDLE



NOTE – HOLE IN SPINDLE MAY BE INCREASED TO A MAXIMUM OF 1 3/4 IN THIS CASE THE CAM HOLE WILL BREAK INTO THE SPINDLE HOLE

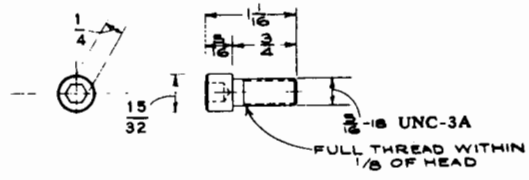
NOTE: #1 HOLES SPACED AS SHOWN AND LOCATED WITHIN .003R OF TRUE POSITION.



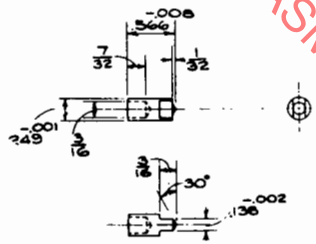


MARK - HEAVY LINE IN LINE WITH DETENT NOTCH
3/8 RADIUS SLOT TO BE SQUARE WITH DETENT NOTCH WITHIN ±2°
.379 SQUARE HOLE TO BE SQUARE WITH RADIUS SLOT WITHIN ±2°

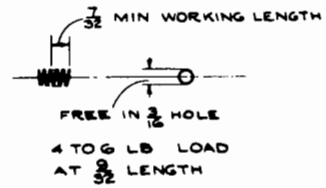
CAM



DETENT SCREW



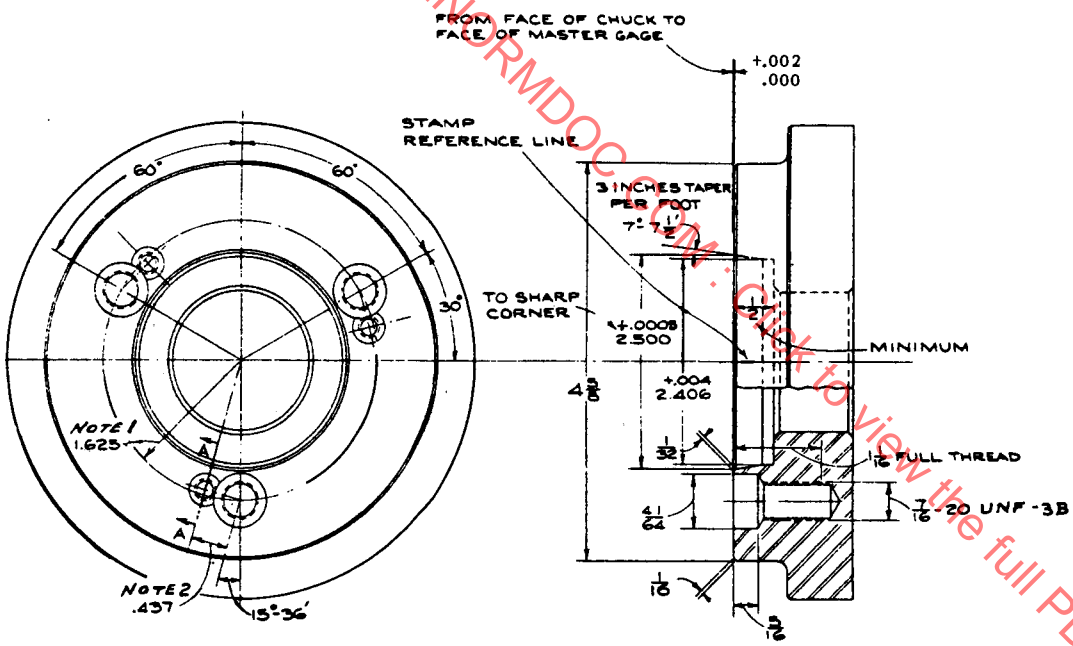
DETENT PLUNGER



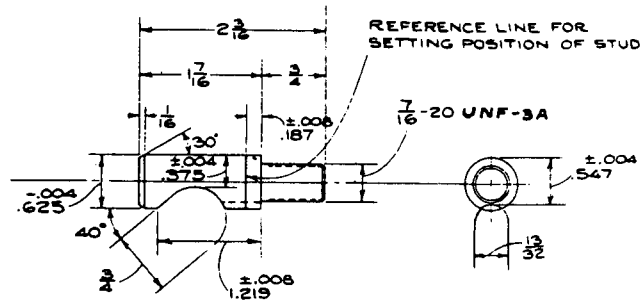
DETENT SPRING

TABLE 10 4 INCH TYPE D1 SPINDLE NOSE. CAM, DETENT SCREW, DETENT PLUNGER, AND SPRING

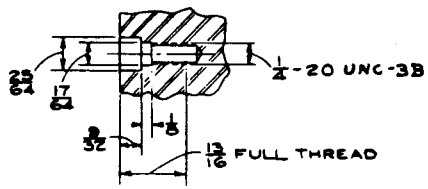
ALL DIMENSIONS IN INCHES
TOLERANCE OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE
SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS



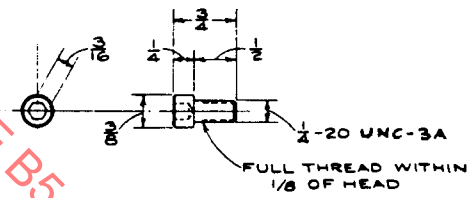
FACE PLATE



CAM LOCK STUD



SECTION A-A



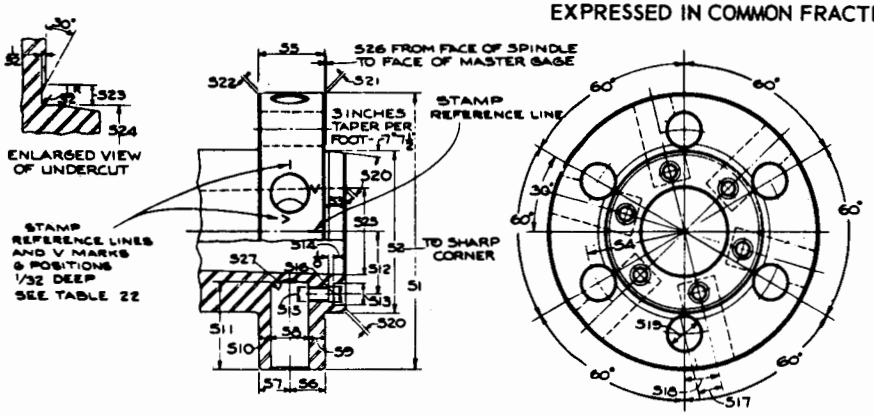
STUD LOCKING SCREW

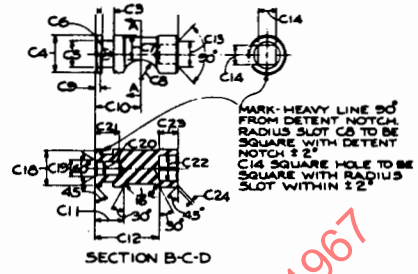
NOTES: #1 - HOLES SPACED AS SHOWN AND LOCATED WITHIN .003R OF TRUE POSITION.

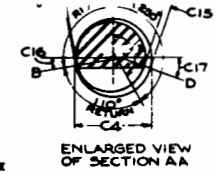
#2 - HOLES LOCATED AS SHOWN WITHIN .004R OF TRUE POSITION.

TABLE 11 BACKS OF CHUCKS AND FACE PLATES. CAM LOCK STUD, AND STUD LOCKING SCREW FOR 4 INCH TYPE D1 SPINDLE NOSE

OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS





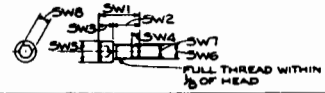


SPINDLE NAME		5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE
Dia of Spindle	S1	5-3/4	7-1/8	8-7/8	11-3/4	15-7/8	21-1/2
Pilot Dia	S2	3.2505 +.0005	4.1880 +.0005	5.50075 +.0005	7.75075 +.0005	11.251 +.001	16.251 +.001
Length of Pilot	S3	1/2	9/16	5/8	11/16	3/4	13/16
Radius of Holes Note 1	S4	2.0625	2.625	3.375	4.625	6.500	9.125
Minimum Width of Flange	S5	1-1/2	1-3/4	2	2-3/8	2-3/4	3-1/4
	S6	13/16	15/16	1-1/16	1-1/4	1-7/16	1-11/16
	S7	11/16	13/16	15/16	1-1/8	1-5/16	1-9/16
Dia of Hole for Cam	S8	.875 +.002	1.000 +.002	1.125 +.002	1.250 +.002	1.375 +.002	1.625 +.002
	S9	3/8	7/16	1/2	5/8	3/4	7/8
	S10	1/4	5/16	3/8	1/2	5/8	3/4
Depth of Hole for Cam	S11	1.875 +.016	2.250 +.016	2.531 +.016	2.9375 +.016	3.3125 +.016	3.6875 +.016
Radius of Cam Screw	S12	1.250 ±.004	1.625 ±.004	2.250 ±.004	3.375 ±.004	5.0625 ±.004	7.500 ±.004
Dia of Counterbore	S13	1/2	37/64	37/64	37/64	37/64	37/64
Depth of Counterbore	S14	11/32	13/32	13/32	13/32	13/32	13/32
Thread UNC-3B	S15	5/16–18	3/8–16	3/8–16	3/8–16	3/8–16	3/8–16
Counterbore	S16	21/64	25/64	25/64	25/64	25/64	25/64
	S17	.531 ±.004	.625 ±.004	.719 ±.004	.844 ±.004	.969 ±.004	1.125 ±.004
Angle	S18	14° 55'	13° 46'	12° 18'	10° 30'	8° 35'	7° 5'
Dia of Hole	S19	.78125 +.002	.90625 +.002	1.03125 +.002	1.21875 +.002	1.40625 +.002	1.65625 +.002
Chamfer	S20	1/16	1/16	1/16	1/16	1/8	1/8
Chamfer	S21	1/16	1/16	1/16	1/16	1/8	1/8
Chamfer	S22	1/16	1/16	1/16	1/16	1/8	1/8
Width of Undercut	S23	1/4	5/16	5/16	5/16	5/16	3/8
Dia of Undercut	S24	3.235 –.002	4.172 –.002	5.485 –.004	7.720 –.004	11.220 –.004	16.220 –.004
Maximum Hole	S25	1-3/4	2-1/4	3-3/8	5-3/8	8-3/8	13
Gage Clearance	S26	.0008 +.002	.0008 +.002	.0008 +.002	.0008 +.002	.002 +.004	.002 +.004
Radius	S27	1/32	1/32	1/32	1/16	1/16	1/16
NOTE: 1–Holes spaced as shown and located within .003R of true position.							

CAM

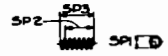
SPINDLE NAME		5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE
Length of Cam	C1	1.844–.008	2.219–.008	2.500–.008	2.875–.008	3.250–.008	3.625–.008
Width of Flange	C2	.125±.004	.156±.004	.1875±.004	.250±.004	.250±.004	.250±.004
Width of Groove	C3	.243±.004	.296±.004	.296±.004	.296±.004	.296±.004	.296±.004
Dia of Cam	C4	.871–.002	.996–.002	1.121–.002	1.246–.002	1.371–.002	1.621–.002
Dia Bottom of Groove	C5	9/16	11/16	13/16	15/16	1-1/16	1-5/16
Dia of Cutter	C6	.230±.002	.283±.002	.283±.002	.283±.002	.283±.002	.283±.002
Location of Slot	C7	.5625–.008	.6406–.008	.734–.008	.828–.008	.922–.008	1.078–.008
Radius of Slot	C8	7/16	1/2	9/16	21/32	3/4	7/8
To Bottom Detent Notch	C9	.094±.004	.125±.004	.156±.004	.219±.004	.219±.004	.219±.004
Location of Slot	C10	.953±.008	1.187±.008	1.344±.008	1.531±.008	1.719±.008	1.906±.008
At Section C-D	C11	9/16	23/32	13/16	29/32	1	1-1/16
At Section C-D	C12	1-3/8	1-11/16	1-7/8	2-5/32	2-7/16	2-3/4
Dia of Center	C13	19/32	11/16	25/32	7/8	31/32	1-1/8
Square Hole	C14	.441+.012	.504+.012	.566+.012	.629+.012	.691+.012	.816+.012
At Section C-D	C15	.061+.012	.087+.012	.087+.012	.089+.012	.089+.012	.107+.012
Angle	C16	10°	10°	10°	15°	15°	15°
Angle	C17	15°	20°	20°	20°	20°	20°
Chamfer	C18	13/16	29/32	1-1/32	1-1/8	1-1/4	1-1/2
Center	C19	3/8	7/16	7/16	7/16	7/16	7/16
Dia of Hole	C20	5/16	3/8	3/8	3/8	3/8	3/8
Depth of Hole	C21	9/16	5/8	5/8	5/8	5/8	5/8
Across Corners	C22	.615–.016	.700–.016	.785–.016	.875–.016	.960–.016	1.135–.016
Depth of Hole	C23	7/16	1/2	9/16	5/8	3/4	13/16
Chamfer	C24	1/16	1/16	1/16	3/32	3/32	3/32
Rise in 250°	C25	.075	.104	.104	.104	.104	.125

CAM SCREW



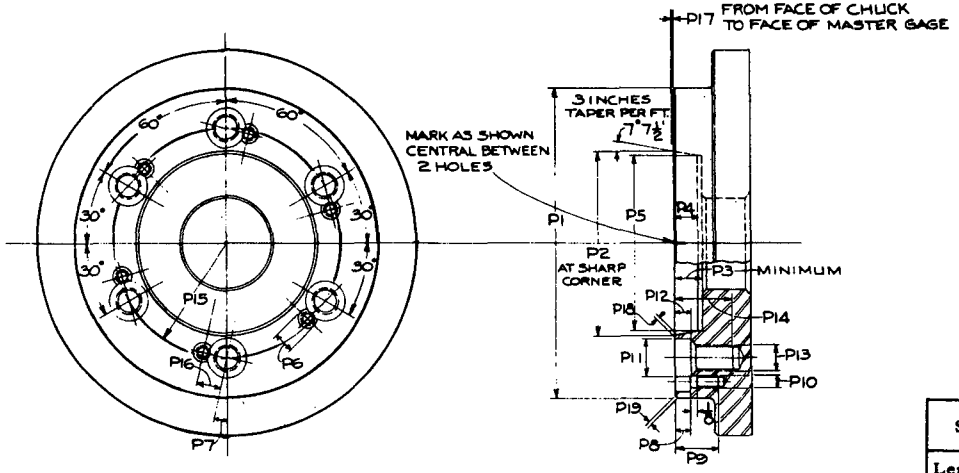
SPINDLE NAME		5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE
Length of Screw	SW1	31/32	1-3/32	1-7/32	1-13/32	1-19/32	1-25/32
Under Head	SW2	21/32	23/32	27/32	1- 1/32	1- 7/32	1-13/32
Head	SW3	5/16	3/8	3/8	3/8	3/8	3/8
Length of Pilot	SW4	7/32	7/32	7/32	7/32	7/32	7/32
Dia of Head	SW5	15/32	9/16	9/16	9/16	9/16	9/16
Thread UNC-3A	SW6	5/16–18	3/8–16	3/8–16	3/8–16	3/8–16	3/8–16
Dia of Pilot	SW7	.230–.002	.283–.002	.283–.002	.283–.002	.283–.002	.283–.002
Hex	SW8	1/4	5/16	5/16	5/16	5/16	5/16

CAM SPRING



SPINDLE NAME		5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE
Dia of Spring	SP1	9/32	11/32	11/32	11/32	11/32	11/32
Working Length	SP2	9/16	5/8	5/8	5/8	5/8	5/8
Free Length	SP3	13/16	7/8	7/8	7/8	7/8	7/8
Load Lb	SP4	8 to 12	12 to 16	12 to 16	12 to 16	12 to 16	12 to 16

TABLE 12 TYPE D1 SPINDLE NOSES, SIZES 5 INCH TO 20 INCH INCLUSIVE, CAMS, CAM SCREWS, AND CAM SPRINGS



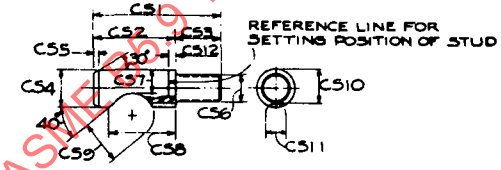
PROVIDE 6-P11 AND 6-P6 HOLES AS SHOWN IN BACKS OF CHUCKS AND FACE PLATES WHERE 6 CAMLOCK STUDS ARE REQUIRED. FEWER HOLES MAY BE PROVIDED TO SUIT LOCATION OF FEWER CAMLOCK STUDS WHEN THE DESIGN AND SERVICE OF CHUCKS AND FACE PLATES IS SATISFACTORY WITH A SMALLER NUMBER OF CAMLOCK STUDS

ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE, UNLESS OTHERWISE SPECIFIED, WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

FACE PLATE

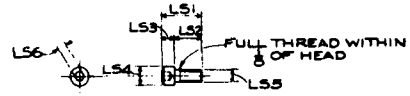
SPINDLE NAME		5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE
Dia of Flange	P1	5-3/4	7-1/8	8-7/8	11-3/4	15-7/8	21-1/2
Pilot Dia	P2	3.2503 −.0005	4.1878 −.0005	5.50055 −.0005	7.75055 −.0005	11.2505 −.001	16.2505 −.001
Depth Pilot Hole	P3	9/16	5/8	11/16	3/4	13/16	7/8
Length of Pilot	P4	7/16	1/2	9/16	5/8	11/16	3/4
Dia of Relief	P5	3.141 +.004	4.062 +.004	5.359 +.006	7.594 +.006	11.078 +.006	16.062 +.006
Counterbore	P6	25/64	1/2	1/2	1/2	1/2	1/2
Angle	P7	14°55'	13°46'	12°18'	10°30'	8°35'	7°5'
Depth Counterbore	P8	9/32	11/32	11/32	11/32	11/32	11/32
Full Depth Thread	P9	13/16	1	1	1-1/8	1-1/8	1-1/8
Thread UNC-3B	P10	1/4–20	5/16–18	5/16–18	5/16–18	5/16–18	5/16–18
Counterbore	P11	49/64	57/64	1-1/64	1-13/64	1-25/64	1-41/64
Depth Counterbore	P12	5/16	3/8	3/8	1/2	1/2	1/2
Thread UNF-3B	P13	1/2–20	5/8–18	3/4–16	7/8–14	1-14	1-1/8–12
Full Depth of Thread	P14	1-3/16	1-3/8	1-1/2	1-3/4	1-15/16	2-1/8
Rad. Bolt Cir. Note 1	P15	2.0625	2.625	3.375	4.625	6.500	9.125
Lock Screw Loc. Note 2	P16	.469	.562	.625	.719	.812	.937
Gage Clearance	P17	.000 +.002	.000 +.002	.000 +.002	.000 +.002	.000 +.004	.000 +.004
Chamfer	P18	1/16	1/16	1/16	1/16	1/8	1/8
Chamfer	P19	1/16	1/16	1/16	1/16	1/8	1/8

NOTES: 1 – Holes spaced as shown and located within .004R of true position.
2 – Holes Located as shown within .004R of true position as defined by P7.



CAM LOCK STUD

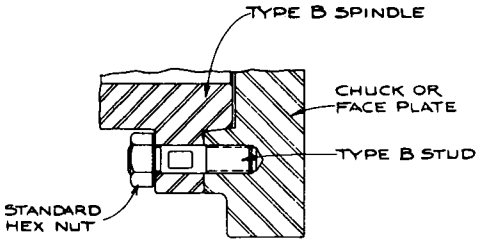
SPINDLE NAME		5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE
Length of Stud	CS1	2-9/16	3	3-3/8	4	4-9/16	5-1/4
Length of Body	CS2	1-11/16	1-15/16	2-3/16	2-5/8	3	3-1/2
Threaded End	CS3	7/8	1-1/16	1-3/16	1-3/8	1-9/16	1-3/4
Dia of Stud	CS4	.750 −.004	.875 −.004	1.000 −.004	1.1875 −.004	1.375 −.004	1.625 −.004
Chamfer	CS5	3/32	1/8	1/8	3/16	3/16	1/4
Thread UNF-3A	CS6	1/2–20	5/8–18	3/4–16	7/8–14	1–14	1⅛–12
To Bottom of Cut	CS7	.469 ±.004	.562 ±.004	.656 ±.004	.812 ±.004	.969 ±.004	1.125 ±.004
	CS8	1.406 ±.008	1.594 ±.008	1.750 ±.008	2.094 ±.008	2.312 ±.008	2.719 ±.008
Dia of Cutter	CS9	7/8	1	1-1/8	1-1/4	1-3/8	1-5/8
	CS10	.640 ±.004	.750 ±.004	.875 ±.004	1.062 ±.004	1.250 ±.004	1.500 ±.004
Dia of Cutter	CS11	13/32	1/2	1/2	1/2	1/2	1/2
To Reference Line	CS12	.1875 ±.008	.1875 ±.008	.1875 ±.008	.250 ±.008	.250 ±.008	.250 ±.008



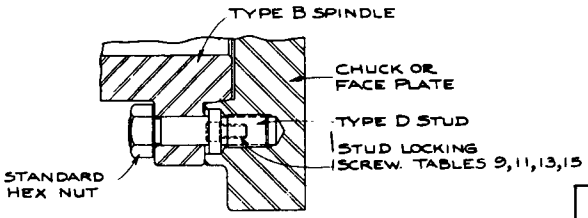
STUD LOCKING SCREW

SPINDLE NAME		5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE
Length of Screw	LS1	3/4	15/16	15/16	1-1/16	1-1/16	1-1/16
Under Head	LS2	1/2	5/8	5/8	3/4	3/4	3/4
Head	LS3	1/4	5/16	5/16	5/16	5/16	5/16
Dia of Head	LS4	3/8	15/32	15/32	15/32	15/32	15/32
Thread UNC-3A	LS5	1/4–20	5/16–18	5/16–18	5/16–18	5/16–18	5/16–18
Hex	LS6	3/16	1/4	1/4	1/4	1/4	1/4

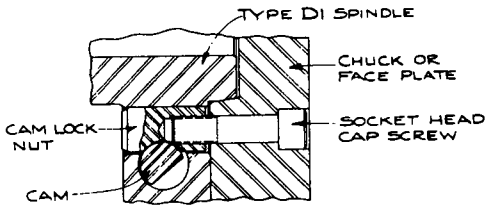
TABLE 13 BACKS OF CHUCKS AND FACE PLATES. CAM LOCK STUDS., AND STUD LOCKING SCREWS FOR TYPE D1 SPINDLE NOSES. SIZES 5 INCH TO 20 INCH, INCL.



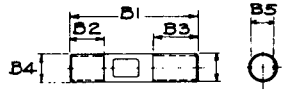
METHOD OF ATTACHING CHUCKS OR FACE PLATES TO TYPE B SPINDLES USING TYPE B STUDS



METHOD OF ATTACHING CHUCKS OR FACE PLATES TO TYPE B SPINDLES USING TYPE D STUDS



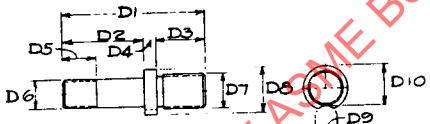
METHOD OF ATTACHING CHUCKS OR FACE PLATES TO TYPE D1 SPINDLES USING CAM LOCK NUTS



ALL DIMENSIONS IN INCHES
TOLERANCES OF ± 1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

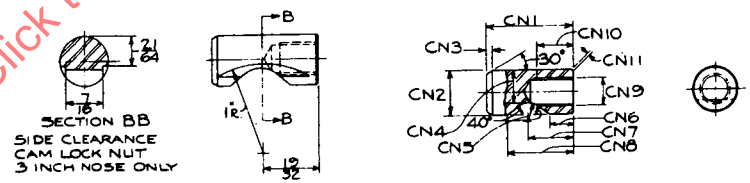
TYPE B STUD

SPINDLE NAME		2 INCH NOSE	3 INCH NOSE	4 INCH NOSE	5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE
Length of Stud	B1	1-1/2	1-13/16	1-15/16	2-1/16	2-3/8	2-13/16	3-5/16	3-13/16	4-1/2
Length of Thread	B2	1/2	9/16	9/16	9/16	5/8	3/4	7/8	15/16	1-1/16
Length of Thread	B3	9/16	11/16	11/16	11/16	13/16	1	1-3/16	1-5/16	1-5/8
Thread UNC-3A	B4	3/8–16	7/16–14	7/16–14	7/16–14	1/2–13	5/8–11	3/4–10	7/8–9	1–8
Across Flats	B5	1/4	5/16	5/16	5/16	3/8	1/2	5/8	3/4	7/8



TYPE D STUD

SPINDLE NAME		2 INCH NOSE	3 INCH NOSE	4 INCH NOSE	5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE
Length of Stud	D1	1-11/16	2-1/16	2-3/16	2-7/16	2-13/16	3-3/16	3-25/32	4-5/16	4-7/8
	D2	15/16	1-5/32	1-9/32	1-13/32	1-19/32	1-27/32	2-3/16	2-17/32	2-29/32
	D3	9/16	11/16	11/16	13/16	15/16	1-1/16	1-3/16	1-3/8	1-9/16
Width of Flange	D4	3/16	7/32	7/32	7/32	9/32	9/32	13/32	13/32	13/32
Length of Thread	D5	1/2	9/16	9/16	9/16	5/8	3/4	7/8	15/16	1-1/16
Thread UNC-3A	D6	3/8–16	7/16–14	7/16–14	7/16–14	1/2–13	5/8–11	3/4–10	7/8–9	1–8
Thread UNF-3A	D7	3/8–24	7/16–20	7/16–20	1/2–20	5/8–18	3/4–16	7/8–14	1–14	1 1/8–12
Dia of Flange	D8	.438–.004	.563–.004	.625–.004	.750–.004	.875–.004	1.000–.004	1.1875–.004	1.375–.004	1.625–.004
Cutter	D9	5/16	3/8	13/32	13/32	1/2	1/2	1/2	1/2	1/2
To Bottom of Cut	D10	.373±.002	.516±.004	.547±.004	.640±.004	.750±.004	.875±.004	1.062 ±.004	1.250 ±.004	1.500 ±.004



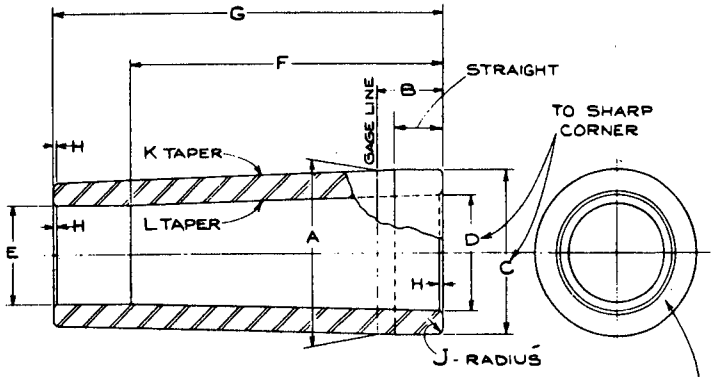
CAM LOCK NUT

SPINDLE NAME		2 INCH NOSE	3 INCH NOSE	4 INCH NOSE	5 INCH NOSE	6 INCH NOSE	8 INCH NOSE	11 INCH NOSE	15 INCH NOSE	20 INCH NOSE
Length of Nut	CN1	1-5/32	1-1/8	1-3/16	1-7/16	1-11/16	1-15/16	2-5/16	2-11/16	3-3/16
Dia of Nut	CN2	.438–.004	.563–.004	.625–.004	.750–.004	.875–.004	1.000–.004	1.1875–.004	1.375–.004	1.625–.004
Chamfer	CN3	3/64	1/16	1/16	3/32	1/8	1/8	3/16	3/16	1/4
To Bottom of Cut	CN4	.297±.004	.390±.004	.421±.004	.500±.004	.625±.004	.734±.004	.875±.004	1.031±.004	1.1875±.004
Radius	CN5	7/32	9/32	9/32	5/16	3/8	7/16	1/2	9/16	5/8
	CN6	15/32	11/32	5/16	3/8	7/16	17/32	21/32	25/32	7/8
To Center of Radius	CN7	23/32	21/32	21/32	25/32	7/8	1-1/64	1-7/32	1-25/64	1-5/8
	CN8	31/32	31/32	1	1-3/16	1-5/16	1-1/2	1-25/32	2	2-3/8
Thread	CN9	5/16–24 UNF-3B	3/8–16 UNC-3B	3/8–16 UNC-3B	7/16–14 UNC-3B	1/2–13 UNC-3B	5/8–11 UNC-3B	3/4–10 UNC-3B	7/8–9 UNC-3B	1–8 UNC-3B
Full Depth Thread	CN10	7/16	7/16	7/16	9/16	11/16	13/16	15/16	1-1/8	1-1/4
Chamfer	CN11	1/32	1/32	1/32	1/32	1/32	1/32	1/16	1/16	1/16

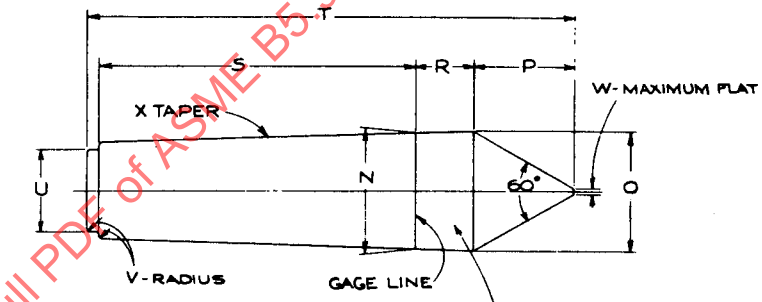
DIMENSIONS OF CAM LOCK NUTS, AND TYPE B AND TYPE D STUDS

TABLE 14 DIMENSIONS OF CAM LOCK NUTS, AND TYPE B AND TYPE D STUDS

ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE
SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS



STAMP SIZES OF AMERICAN STANDARD TAPERS
EXAMPLE: "5 TO 3 AM STD TAPER"



STAMP SIZE OF AMERICAN STANDARD TAPER
EXAMPLE: "3 AM STD TAPER"

SLEEVE

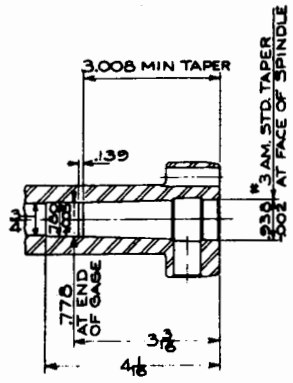
SPINDLE NAME	A	B	C	D	E	F	G	H	J	K	L
2 Inch Nose	.938	11/16	−.005 .953	−.002 .475	+.005 .375	2	3-7/8	1/32	1/32	#3 Am.Std. Taper	#1 Am.Std. Taper
3 Inch Nose	1.500	1/2	−.005 1.515	−.002 .700	+.005 .575	2 7/16	5	1/16	1/16	# 4½ Am.Std. Taper	#2 Am.Std. Taper
4 Inch Nose Small Sleeve	1.500	11/16	−.005 1.515	−.002 .938	+.005 .785	3	5-3/16	1/16	1/16	# 4½ Am.Std. Taper	#3 Am.Std. Taper
4 Inch Nose Large Sleeve	1.748	11/16	−.005 1.765	−.002 .938	+.005 .785	3	5-7/8	1/16	1/16	#5 Am.Std. Taper	#3 Am.Std. Taper
5 Inch Nose	1.748	7/8	−.005 1.765	−.002 .938	+.005 .785	3	6-1/16	1/16	1/16	#5 Am.Std. Taper	#3 Am.Std. Taper
6 Inch Nose Small Sleeve	1.748	1-1/16	−.005 1.765	−.002 1.231	+.005 1.035	3-3/4	6-1/4	1/16	1/16	#5 Am.Std. Taper	#4 Am.Std. Taper
6 Inch Nose Large Sleeve	2.000	1-1/16	−.005 2.020	−.002 1.231	+.005 1.035	3-3/4	5-13/16	1/16	1/16	#200 Am.Std. Taper	#4 Am.Std. Taper
8 Inch Nose	2.500	1-1/4	−.005 2.520	−.002 1.748	+.005 1.495	4-3/4	6-3/4	1/16	1/16	#250 Am.Std. Taper	#5 Am.Std. Taper
11 Inch Nose	3.500	1-7/16	−.005 3.520	−.002 2.494	+.005 2.140	6-3/4	8-7/16	1/16	1/16	#350 Am.Std. Taper	#6 Am.Std. Taper

CENTER

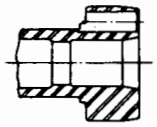
SPINDLE NAME	N	O	P	R	S	T	U	V	W	X
2 Inch Nose	.475	.493	27/64	23/64	2-1/16	2-29/32	5/16	1/64	1/64	#1 Am.Std. Taper
3 Inch Nose	.700	.728	5/8	9/16	2-1/2	3-13/16	7/16	1/32	1/64	#2 Am.Std. Taper
4 Inch Nose*	.938	.982	27/32	7/8	3-1/16	4-29/32	5/8	1/32	1/32	#3 Am.Std. Taper
5 Inch Nose*	.938	.982	27/32	7/8	3-1/16	4-29/32	5/8	1/32	1/32	#3 Am.Std. Taper
6 Inch Nose*	1.231	1.276	1-3/32	7/8	3-7/8	5-31/32	3/4	1/16	1/32	#4 Am.Std. Taper
8 Inch Nose*	1.748	1.814	1 17/32	1-1/4	4-7/8	7-29/32	1-1/8	1/16	1/16	#5 Am.Std. Taper
11 Inch Nose*	2.494	2.559	2-5/32	1-1/4	6-7/8	10-17/32	1-3/4	1/16	3/32	#6 Am.Std. Taper

These centers are the same as for Type L Spindle Noses see Table 31.

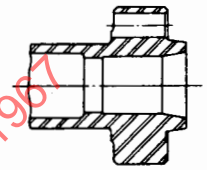
TABLE 15 SLEEVES AND CENTERS FOR TYPE D1 SPINDLE NOSES FOR ENGINE LATHES AND TOOL ROOM LATHES



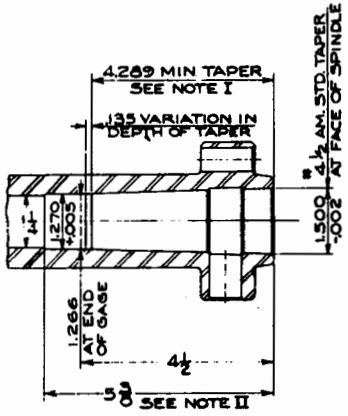
2 INCH SPINDLE NOSE
WITH
*3 AM. STANDARD TAPER



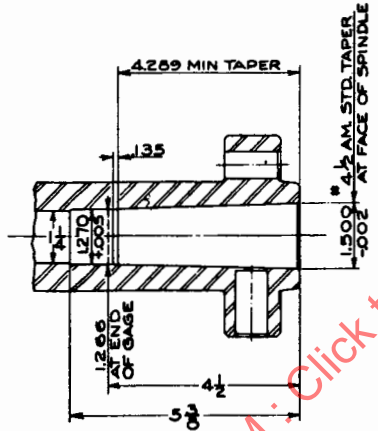
2 INCH SPINDLE NOSE
FOR
DRAW-IN COLLET



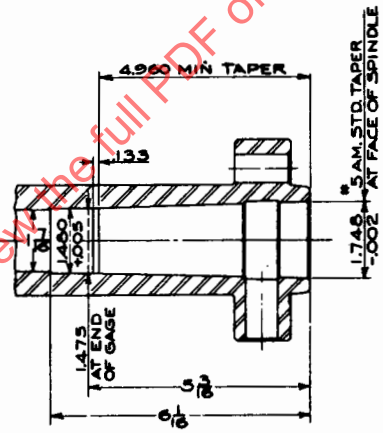
3 INCH SPINDLE NOSE
FOR
DRAW-IN COLLET



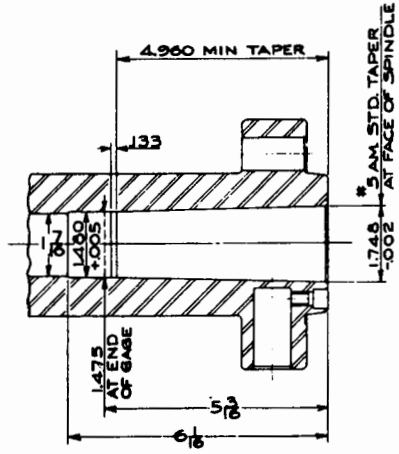
3 INCH SPINDLE NOSE
WITH
*4 1/2 AM. STANDARD TAPER



4 INCH SPINDLE NOSE
WITH
*4 1/2 AM. STANDARD TAPER



4 INCH SPINDLE NOSE
WITH
*5 AM. STANDARD TAPER



5 INCH SPINDLE NOSE
WITH
*5 AM. STANDARD TAPER

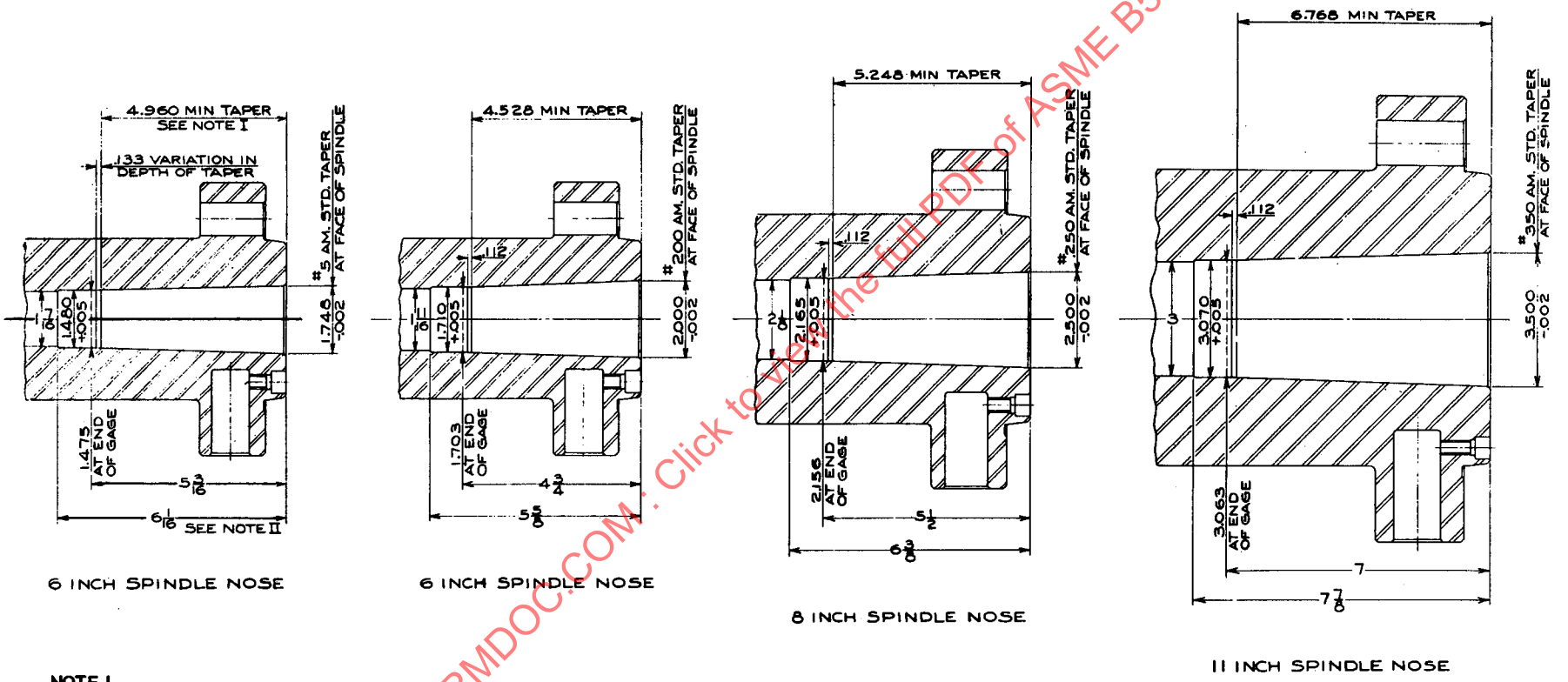
NOTE I
MINIMUM LENGTH OF TAPER GIVEN CORRESPONDS TO LOW LIMIT OF TAPER DIAMETER AND HIGH LIMIT OF STRAIGHT HOLE AT BOTTOM OF TAPER

NOTE II
STRAIGHT HOLE AT BOTTOM OF TAPER IS OF SUFFICIENT DEPTH TO CLEAR AM. STD. PLUG GAGE SHOWN IN ASA B5.10–1963

STAMP SIZE OF AMERICAN STANDARD TAPER HOLE ON OUTSIDE DIAMETER OF 2 INCH SPINDLE NOSE
STAMP SIZE OF AMERICAN STANDARD TAPER HOLE IN UNDERCUT FOR ALL OTHER SPINDLE NOSES
EXAMPLE: "4 1/2 AM STD TAPER HOLE"

TABLE 16 TAPER HOLES, COUNTERBORES FOR SAME, AND THRU HOLES IN TYPE D1 SPINDLE NOSES, 2 INCH TO 5 INCH INCLUSIVE, FOR ENGINE LATHES AND TOOL ROOM LATHES

ALL DIMENSIONS IN INCHES



6 INCH SPINDLE NOSE

6 INCH SPINDLE NOSE

8 INCH SPINDLE NOSE

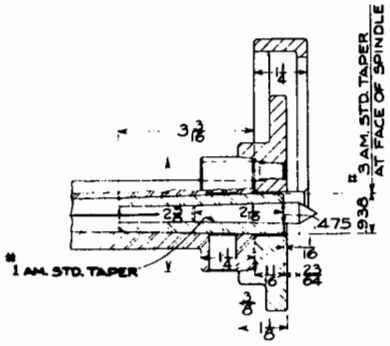
11 INCH SPINDLE NOSE

NOTE I
MINIMUM LENGTH OF TAPER GIVEN CORRESPONDS TO LOW LIMIT OF TAPER DIAMETER AND HIGH LIMIT OF STRAIGHT HOLE AT BOTTOM OF TAPER

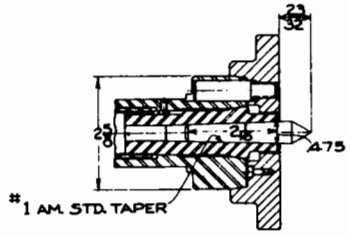
NOTE II
STRAIGHT HOLE AT BOTTOM OF TAPER IS OF SUFFICIENT DEPTH TO CLEAR USA STANDARD PLUG GAGE SHOWN IN USAS B5.10–1963

STAMP SIZE OF AMERICAN STANDARD TAPER HOLE IN UNDERCUT
EXAMPLE: "250 AM. STD TAPER HOLE"

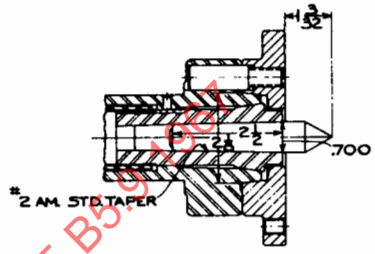
TABLE 17 TAPER HOLES, COUNTERBORES FOR SAME, AND THRU HOLES IN TYPE D1 SPINDLE NOSES, SIZES 6 INCH TO 11 INCH INCLUSIVE, FOR ENGINE LATHES AND TOOL ROOM LATHES



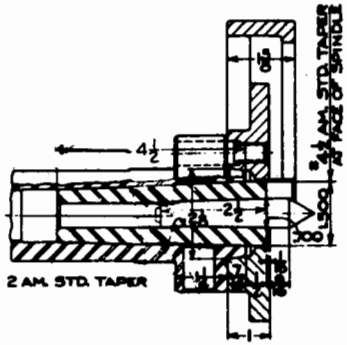
2 INCH TYPE D1 SPINDLE NOSE



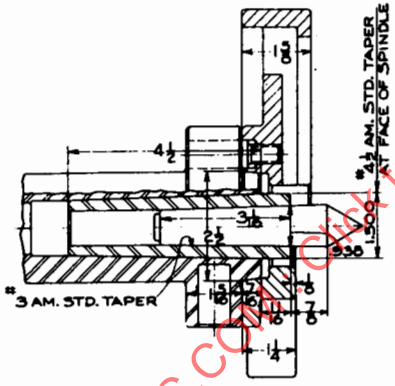
2 INCH TYPE D1 SPINDLE NOSE WITH DRAW-IN COLLET



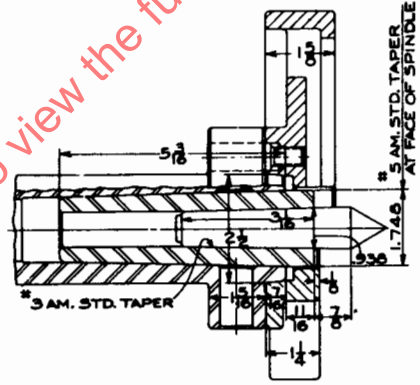
3 INCH TYPE D1 SPINDLE NOSE WITH DRAW-IN COLLET



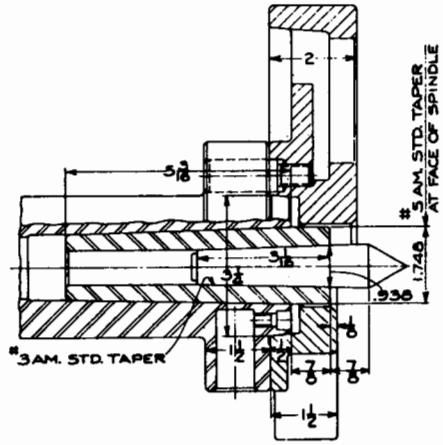
3 INCH TYPE D1 SPINDLE NOSE



4 INCH TYPE D1 SPINDLE NOSE



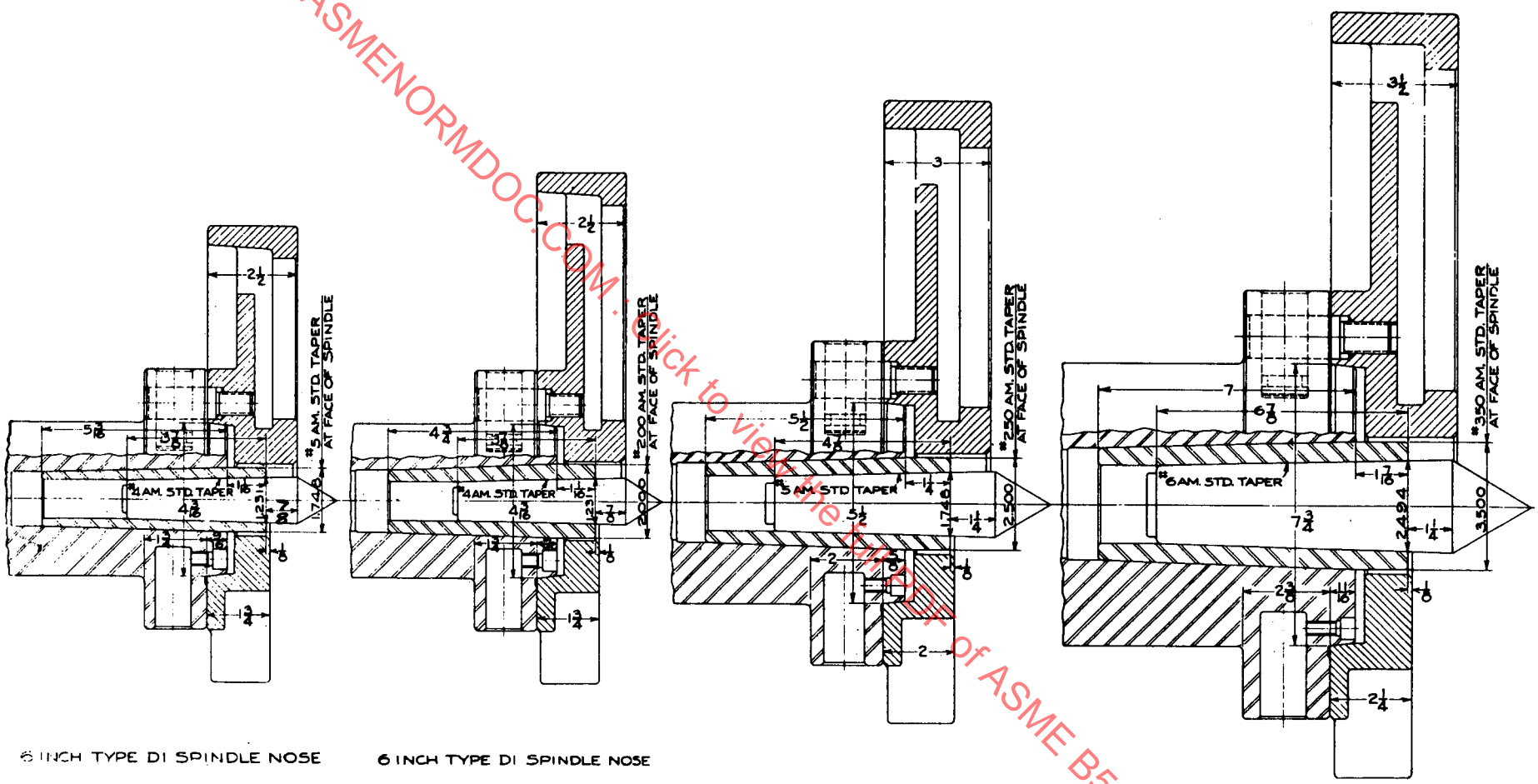
4 INCH TYPE D1 SPINDLE NOSE



5 INCH TYPE D1 SPINDLE NOSE

TABLE 18 SECTIONS THRU TYPE D1 SPINDLE NOSES, SIZES 2 INCH TO 5 INCH INCLUSIVE, FOR ENGINE LATHES AND TOOL ROOM LATHES, ASSEMBLED WITH DOG PLATES, FACE PLATES, CENTERS, AND SLEEVES

ALL DIMENSIONS IN INCHES



6 INCH TYPE D1 SPINDLE NOSE

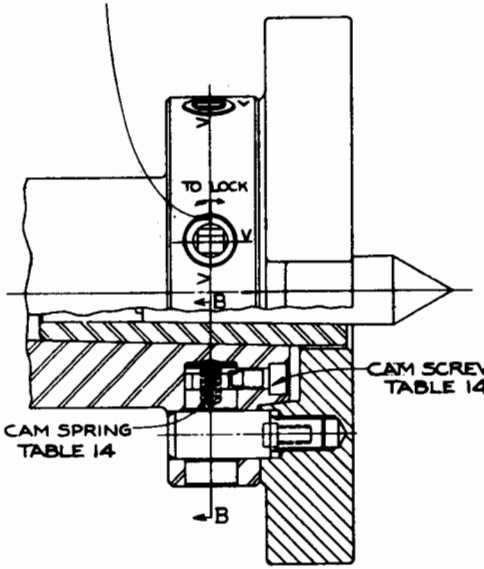
6 INCH TYPE D1 SPINDLE NOSE

8 INCH TYPE D1 SPINDLE NOSE

11 INCH TYPE D1 SPINDLE NOSE

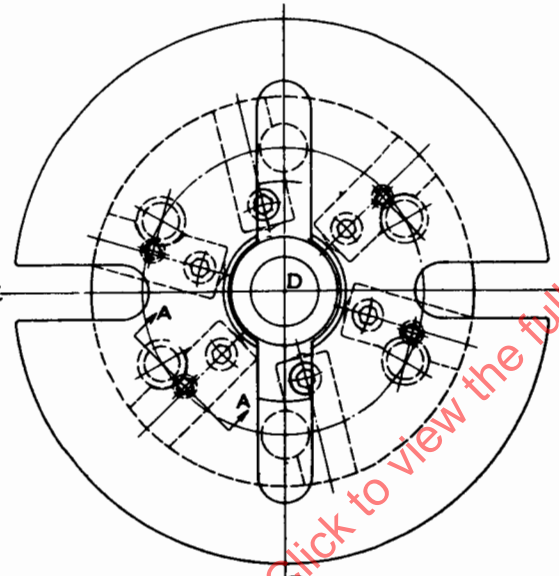
TABLE 19 SECTIONS THRU TYPE D1 SPINDLE NOSES, SIZES 6 INCH TO 11 INCH INCLUSIVE, FOR ENGINE LATHES AND TOOL ROOM LATHES, ASSEMBLED WITH DOG PLATES, FACE PLATES, CENTERS, AND SLEEVES

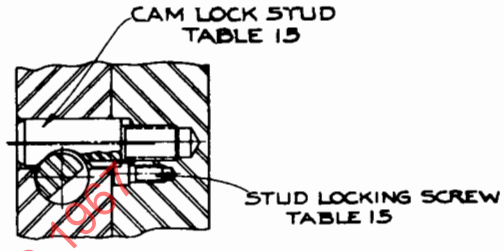
ALL DIMENSIONS IN INCHES



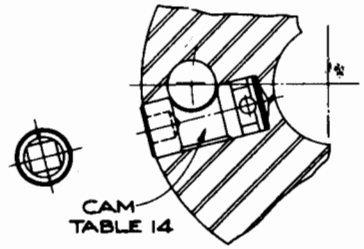
ASSEMBLY OF 6 INCH TYPE D1 SPINDLE NOSE WITH DOG PLATE, SLEEVE, AND CENTER

SECTION C-D-E THRU DOG PLATE

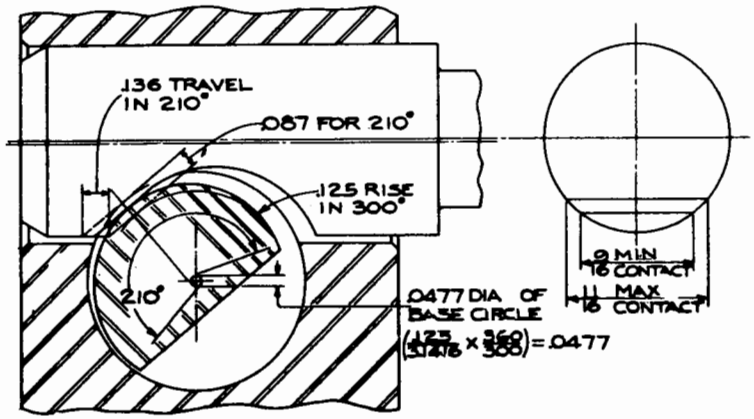




SECTION A-A THRU CAM AND CAM LOCK STUD WITH CAM IN LOCKED POSITION



SECTION B-B THRU CAM WITH CAM IN OPEN POSITION



ENLARGED VIEW OF CAM AND CAM LOCK STUD

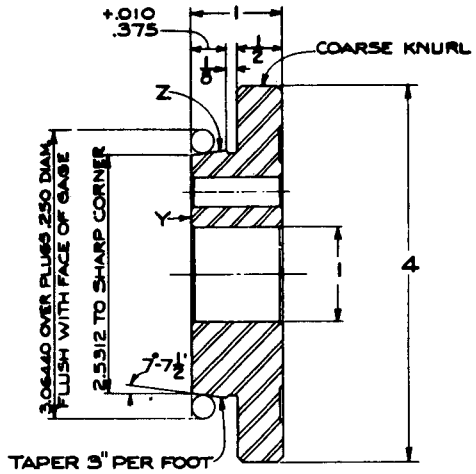
TABLE 20 SECTIONS THRU 6 INCH TYPE D1 SPINDLE NOSE ASSEMBLED WITH STUDS, CAMS, DOG PLATE, SLEEVE, AND CENTER

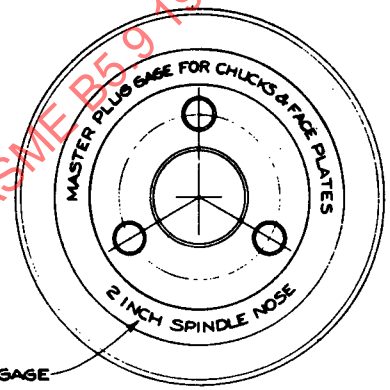
ALL DIMENSIONS IN INCHES
TOLERANCES OF ± 1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

TOLERANCE ON DIAMETER OF SURFACE Z MEASURED WITH REFERENCE TO SURFACE Y IS ±.00005

SURFACES Y AND Z SHOULD BE GOOD PRUSSIAN BLUE FIT ON MATING SURFACES OF MATING RING GAGE

GAGES TO BE HARDENED AND GROUND, AND SEASONED TO PREVENT DISTORTION

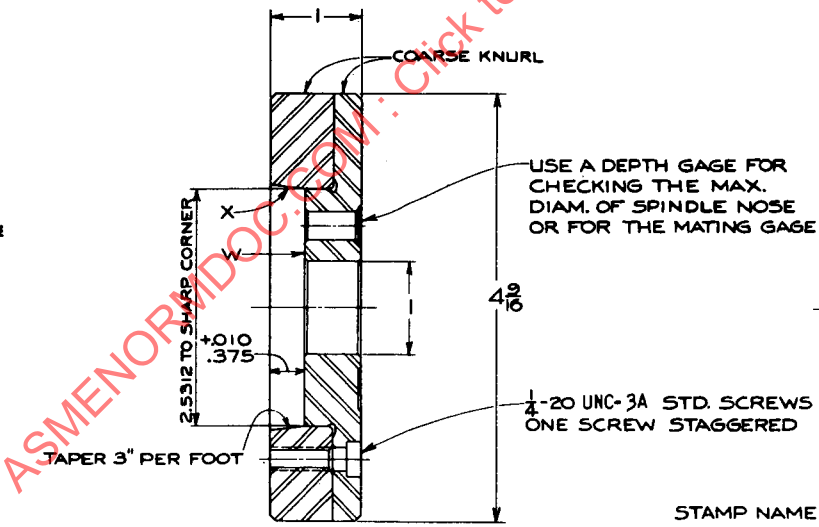




TOLERANCE ON DIAMETER OF SURFACE X MEASURED WITH REFERENCE TO SURFACE W IS ±.00005

SURFACES W AND X SHOULD BE GOOD PRUSSIAN BLUE FIT ON MATING SURFACES OF MATING PLUG GAGE

GAGES TO BE HARDENED AND GROUND, AND SEASONED TO PREVENT DISTORTION



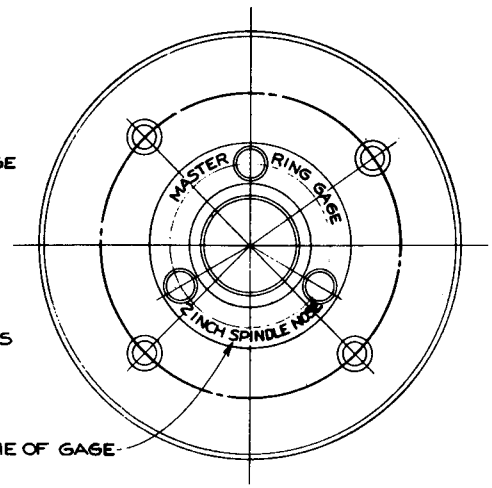
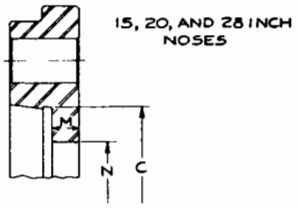
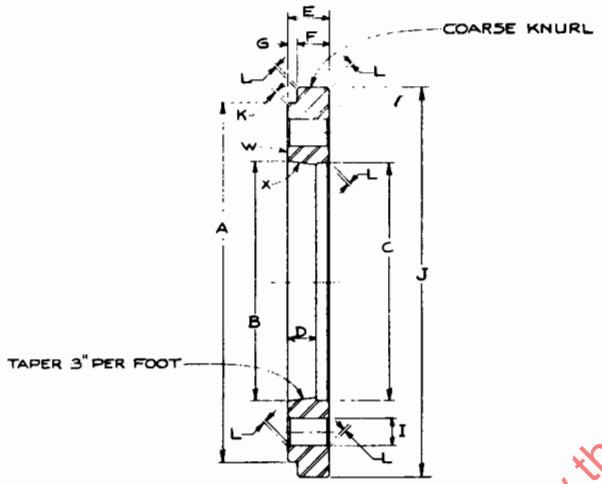


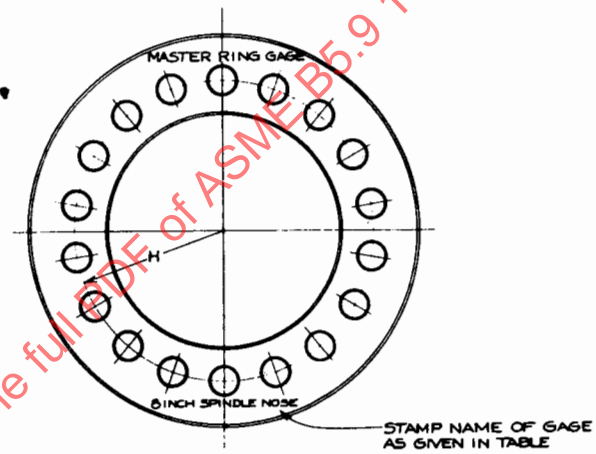
TABLE 21 MASTER GAGES FOR 2 INCH TYPES A, B, AND D SPINDLE NOSES, CHUCKS, AND FACE PLATES

ALL DIMENSIONS IN INCHES
TOLERANCES OF ± 1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS



TOLERANCE ON DIAMETER OF SURFACE "X" MEASURED WITH REFERENCE TO SURFACE "W" IS ±.0001
SURFACES "W" AND "X" SHOULD BE GOOD PRUSSIAN BLUE FIT ON MATING SURFACES OF MATING PLUG GAGE SHOWN BY TABLE 23
GAGES TO BE HARDENED AND GROUND AND SEASONED TO PREVENT DISTORTION





SPINDLE NAME	A	B	C	D	E	F	G	H	I	J	K	L	M	N	STAMP
3 Inch Nose	3 5/8	2.125	2 1/8	15/32	1/4	5/8	1/8	1 7/16	6—3/8 Holes	4 3/8	1/64	1/16			Master Ring Gage 3 Inch Spindle Nose
4 Inch Nose	4 1/4	2.5005	2 1/2	15/32	1/4	3/8	1/8	1 11/16	12—7/16 Holes	5	1/64	1/16			Master Ring Gage 4 Inch Spindle Nose
5 Inch Nose	5 1/4	3.2503	3 1/4	17/32	1/4	5/8	1/8	2 1/8	16—1/2 Holes	6	1/64	1/16			Master Ring Gage 5 Inch Spindle Nose
6 Inch Nose	6 1/2	4.1878	4 3/16	19/32	7/8	5/8	1/4	2 1/4	16—9/16 Holes	7 1/4	1/64	1/16			Master Ring Gage 6 Inch Spindle Nose
8 Inch Nose	8 1/4	5.50055	5 1/2	21/32	1	1/4	1/4	3 7/16	18—3/8 Holes	9	1/64	1/16			Master Ring Gage 8 Inch Spindle Nose
11 Inch Nose	11	7.75055	7 3/4	23/32	1 1/4	1/4	1/2	4 1/4	24—1/4 Holes	11 1/4	1/64	1/16			Master Ring Gage 11 Inch Spindle Nose
15 Inch Nose	15	11.2505	11 1/4	25/32	1 5/8	7/8	3/4	6 5/8	24—1" Holes	15 1/4	1/64	1/16	5/8	9 1/2	Master Ring Gage 15 Inch Spindle Nose
20 Inch Nose	20 1/2	16.2505	16 1/4	27/32	2	1	1	9 1/4	30—1 1/8 Holes	21 1/4	1/64	1/16	3/4	13 3/4	Master Ring Gage 20 Inch Spindle Nose
28 Inch Nose	28 1/2	23.000	23	31/32	2 1/2	1 1/4	1 1/4	13	36—1 1/4 Holes	29 1/4	1/64	1/16	1	20	Master Ring Gage 28 Inch Spindle Nose

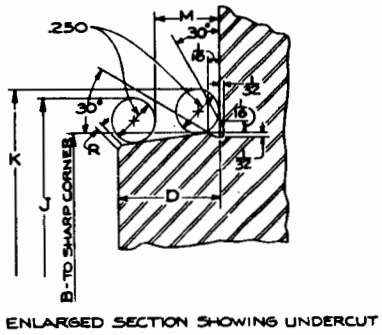
TABLE 22 MASTER RING GAGES FOR TYPES A, B, AND D SPINDLE NOSES SIZES 3 INCH TO 28 INCH INCLUSIVE

TOLERANCE ON DIAMETER OF SURFACE Z MEASURED WITH REFERENCE TO SURFACE Y IS ±.0001

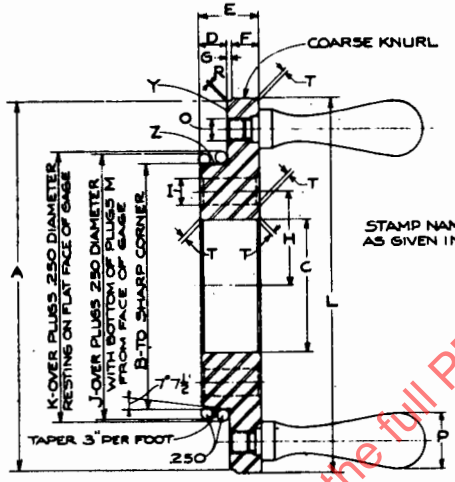
SURFACES Y AND Z SHOULD BE GOOD PRUSSIAN BLUE FIT ON MATING SURFACES OF MATING RING GAGE SHOWN BY TABLE 22

GAGES TO BE HARDENED AND GROUND AND SEASONED TO PREVENT DISTORTION

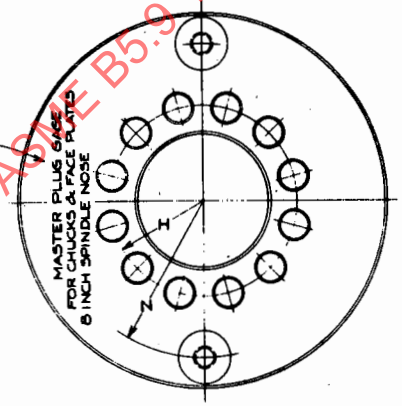
ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS



ENLARGED SECTION SHOWING UNDERCUT



STAMP NAME OF GAGE AS GIVEN IN TABLE



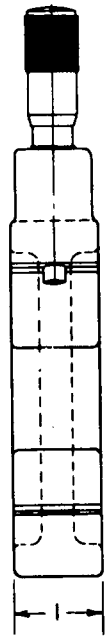
SPINDLE NAME	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R	T	STAMP
3 Inch Nose	3 5/8	2.125	1	15/32	31/32	7/16	1/16	Omit	Omit	2.53320	2.59570	3¼	.250	Omit	Omit	Omit	1/64	1/16	Master Plug Gage For Chucks and Face Plates For 3 Inch Spindle Nose
4 Inch Nose	4¼	2.5005	1 3/8	15/32	1 1/32	½	1/16	Omit	Omit	2.90870	2.97120	4 3/8	.250	1 11/16	3/8-16UNC-3	15/16	1/64	1/16	Master Plug Gage For Chucks and Face Plates For 4 Inch Spindle Nose
5 Inch Nose	5¼	3.2503	2	17/32	1 3/32	½	1/16	Omit	Omit	3.64287	3.72100	5 3/8	.3125	2⅛	3/8-16UNC-3	15/16	1/64	1/16	Master Plug Gage For Chucks and Face Plates For 5 Inch Spindle Nose
6 Inch Nose	6½	4.1878	2⅛	19/32	1 5/32	½	1/16	1 9/16	12—½ Holes	4.56475	4.65850	6 5/8	.375	2¼	3/8-16UNC-3	15/16	1/64	1/16	Master Plug Gage For Chucks and Face Plates For 6 Inch Spindle Nose
8 Inch Nose	8¼	5.50055	3	21/32	1⅛	5/8	3/32	2⅛	12—⅝ Holes	5.86187	5.97125	8 3/8	.4375	3½	½-13UNC-3	1¼	1/64	1/16	Master Plug Gage For Chucks and Face Plates For 8 Inch Spindle Nose
11 Inch Nose	11	7.75055	3¼	23/32	1 9/16	¾	3/32	2⅞	12—1" Holes	8.09625	8.22125	11⅛	.500	4½	½-13UNC-3	1¼	1/64	1/16	Master Plug Gage For Chucks and Face Plates For 11 Inch Spindle Nose
15 Inch Nose	15	11.2505	6¼	25/32	1¼	⅞	3/32	4½	16—1⅛ Holes	11.58057	11.72120	15⅛	.5625	6½	½-13UNC-3	1¼	1/64	1/16	Master Plug Gage For Chucks and Face Plates For 15 Inch Spindle Nose
20 Inch Nose	20½	16.2505	11¼	27/32	1 15/16	1	3/32	6⅞	24—1¼ Holes	16.56495	16.72120	20 5/8	.625	9	½-13UNC-3	1¼	1/64	1/16	Master Plug Gage For Chucks and Face Plates For 20 Inch Spindle Nose
28 Inch Nose	28½	23.000	17 5/8	31/32	2 3/16	1⅛	3/32	10⅛	30—1⅜ Holes	23.28320	23.47070	28 5/8	.750	13	½-13UNC-3	1¼	1/64	1/16	Master Plug Gage For Chucks and Face Plates For 28 Inch Spindle Nose

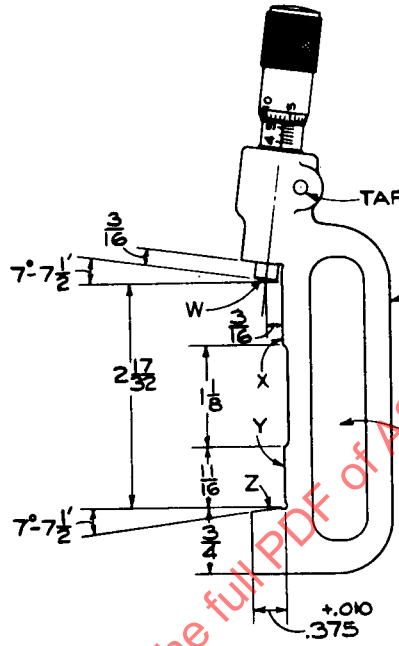
TABLE 23 MASTER PLUG GAGES FOR CHUCKS AND FACE PLATES FOR TYPES A, B, AND D SPINDLE NOSES, SIZES 3 INCH TO 28 INCH INCLUSIVE

TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

MICROMETER HEAD TO BE GRADUATED IN HALF THOUSANDTHS.
GAGE TO BE HARDENED AND GROUND.
SURFACES W, X, Y, AND Z TO BE A GOOD PRUSSIAN BLUE FIT ON MASTER PLUG GAGE - TABLE 21

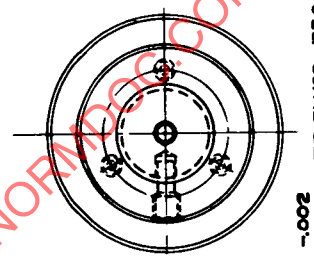
OUTSIDE MICROMETER WORKING GAGE

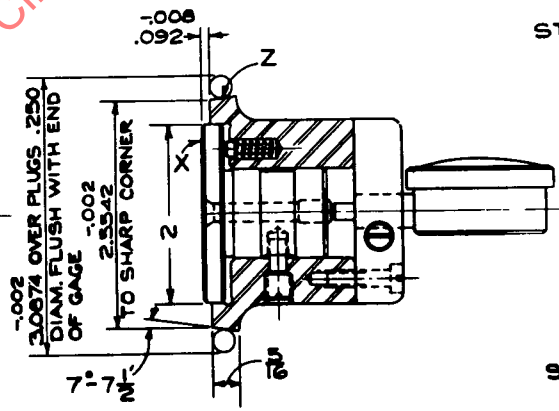




INDICATOR GRADUATED IN .0001 READING PLUS AND MINUS.
GAGE TO BE HARDENED AND GROUND.
SURFACES X AND Z TO BE A GOOD PRUSSIAN BLUE FIT ON MASTER RING GAGE - TABLE 21

INSIDE INDICATOR WORKING GAGE





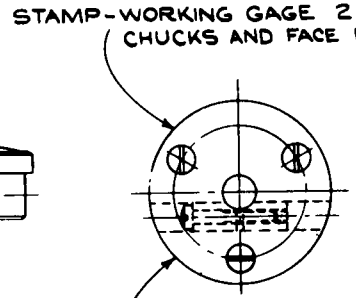
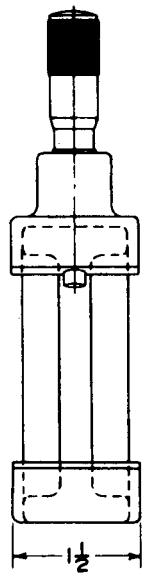


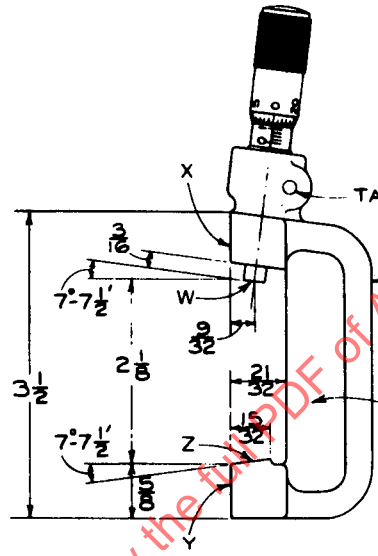
TABLE 24 WORKING GAGES FOR 2 INCH TYPES A, B, AND D SPINDLE NOSES, CHUCKS AND FACE PLATES

ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

MICROMETER HEAD TO BE GRADUATED IN HALF THOUSANDTHS
GAGE TO BE HARDENED AND GROUND.
SURFACES W, X, Y, AND Z TO BE A GOOD PRUSSIAN BLUE FIT ON MASTER PLUG GAGE - TABLE 23

OUTSIDE MICROMETER WORKING GAGE





TAPER PIN FOR LOCKING MICROMETER IN PLACE

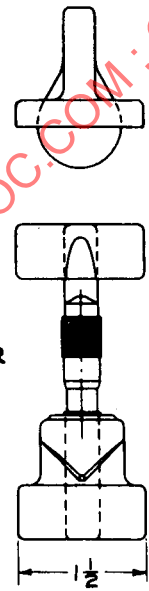
STAMP - WORKING GAGE 3 INCH SPINDLE NOSE

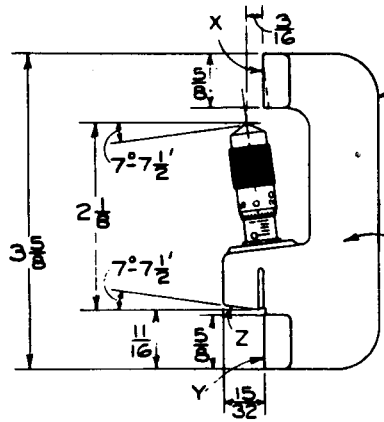
STAMP THIS SIDE - READ 2.1250 +.00025 ON SPINDLE

STAMP OTHER SIDE - SET TO READ 2.1250 ON MASTER GAGE

MICROMETER HEAD TO HAVE ½ INCH RANGE ONLY AND BE GRADUATED IN HALF THOUSANDTHS WITH ADJUSTMENT FOR SIZE PROVIDED
GAGE TO BE HARDENED AND GROUND.
SURFACES X, Y, AND Z TO BE A GOOD PRUSSIAN BLUE FIT ON MASTER RING GAGE - TABLE 22

INSIDE MICROMETER WORKING GAGE





STAMP - WORKING GAGE 3 INCH CHUCKS AND FACE PLATES

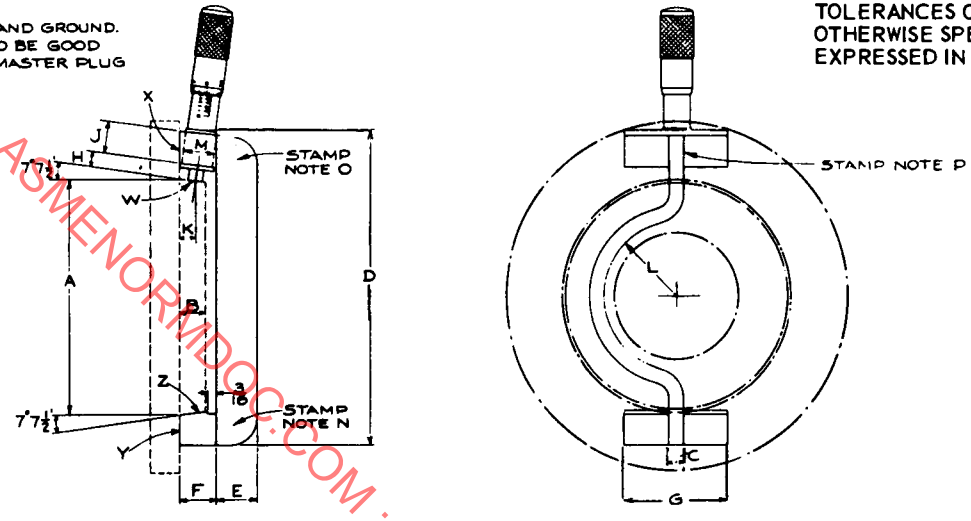
STAMP THIS SIDE - READ 2.1250 -.0005 ON CHUCKS AND FACE PLATES

STAMP OTHER SIDE - SET TO READ 2.1250 ON MASTER GAGE

TABLE 25 WORKING GAGES FOR 3 INCH TYPES A, B, AND D SPINDLE NOSES, CHUCKS AND FACE PLATES

MICROMETER HEADS TO BE GRADUATED IN HALF THOUSANDTHS
GAGES TO BE HARDENED AND GROUND.
SURFACES W, X, Y AND Z TO BE GOOD PRUSSIAN BLUE FIT ON MASTER PLUG GAGE. SEE TABLE 26

ALL DIMENSIONS IN INCHES
TOLERANCES OF ± 1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

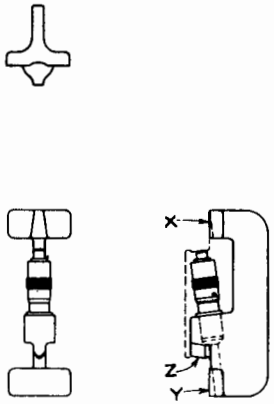


SPINDLE NAME	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P
4 Inch Nose	2 ½	1/2.	⅜	4	1	3/4	1¾	¼	⅝	9/32	¾	1/2	Set to Read 2.5005 on Master Gage	Read 2.5005 + .0005 On Spindle	Working Gage 4 Inch Spindle Nose
5 Inch Nose	3 ¼	9/16	⅜	4¾	1	3/4	1¾	¼	⅝	9/32	1	1/2	Set to Read 3.2503 on Master Gage	Read 3.2505 + .0005 On Spindle	Working Gage 5 Inch Spindle Nose
6 Inch Nose	4 3/16	5/8	⅜	6 1/16	1 ⅛	15/16	2 ½	⅜	¾	⅜	1 ⅜	1/2	Set to Read 4.1878 on Master Gage	Read 4.1880 + .0005 On Spindle	Working Gage 6 Inch Spindle Nose
8 Inch Nose	5 ½	11/16	⅜	7 ⅜	1 ⅛	15/16	2 ½	⅜	¾	⅜	1 ¾	11/16	Set to Read 5.50055 on Master Gage	Read 5.50075 + .0005 On Spindle	Working Gage 8 Inch Spindle Nose
11 Inch Nose	7 ¾	3/4	⅜	9 ⅝	1 ⅛	15/16	2 ½	⅜	¾	⅜	1 ¾	11/16	Set to Read 7.75055 on Master Gage	Read 7.75075 + .0005 On Spindle	Working Gage 11 Inch Spindle Nose
15 Inch Nose	11 ¼	13/16	½	13 ⅜	1 ¼	1-1/16	3	½	¾	7/16	2 ½	11/16	Set to Read 11.2505 on Master Gage	Read 11.251 + .001 On Spindle	Working Gage 15 Inch Spindle Nose
20 Inch Nose	16 ¼	7/8	½	18 ⅜	1 ¼	1-1/16	3	½	¾	7/16	2 ½	11/16	Set to Read 16.2505 on Master Gage	Read 16.251 + .001 On Spindle	Working Gage 20 Inch Spindle Nose
28 Inch Nose	23	1	⅝	25 ½	1 ⅜	1-1/4	3	½	1	½	2 ½	11/16	Set to Read 23.0000 on Master Gage	Read 23.001 + .001 On Spindle	Working Gage 28 Inch Spindle Nose

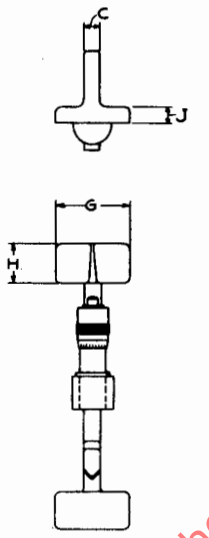
TABLE 26 OUTSIDE MICROMETER WORKING GAGES FOR TYPES A, B, AND D SPINDLE NOSES SIZES 4 INCH TO 28 INCH INCLUSIVE

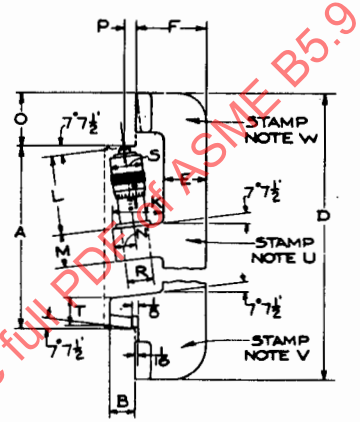
ALL DIMENSIONS IN INCHES
TOLERANCES OF ± 1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

MICROMETER HEADS TO HAVE ½ INCH RANGE ONLY AND BE GRADUATED IN HALF THOUSANDTHS WITH ADJUSTMENT FOR SIZE ON THE END OF THE BARREL. GAGES TO BE HARDENED AND GROUND. SURFACES X, Y, AND Z TO BE A GOOD PRUSSIAN BLUE FIT ON MASTER RING GAGES - TABLE 22



TYPE OF GAGE FOR 4 INCH NOSE





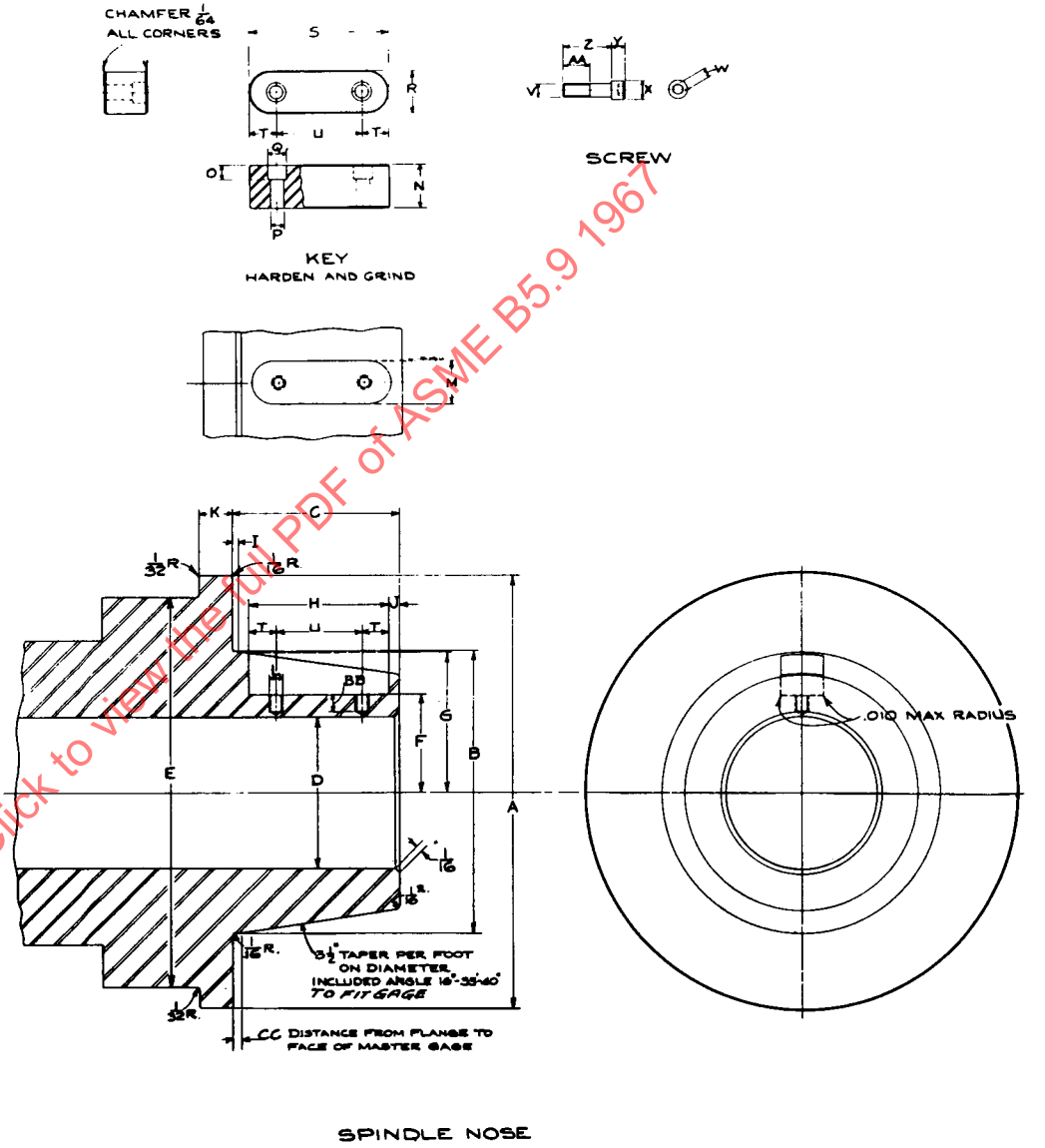
TYPE OF GAGES FOR 5 INCH AND LARGER NOSES

SPINDLE NAME	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	S	T	U	V	W
4 Inch Nose	2 ½	15/32	¼	4 ¼	13/16	1 ⅜	1 ½	⅝	5/16		1 ½			⅞	3/16	½	9/16		Set to Read 2.5005 on Master Gage	Read 2.5005—.0005 on Chucks & Face Plates	Working Gages for 4 Inch Chucks & Face Plates
5 Inch Nose	3 ¼	17/32	¼	5 ¼	13/16	1 ⅜	1 ½	⅝	5/16	15/16	1 ¾	½	⅜	1	3/16	½	9/16	½	Set to Read 3.2503 on Master Gage	Read 3.2503—.0005 on Chucks & Face Plates	Working Gages for 5 Inch Chucks & Face Plates
6 Inch Nose	4 ⅜	19/32	⅜	6 ½	1	1 ⅜	1 ¾	⅞	⅜	1 ⅛	2-13/16	¾	½	1-5/32	¼	⅝	¾	⅝	Set to Read 4.1878 on Master Gage	Read 4.1878—.0005 on Chucks & Face Plates	Working Gages for 6 Inch Chucks & Face Plates
8 Inch Nose	5 ½	21/32	⅜	8 ¼	1	1 ⅜	1 ¾	⅞	⅜	1-5/32	1 ⅝	¾	½	1 ⅜	¼	⅜	¾	⅝	Set to Read 5.50055 on Master Gage	Read 5.50055—.0005 on Chucks & Face Plates	Working Gages for 8 Inch Chucks & Face Plates
11 Inch Nose	7 ¾	23/32	⅜	11	1	1 ⅜	1 ¾	⅞	⅜	1-7/32	1 ⅞	¾	½	1 ⅝	5/16	⅝	¾	⅝	Set to Read 7.75055 on Master Gage	Read 7.75055—.0005 on Chucks & Face Plates	Working Gages for 11 Inch Chucks & Face Plates
15 Inch Nose	11 ¼	25/32	⅜	15	1 ¼	1 ⅞	2	1	⅜	1-7/32	1 ⅞	¾	½	1 ⅞	5/16	⅝	¾	¾	Set to Read 11.2505 on Master Gage	Read 11.2505—.001 on Chucks & Face Plates	Working Gages for 15 Inch Chucks & Face Plates
20 Inch Nose	16 ¼	27/32	⅜	20 ½	1 ¼	1 ⅞	2	1	⅜	1-9/32	1 ⅞	¾	½	2 ⅛	⅜	⅝	¾	¾	Set to Read 16.2505 on Master Gage	Read 16.2505—.001 on Chucks & Face Plates	Working Gages for 20 Inch Chucks & Face Plates
28 Inch Nose	23	31/32	½	28 ½	1 ½	2 ⅛	2	1	½	1-11/32	1 ⅞	¾	½	2 ¾	7/16	⅜	¾	¾	Set to Read 23.0000 on Master Gage	Read 23.0000—.001 on Chucks & Face Plates	Working Gages for 28 Inch Chucks & Face Plates

TABLE 27 INSIDE MICROMETER WORKING GAGES FOR CHUCKS AND FACE PLATES FOR TYPES A, B, AND D SPINDLE NOSES, SIZES 4 INCH TO 28 INCH INCLUSIVE

ALL DIMENSIONS IN INCHES
TOLERANCES OF ± 1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

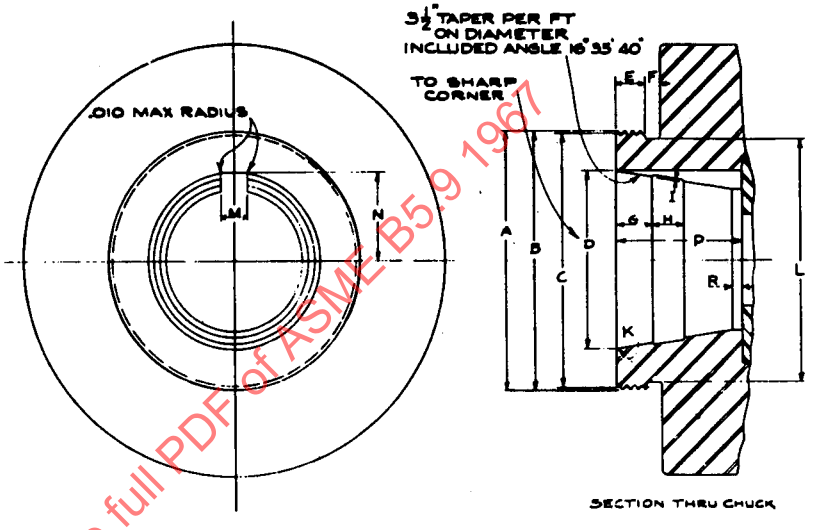
SPINDLE NAME		L00 NOSE	L0 NOSE	L1 NOSE	L2 NOSE	L3 NOSE
Dia of Flange	A	3-1/2	4-1/8	5-3/4	7-3/8	10
Dia of Large End of Pilot	B	+.002 2.750	+.002 3.250	+.002 4.125	+.002 5.250	+.002 6.500
Length of Pilot	C	2	2-3/8	2-7/8	3-3/8	3-7/8
Maximum Hole	D	1-1/2	2	2-1/4	3	3-7/8
Diameter for Draw Nut Fit	E	−.005 2.870	−.005 3.495	−.005 4.745	−.005 6.370	−.005 8.995
Distance from Center To Bottom of Keyseat	F	−.005 .995	−.005 1.245	−.005 1.4325	−.005 1.870	−.005 2.245
Distance from Center To Top of Key	G	−.007 1.370	−.007 1.620	−.007 2.0575	−.007 2.620	−.007 3.245
Length of Keyseat	H	+.010 1.500	+.010 1.750	+.010 2.375	+.010 2.875	+.010 3.250
Width of Flat	I	1/8	1/8	1/8	1/8	1/8
End of Nose to End of Keyseat	J	3/16	1/4	1/4	1/4	1/4
Width of Flange	K	9/32	5/16	7/16	5/8	3/4
Thread	L	#10-32 UNF-3B	#10-32 UNF-3B	1/4-20 UNC-3B	5/16-18 UNC-3B	5/16-18 UNC-3B
Width of Keyseat	M	−.001 .375	−.001 .375	−.001 .625	−.001 .750	−.001 1.000
Height of Key	N	−.002 .375	−.002 .375	−.002 .625	−.002 .750	−.002 1.000
Depth of Counterbore	O	7/32	7/32	9/32	11/32	11/32
Drill	P	7/32	7/32	9/32	11/32	11/32
Counterbore	Q	11/32	11/32	13/32	15/32	15/32
Width of Key	R	−.001 .375	−.001 .375	−.001 .625	−.001 .750	−.001 1.000
Length of Key	S	−.010 1.500	−.010 1.750	−.010 2.375	−.010 2.875	−.010 3.250
	T	1/4	5/16	7/16	9/16	5/8
Distance Between Screw Holes	U	1	1-1/8	1-1/2	1-3/4	2
Thread	V	#10-32 UNF-3A	#10-32 UNF-3A	1/4-20 UNC-3A	5/16-18 UNC-3A	5/16-18 UNC-3A
Hex Socket	W	5/32	5/32	3/16	7/32	7/32
Diameter of Head	X	5/16	5/16	3/8	7/16	7/16
Height of Head	Y	3/16	3/16	1/4	5/16	5/16
Length Under Head	Z	3/8	3/8	5/8	3/4	1
Full Length Thread	AA	1/4	1/4	7/16	1/2	3/4
Min Depth of Tapped Holes	BB	1/4	1/4	5/16	3/8	3/8
Gage Clearance	CC	+.007 .125	+.007 .125	+.007 .125	+.007 .125	+.007 .125



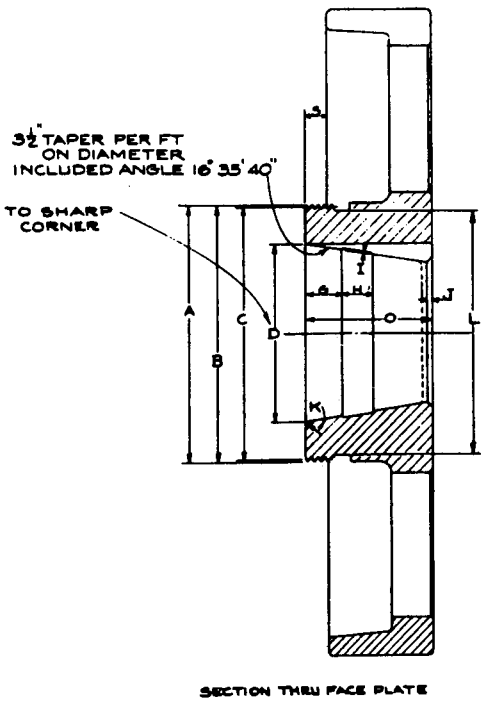
SPINDLE NOSE

TABLE 28 TYPE L SPINDLE NOSES, DRIVE KEYS, AND RETAINING SCREWS

ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS



SPINDLE NAME		L00 NOSE	L0 NOSE	L1 NOSE	L2 NOSE	L3 NOSE
Nominal Thread		3¼-6 Unified Form-Special	4½-6 Unified Form-Special	6-6 Unified Form-Special	7¾-5 Unified Form-Special	10⅜-4 Unified Form-Special
Outside Diameter of Thread	B	−.0202 3.7450	−.0202 4.4950	−.0202 5.9950	−.0236 7.7450	−.0280 10.3700
Pitch Dia of Thread	C	−.0074 3.6367	−.0083 4.3867	−.0083 5.8867	−.0091 7.6151	−.0134 10.2076
Dia of Large End of Taper	D	−.002 2.750	−.002 3.250	−.002 4.125	−.002 5.250	−.002 6.500
Length of Thread	E	9/16	9/16	5/8	7/8	15/16
Width of Neck	F	1/4	1/4	1/4	5/16	3/8
End of Pilot to Relief	G	5/8	7/8	1	1-3/16	1-3/8
Width of Relief	H	1/2	3/4	7/8	1	1-1/8
Depth of Relief	I	1/32	1/32	1/32	1/32	1/32
Chamfer	J	1/16	1/16	1/8	1/8	1/8
Corner Radius	K	1/32	1/32	1/32	1/32	1/32
Neck Diameter	L	3-1/2	4-1/4	5-3/4	7-7/16	10
Width of Keyway	M	+.002 .377	+.002 .377	+.002 .627	+.002 .752	+.002 1.002
From Center to Bottom of Keyway	N	+.015 1.375	+.015 1.625	+.015 2.0625	+.015 2.625	+.015 3.250
Length of Hole	O	2	2-3/8	3	3-1/2	4
Length of Hole	P	2-1/8	2-1/2	3	3-1/2	4
Straight Hole	R	1/4	1/4	1/4	1/4	1/4
Min Extension	S	3/8	3/8	1/2	1/2	1/2



TYPE 29 BACKS OF CHUCKS AND FACE PLATES FOR TYPE L SPINDLE NOSES

ALL DIMENSIONS IN INCHES
TOLERANCES OF ± 1/64 ARE PERMISSIBLE UNLESS OTHERWISE SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS

	SPINDLE NAME				
	L00 NOSE	L0 NOSE	L1 NOSE	L2 NOSE	L3 NOSE
A	4-5/8	5-1/2	7-1/2	9-3/8	12-5/8
B	1-3/16	1-1/4	1-9/16	2-1/4	2-9/16
C	3¼-6 Unified Form-Special	4½-6 Unified Form-Special	6-6 Unified Form-Special	7¾- 5 Unified Form-Special	10⅜-4 Unified Form-Special
D	+.0074 3.6417 P.D.	+.0083 4.3917 P.D.	+.0083 5.8917 P.D.	+.0091 7.6201 P.D.	+.0134 10.2126 P.D.
E	+.0180 3.5696 Bore	+.0180 4.3196 Bore	+.0180 5.8196 Bore	+.0216 7.5334 Bore	+.0270 10.1044 Bore
F	9/16	5/8	3/4	1	1-1/8
G	+.005 2.875	+.005 3.500	+.005 4.750	+.005 6.375	+.005 9.000
H	3-1/2	4-1/8	5-11/16	7-3/8	10
I	1/4	1/4	3/8	5/8	3/4
J	3-13/16	4-9/16	6-1/16	7-13/16	10-7/16
K	3/16	1/4	5/16	3/8	3/8
L	9/16	1/2	3/4	1-1/8	1-5/16
M	1/2	1/2	11/16	3/4	13/16
N	1/4	1/4	5/16	5/8	13/16
O	1/2	3/4	3/4	7/8	1
P	1-1/2	1-3/4	1-3/4	2-1/2	3-1/2
R	1/16	1/16	1/16	1/16	1/16

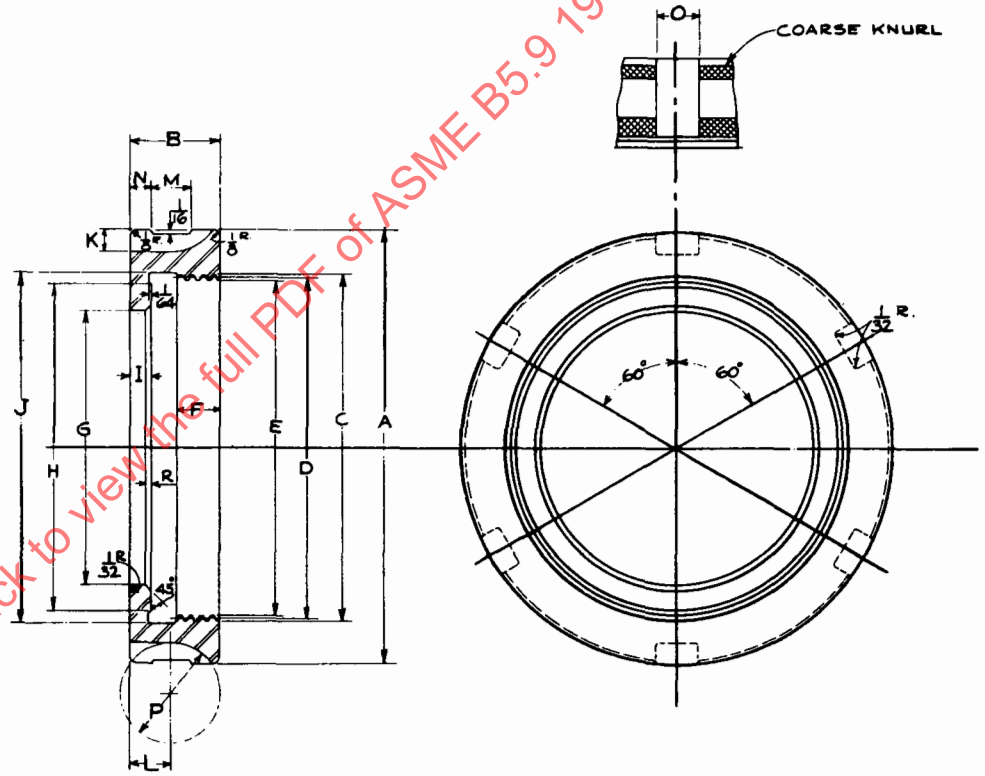
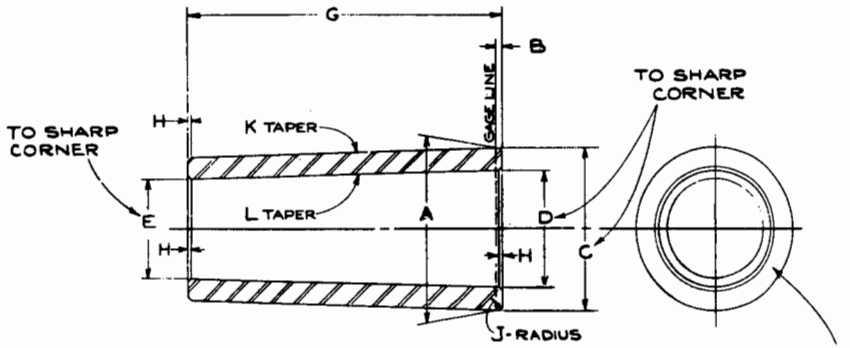
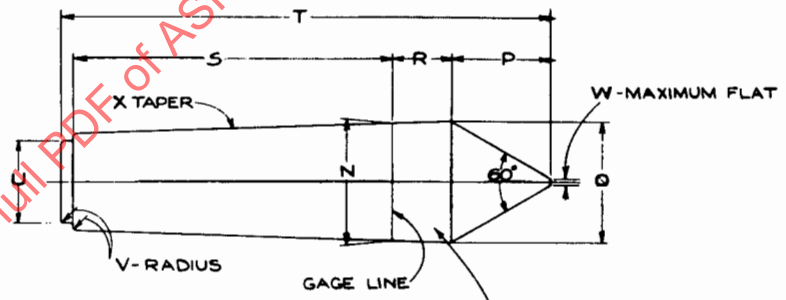


TABLE 30 DRAW NUTS FOR TYPE L SPINDLE NOSES

ALL DIMENSIONS IN INCHES
TOLERANCES OF ±1/64 ARE PERMISSIBLE UNLESS OTHERWISE
SPECIFIED WHEN DIMENSIONS ARE EXPRESSED IN COMMON FRACTIONS



STAMP SIZES OF AMERICAN STANDARD TAPERS
EXAMPLE: "5 TO 3 AMER STD TAPER"



STAMP SIZE OF AMERICAN STANDARD TAPER
EXAMPLE: "3 AMER STD TAPER"

SLEEVE

SPINDLE NAME	A	B	C	D	E	G	H	J	K	L
L00 Nose	1.500	1/16	1.5032	−.002 .938	.7874	3	1/16	1/32	#4½ Am.Std. Taper	#3 Am.Std. Taper
L0 Nose	1.748	1/16	1.7513	−.002 .938	.7874	3	1/16	1/32	#5 Am.Std. Taper	#3 Am.Std. Taper
L1 Nose Small Sleeve	1.748	1/8	1.7546	−.002 1.231	1.0364	3-3/4	1/16	1/16	#5 Am.Std. Taper	#4 Am.Std. Taper
L1 Nose Large Sleeve	2.000	1/8	2.0078	−.002 1.231	1.0364	3-3/4	1/16	1/16	#200 Am.Std. Taper	#4 Am.Std. Taper
L2 Nose	2.500	1/8	2.5078	−.002 1.748	1.4980	4-3/4	1/16	1/16	#250 Am.Std. Taper	#5 Am.Std. Taper
L3 Nose	3.500	1/8	3.5078	−.002 2.494	2.1421	6-3/4	1/16	1/16	#350 Am.Std. Taper	#6 Am.Std. Taper

CENTER

SPINDLE NAME	N	O	P	R	S	T	U	V	W	X
L00 Nose	.938	.982	27/32	7/8	3 1/16	4-29/32	5/8	1/32	1/32	#3 Am.Std. Taper
L0 Nose	.938	.982	27/32	7/8	3 1/16	4-29/32	5/8	1/32	1/32	#3 Am.Std. Taper
L1 Nose	1.231	1.276	1-3/32	7/8	3 7/8	5-31/32	3/4	1/16	1/32	#4 Am.Std. Taper
L2 Nose	1.748	1.814	1-17/32	1 1/4	4 7/8	7-29/32	1 1/8	1/16	1/16	#5 Am.Std. Taper
L3 Nose	2.494	2.559	2-5/32	1 1/4	6 7/8	10-17/32	1 3/4	1/16	3/32	#6 Am.Std. Taper

CENTERS ARE THE SAME AS FOR TYPE D SPINDLE NOSES SEE TABLE 15

TABLE 31 SLEEVES AND CENTERS FOR TYPE L SPINDLE NOSES FOR ENGINE LATHES AND TOOL ROOM LATHES